

Remember that the pesticide label is the legal document on pesticide use. Read the label and follow all instructions closely. The use of a pesticide in a manner not consistent with the label can lead to the injury of crops, humans, animals and the environment. The use of a pesticide inconsistent with the label directions can also lead to civil or criminal fines and/or condemnation of the crop. Pesticides are good management tools for the control of pests on crops, but only when they are used in a safe, effective and prudent manner according to the label.

**These recommendations are not intended to replace the specific product labels.  
Always read and follow label instructions carefully.**

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# Insect, Disease and Nematode Control for Commercial Vegetables

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This MSU Extension bulletin was prepared to help commercial vegetable producers make informed decisions on pest management.

## How to Use This Bulletin

Recommendations are organized into sections by crop. Within a crop, specific pests are listed along with their control recommendations. Frequent users may want to insert tabs for easy location of each crop section.

This publication focuses on chemical tactics and should be used in conjunction with an overall sound program of integrated pest management. Chemical recommendations are included for insect, disease and nematode control, as well as handling pesticides safely to prevent human and environmental harm. The management suggestions in this bulletin are designed to help protect the grower's crop from the pre-plant stage to market and, in certain cases, through storage.

The suggestions include the basic information necessary for the chemical components of pest control. The majority of the suggested materials have been tested at Michigan State University to determine the most effective materials, rates of application, timing of applications, method of application and site of application on the plant or in the soil. When this information is coupled with week-to-week information on pest populations, as disseminated in Crop Advisory Teams (CAT) Alerts, the minimum number of chemicals and treatments need be applied to attain the desired level of control.

It is extremely important that growers monitor (scout) each individual field for potential pest problems. Pest populations (insects, nematodes, and diseases) vary not only from year to year, but also from field to field and even within a given field. Pest populations vary in first appearance, number of individuals and severity of damage. These observations are the prime responsibility of the grower.

Growers should make them known to county and university Extension personnel. Through this type of two-way communication, Michigan agriculture will remain in the forefront in quality and quantity.

A grower's choice of a particular pesticide should be based on pests present, beneficial insects present (including honeybees and predators and parasites of pests), available materials, days to harvest, environmental and personal safety and cost.

Materials and rates of application listed on pages 22-123 are based on the latest information available at the time this publication went to press. Materials marked with an asterisk (\*) are particularly recommended for problem infestations.

Recommendations are changed as products are removed from the market, new products are introduced, new uses are found for old products, or new restrictions are placed on their use.

Your county MSU Extension agent is informed of the changes as they occur through Crop Advisory Team (CAT) Alerts or the MSU Extension computer network. Recommendations may be updated in the on-line version of this bulletin (see Useful Web-sites). Check with your Extension agent for updates that have occurred since the publication of this bulletin. **Always read and follow the directions and limitations on the pesticide label.**

The information given here is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by MSU Extension is implied.

Some of the more hazardous pesticides are on the Restricted Use Pesticide (RUP) list. You will need to be certified by the Michigan Department of Agriculture in order to buy and use these RUP's. Your county Extension agent has a current listing of the RUP's and will advise you on the procedures for certification.

## Safety Tips and Special Warnings

Your county agricultural agent can supply information on the dangers of environmental and personal safety with insecticides, fungicides and nematicides. You can get help for insecticide, fungicide and nematicide poison cases by telephoning the nearest Poison Control Center (see back cover). A list of insecticides and nematicides and their relative toxicities (LD50) is given on the following pages. The potential to leach into the groundwater or runoff into surface waters is given for both insecticides and fungicides.

**Phosphate Insecticides.** The phosphate group includes Imidan, Guthion and other similar materials. Many of these are extremely dangerous to users at the time of application. Read the label on the container for instructions for safe use. If any insecticide cannot be used according to those directions, do not use it at all.

**Note to Aerial Applicators.** Pilots and loading crews should know the dangers of applying methyl parathion and other hazardous insecticides. Take special care to avoid skin, respiratory and oral absorption.

- Always read the label before buying or using pesticides. Use pesticides only for the purpose(s) listed and in the manner directed.
- Pesticides that require special protective clothing or equipment should be used only by trained, experienced applicators.

\* The authors are Extension specialists in Entomology, Plant Pathology, and Nematology; Lynnae is in the Pesticide Education Program.

- Do not apply more than the specified amount of pesticides; overdoses can harm you, the consumers and the environment.
- Keep pesticides away from food and dishes.
- Keep children and pets away from pesticides and sprayed areas.
- Do not smoke or eat while applying pesticides.
- Avoid inhaling pesticides.
- Never spray on a windy day.
- When mixing pesticides, use care to avoid splashing.
- Avoid breaking or spilling pesticide containers.
- Avoid contact with skin and clothing.
- If you spill a pesticide on your skin, wash with detergent and water. If spilled on clothing, change clothing immediately.
- Store pesticides in their original containers with proper labels in a locked storage area. Never transfer a pesticide to a container that would attract children, such as a soft drink bottle
- Dispose of empty containers safely. Triple rinse (or equivalent) containers and offer for recycling or dispose of in a licensed sanitary landfill. Refer to your dealer for directions for disposal of specific containers.
- Wash with soap and water after using pesticides and launder clothes separately before wearing again.
- Getting any pesticide into the eyes or mouth can be especially serious. Read and understand first aid instructions listed on the label **BEFORE** you use the pesticide. Follow instructions explicitly. Flush eyes or mouth with water as soon as possible after exposure. Do not induce vomiting unless it is specified on the label. See a doctor immediately if there is any chance of poisoning. Take the pesticide container or label with you so that the doctor can read the "Instructions to the Physician" that are included on the label. Many labels carry the telephone number of a 24-hour emergency service offered by the pesticide company. Call this number for authoritative advice on diagnosis and treatment. Your physician can use this service if needed. The physician can also receive advice, when needed, by calling the nearest Poison Treatment Center listed on the back cover.

### Pesticide Emergency Preparedness

At the time that the pesticide is purchased, ask the chemical dealer for a complete specimen label and Material Safety Data Sheet (MSDS are required for farms with employees) of the product you bought. This label and labeling information packet is an exact duplicate of the label information that is affixed to and/or must accompany the pesticide container. Use the specimen label material as a reference during any pesticide emergency. Bring the label along with any person who has become poisoned and needs medical attention.

Closely follow all the warning statements outlined in the Precautionary Statements section of the pesticide label. Be certain that you use all protective clothing and equipment as specified by the label. Make certain all persons involved in the operation of the farm know and can carry out the information in the Statement of Practical Treatment. (See also the section on SARA Title III.)

You can develop an emergency farm plan that will prepare you and your employees for pesticide and other farm emergencies, by completing the form in Extension Bulletin E-2575.

### Pesticide Registration

Recommendations in this bulletin are based on field trials conducted in Michigan and other North Central Region states over a period of several years. All pesticides must be currently registered with the U.S. Environmental Protection Agency (E.P.A.) and the Michigan Department of Agriculture before they can be used legally in Michigan.

The pesticide label is a legal document on pesticide use. Read the label carefully and follow all instructions closely. Use of any pesticide in a manner not consistent with the label can lead to civil or criminal punishment and/or condemnation of the illegally sprayed crop. Do not mix and apply together any pesticides and fertilizers if it is forbidden on either product label.

### Pesticide Tolerances (Residues) on Vegetable Crops

Tolerances are established by the E.P.A. for every pesticide registered in the United States. These tolerances are the maximum allowable residues in parts per million (ppm) of a pesticide that may be on or in a specified crop at the time of harvest. If residues of a pesticide on a crop exceed the tolerance established for that pesticide, that crop may be seized and destroyed.

To keep below the tolerance levels established for a pesticide, apply only the formulated amount of pesticide per acre as instructed by the product label. Do not exceed this restriction. Also, to meet the label-required pre-harvest interval, discontinue the use of pesticides the number of days before harvest that the label specifies. Always remember the following restrictions on the use of all pesticides: 1) The legal amount of active material per acre that can be applied during a given growing season; and 2) The number of days before harvest that chemical application on a crop must be discontinued.

### Use of Pesticides for Pests Not on Label

The law regulating pesticides in the United States is the Federal Insecticide, Fungicide and Rodenticide Act, or FIFRA. FIFRA is administered by the Environmental Protection Agency (EPA) and in Michigan by the Michigan Department of Agriculture (MDA). FIFRA governs the registration, distribution, sale and use of all pesticides. Within FIFRA there exists a provision that allows the use of a pesticide for a pest not noted on the label as long as the application is made to a crop specified on the label. This provision is referred to as 2(ee). All rates and restrictions, including pre-harvest intervals, for the labeled crop must be followed. Please note, however, that the manufacturer will not assume responsibility for product performance so 2(ee) applications are made at the grower's risk. For more information about 2(ee) applications, contact your local MSU Extension or Michigan Department of Agriculture office.

### Record Keeping

The 1990 Farm Bill requires that all applicators who apply restricted use pesticides (RUP) keep records and maintain them for two years. Records to be kept include:

- brand name or product name and the EPA registration number,
- total amount of the product used,
- size of the area treated,

- crop, commodity, stored product or site to which the pesticide was applied,
- location of the application,
- month, day and year of the application,
- name and certification number of the applicator or applicator's supervisor.

Any record form is acceptable as long as the required data is included. Penalties are up to \$500 for the first violation and up to \$1,000 for subsequent violations. Provisions for protecting the identity of the individual producers are included in the law. Commercial applicators must furnish a copy of the required records to the customer of the RUP application.

### **Agricultural Chemical Use Precautions**

The use of any pesticide, especially a restricted-use-pesticide (RUP), entails a significant amount of responsibility and liability on the part of the grower. Therefore, handle all pesticides with extreme caution and respect for the following reasons:

- to protect yourself and others.
- to protect your crop and soil from chemical damage.
- to protect the environment from chemical damage.

These points cannot be emphasized enough. Pesticide accidents occur most often during mixing and tank filling operations. Although accidental ingestion of chemicals is considered to be the greatest health hazard, there is also great danger of poisoning when pesticides contact skin or eyes or when dust or vapors are inhaled. To prevent such accidents, wear protective clothing at all times when handling and applying pesticides and cleaning spray equipment. Such mandatory garments include chemical resistant gloves and boots, splash-guard goggles and a respirator manufactured specifically for the type of chemical compound that is being used. Care for these items as you would your farm implements. They may save your life in case of an accident. Always heed all the precautionary statements on the product label and cover-up to protect yourself. (See MSU Extension Bulletins E-1546, Take Cover! Protect Yourself from Exposure, E-2215, Using Pesticides Safely: A Guide for the Applicator; NC-204, Protective Clothing for Handling Pesticides, and AM-106, EPA Chemical Resistance Category Chart, for more information.)

Protecting yourself during any application of an agricultural chemical is required. Give the same consideration to any field worker(s) you may employ. Farm workers assisting in the application of any pesticide should also wear protective clothing, as specified by the product label.

Protect your crops and land by applying any pesticide at the label directed rate and under favorable environmental conditions. To do otherwise may be a violation of the label and could cause damage to the crop and carry over in the soil. Excessive pesticide residues in the soil may also leach into surface and groundwater. Overdosing will also increase residues on the crop and the number of days before the crop can be harvested legally. To avoid any pesticide damage and/or illegal residues on crops and in the soil, follow the recommended rates of application and use properly calibrated implements.

Pesticide drift from aerial and ground application is a serious problem. Drift can be a particular problem if houses, schools or urban areas are nearby. Drift can also contaminate sensitive crops and the environment (crop land and surface water). Avoid pesticide drift from all pesticides. Because few chemicals are allowed

on forage for all types of livestock, exercise extreme caution when using any pesticides to avoid contaminating hay, pasture and stover. Where problems with pesticide drift exist, use the least hazardous materials with additives labeled to reduce spray drift. These additives add elasticity to spray suspensions to reduce the shearing effect (break up of spray stream) caused by spray dispensing equipment and air movement.

### **SARA Title III Emergency Planning and Community Right to Know Act**

The Emergency Planning and Community Right to Know Law, under SARA Title III, requires farmers to notify their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), and local fire department that they store extremely hazardous materials, along with the name and telephone number of the facility representative. Check with your state Department of Natural Resources or MSU Extension to receive a list of EPA established "Extremely Hazardous Substances" and their threshold planning quantities.

The LEPC and fire chief may request maps of your storage facility and detailed lists of materials you store.

This law also requires that, in the event of a spill, the SERC, LEPC and National Response Commission be notified. The reportable quantities for spills is much less than for storage and can be obtained from the above sources. See Extension Bulletin E-2575 for more details on SARA Title III and a list of commonly used extremely hazardous substances.

### **Worker Protection Standard**

New federal rules for farm worker protection, issued during 1992, require farmers to provide additional training and notification to farm workers to prevent accidental or occupational exposure to pesticides. Farmers should contact Extension agents to learn the details of this standard and availability of training materials for education of workers and handlers.

Read and follow the label instructions on Restricted Entry Intervals (REI) for every pesticide used. Some pesticide labels require both oral warning and posted signs to notify workers of pesticide applications. If the label doesn't require both forms of notification, notify workers either orally or by posting warning signs at entrances to treated areas. (Greenhouses must post warning signs for every application.) When using posted signs, post 24 hours or less before the pesticide application and remove signs within three days after the end of the restricted entry interval. Keep workers out during the entire time the signs are posted (except for early-entry workers wearing the proper personal protective equipment).

### **Michigan Groundwater Stewardship Program (MGSP)**

The Michigan Groundwater Stewardship Program is a cooperative effort between the Michigan Department of Agriculture (MDA), Michigan State University Extension, Conservation Districts, and the USDA Natural Resources Conservation Service. The program is funded through fees assessed on sales of pesticides and nitrogen fertilizers. MGSP-sponsored education, technical assistance and cost share help individuals reduce the risk of groundwater contamination associated with pesticide and nitrogen fertilizer use.

Producers who complete the environmental risk assessments for their farmstead and cropping systems (Farm\*A\*Syst and Crop\*A\*Syst) will be able to determine what structural, management and record-keeping changes (if any) will be needed for their farming systems to be in conformance with Michigan Right to Farm guidelines and state and federal environmental laws.

Once a producer develops and implements a plan to address the risks indicated by the environmental assessments, he or she can contact the MDA to request farming system verification under the Michigan Agriculture Environmental Assurance Program (MAEAP). MAEAP-verified farms are eligible for various incentives.

### Protect Nontarget Organisms

Bees and other pollinating insects are essential for successful production of tree fruits, small fruits, most seed crops and certain vegetables. Many insecticides are highly toxic to pollinating honeybees and wild bees. Be aware of how bee poisonings can occur from applying pesticides and how to prevent them. Take the following precautions to reduce the chance of bee poisoning:

- Do not apply pesticides that are toxic to bees if the site contains a crop or weeds which are in bloom. This applies not only to the fruit bloom but also to dandelions and clovers that may be reached by the spray. Mow cover crops and weeds to remove the blooms prior to spraying.
- Select pesticides that are least harmful to bees and select the safest formulation. Dusts are more hazardous to bees than sprays. Wettable powders and microencapsulated products are more hazardous than emulsifiable concentrates or water soluble formulations because particulate pesticide material may be carried back to the hive. Granular insecticide formulations are generally the least hazardous to bees.
- Reduce drift during application. Use drift control materials whenever possible.
- Time pesticide applications carefully. Evening applications are less hazardous than early morning; both are safer than midday applications.
- Do not let puddles of spray accumulate on the ground where bees might drink it. Supplying fresh water near bee's hives can reduce this hazard.
- Do not treat near hives. Bees may need to be moved or covered before using insecticides near colonies.

The best way to avoid injury of beneficial insects and microorganisms is to minimize pesticide usage. Use selective pesticides when ever possible and apply only when necessary as part of a total pest management program.

Pesticides can be harmful to all kinds of vertebrates such as fish and wildlife. Most recognizable are the direct effects from acute poisoning. Fish kills can result from water polluted by a pesticide (usually insecticides). Pesticides can enter water via drift, surface runoff, soil erosion, and leaching.

Bird kills from pesticides can occur when birds ingest the toxicant in granules, baits, or treated seed; are exposed directly to the spray; consume a treated crop; drink and use contaminated water; or feed on pesticide-contaminated prey.

### Endangered Species Act

To minimize the adverse impact of pesticides on endangered species, the EPA has initiated The Endangered Species Act. Every implicated pesticide will have an endangered species warning statement regarding use of the product within the geographic area where endangered species restrictions apply. Users must obtain a county-specific endangered species bulletin from the local Extension office, which will identify the specific area where use restrictions apply. Application of listed pesticides in the identified geographic areas in that county will be restricted or prohibited.

### Right to Farm

Farmers in Michigan are protected from nuisance lawsuits under the Right to Farm Act if they follow acceptable management practices. The Generally Accepted Agricultural and Management Practices for pesticide utilization and pest control, nutrient utilization, and manure management have been completed and are revised annually. Contact your Extension agent or regional office of the Michigan Department of Agriculture to obtain copies.

### Pesticide Name

The insecticide trade name (first letter capitalized; Lorsban, for example) is used when an insecticide is sold under only one well known brand name. The accepted common name of an insecticide is used when it is sold under several brand names, with some trade names are shown on the following line(s). The fungicide and nematicide trade names are listed underneath the chemical formulation name.

### Pesticide Formulations

Fungicides, insecticides and nematicides can be purchased in a variety of formulations. Not only is it important that a grower purchase the correct pesticide for the intended pest control (i.e., pesticide product labeled for both the crop and the pest), but also that the grower chooses the formulation best suited for the particular job. Such a decision should be based on the pesticide product's effectiveness, cost, practicality and relative safety to the applicator, the crop and the environment. The following are some additional considerations worth remembering when choosing a specific formulation:

- Some formulations require constant spray tank agitation; others do not.
- Dusts and granules do not require water for application, but accurate calibration of equipment and uniform distribution are often difficult to achieve and maintain.
- The potential hazard to the applicator and the potential of drift and environmental contamination vary substantially among formulations.
- Dry formulations are generally less affected by subfreezing temperatures during storage than liquid formulations.
- Some crops may be treated with any formulation of a particular pesticide; others require using a specific formulation.
- The price per pound of active ingredient varies for different formulations.

Also remember that for two products with the same active ingredient but different formulation, the application rate to be used

on a specific site and pest may be different. **Always read and follow the label instructions carefully.**

### Restrictions

The pre-harvest interval, the minimum number of days required between last application and harvest or other use of the crop, is listed. Special limits on the use of the pesticide are also given when they apply. Follow these restrictions exactly to avoid possible deleterious residues on the crop at harvest. Pesticides that are relatively safe around honeybees are also noted when pertinent.

### Compatibility

When two or more chemicals are mixed together in a spray tank, they may or may not mix well, or the mixture may cause injury to germinating seeds or plants. This relationship is called compatibility. The lack of compatibility could affect the application and effectiveness of the chemical spray.

It is usually not advisable to mix different formulations such as wettable powders and emulsifiable concentrates together in a spray tank. This is especially important if other materials, such as foliar nutrients, are included in the spray and applied in low gallons per acre. Always be sure to read and follow the directions and limitations on the pesticide label before mixing.

### Pesticide Additives

During the development of a pesticide, chemical companies attempt to formulate the active ingredient to optimize performance, mixing and handling under diverse conditions. Every commercially available pesticide formulation contains its own particular set of additives to accomplish this action. However, sometimes additional additives are required for specific applications or when compatibility or mixing problems occur. The pesticide label will describe the need and use of these additives. Avoid indiscriminate use of additives because they may not improve pesticide performance and may actually reduce pest control or cause crop injury.

The following are some definitions of pesticide spray additives. For more information on types of spray additives and when to use them with herbicides, see MSU Extension Bulletin E-1858, Using Spray Additives with Herbicides.

- Adjuvant—any substance that enhances pesticide effectiveness, an added ingredient.
- Surfactant—a surface active material that can facilitate emulsifying, dispersing, spreading, wetting, sticking or other surface-modifying characteristics of a pesticide solution.
- Emulsifier—an agent that promotes the dispersion of one liquid in another.
- Wetting Agent Spreader—an ingredient that reduces water surface tension causing better contact between the spray solution and treated surfaces.
- Soap—sodium or potassium salts of fatty acids. These additives can form insoluble materials in hard water. Detergents are synthetic materials used for cleaning.
- Sticker—a deposit builder that increases pesticide adhesion to plant surfaces.
- Defoaming Agent—reduces or eliminates foaming in the spray tank.

- Drift Control Agent—an agent that prevents the formation of very fine spray droplets that are especially subject to drift; improves coverage.
- Compatibility Agent or Co-solvent — an inert ingredient that may aid in the dispersion of otherwise incompatible mixtures.

Pesticides are applied in a number of ways, so adding and using an additive is up to the applicator. Sometimes, additives are only required for pest control treatments made during adverse climatic conditions. In other cases, the nature of the pesticide may require adding an additive to the spray mixture rather than the formulation. The pesticide label always gives directions for the use of additives, if they are required.

### Soil Type Considerations

Soil texture (sand, silt, clay) and organic matter content influence the effectiveness of soil-applied pesticides. In general, lower rates of pesticides are required on sandy (coarse-textured) soils than on clays or soils with high organic matter content (fine-textured) to obtain the same level of control. Pesticide rate recommendations in this bulletin are given for medium-textured soils with greater than 3 per cent organic matter content, unless otherwise noted. Clay and organic matter absorb pesticides, making them less available to kill soil-borne pests. Soils with high clay and organic matter content require greater pesticide rates for adequate pest control. Sandy soils with low organic matter content require careful pesticide rate selection to avoid crop injury.

Poor application of soil insecticides, such as plowing or drilling the insecticides deeper than about 4 inches, or using sidedressings when broadcast treatments are best, reduces the value of pesticide treatments. Do not expect the impossible in your efforts to control soil-borne pests. As with foliar sprays, materials need to be carefully applied to achieve maximum effectiveness.

### Pesticides and the Environment

Many people obtain their drinking water from wells. Well water is groundwater. Groundwater is stored in water-bearing geological formations called aquifers. It moves through aquifers and is obtained at springs, streams, or wells.

The upper level of the saturated zone in the soil is called the water table. The water table depth fluctuates, depending on the amount of water removed from the ground and the amount of water added by recharge.

Both surface water and groundwater are subject to contamination by point and non point source pollution. Point source contamination refers to movement of a pesticide into water from a specific site. Nonpoint source contamination generally results from land runoff, precipitation, acid rain, or percolation rather than from discharge at a single location.

Several factors influence the fate of pesticides in groundwater.

**Adsorption** is the binding of chemicals to soil particles. The amount and persistence of pesticide adsorption varies with pesticide properties, soil moisture, soil pH, and soil texture. Soils high in organic matter or clay are the most adsorptive; coarse, sandy soils are much less adsorptive.

A soil-adsorbed pesticide is less likely to volatilize, leach or be degraded by microorganisms. It is also less available for absorption by plants. Therefore, pesticides used on highly adsorptive

soils may require higher rates or more frequent applications to compensate for soil adsorption.

**Volatilization** occurs when a solid or liquid turns into a gas. A pesticide in a gaseous state can be carried away from the treated area by air currents. This is called vapor drift. Unlike the drift of sprays and dusts that can sometimes be seen during application, vapor drift is invisible.

Avoid applying volatile pesticides when conditions favor volatilization, such as temperature inversions. Pesticide labels usually mention the potential for volatility of pesticides. Volatilization can sometimes be reduced through the use of low volatile formulations or soil incorporation of the pesticide.

**Photodegradation** is the breakdown of pesticides by the sun-light. Pesticides applied to foliage or the soil surface may be broken down by exposure to light. Soil incorporation can reduce pesticide exposure to sunlight.

**Microbial degradation** occurs when microorganisms such as fungi and bacteria use a pesticide as a food source. It can be rapid and thorough under favorable soil conditions, including warm temperatures, favorable pH levels, adequate soil moisture, oxygen and fertility. The amount of adsorption also influences microbial degradation. Adsorbed pesticides are more slowly degraded because they are less available to some microorganisms.

**Chemical degradation** is the breakdown of a pesticide by soil processes not involving a living organism. Adsorption of the pesticides, soil pH, soil temperature and moisture influence the rate of degradation. Some pesticides are more rapidly degraded on low pH soils.

**Absorption** is the process by which plants and microorganisms take up chemicals. It is another process that can transfer pesticides in the environment. Once absorbed, most pesticides are degraded within plants. Residues may persist inside the plant or be released back into the environment as the plant decays.

**Runoff** moves pesticides in surface water, either mixed in the water or bound to soil particles. The amount of pesticide runoff depends on the grade or slope of the field, the type of soil, the amount of rainfall, (especially close to the time of application), and properties of the pesticide. For example, a pesticide applied to a saturated clay soil is highly susceptible to runoff. Established vegetation or plant residues reduce runoff.

Pesticide runoff is greatest when heavy rainfall occurs shortly after application. No-tillage, minimum-tillage, and soil incorporation reduce runoff. Surface grading, drainage ditches and dikes, and the use of border vegetation can help reduce pesticide movement into surface water.

**Leaching** is the movement of pesticides through the soil into groundwater. Several factors influence leaching including water solubility of the pesticide, soil structure and texture, and persistence of pesticide adsorption to soil particles. If a pesticide is strongly adsorbed to soil particles, it is less likely to leach, regardless of its solubility, unless the soil particles themselves move with the water flow.

### Keeping Pesticides Out of Groundwater and Surface Water

It is very difficult to purify or clean contaminated groundwater or surface water. Management practices can be implemented to effectively reduce pesticide runoff and leaching and protect groundwater and surface water.

Use integrated crop management programs —Minimize pesticide use by combining chemical control with other pest management practices such as tillage, cultivation, crop rotation, and pest scouting.

- Reduce compaction—Surface water runoff increases when soils are compacted.
- Rotate crops —Crop rotations may provide more surface crop residue and may reduce the application of the same pesticides to a field.
- Use conservation tillage practices —Include no-till, minimum till, cover crops, grass waterways and buffer strips.
- Consider the geology of your area—When planning pesticide applications, be aware of the water table depth and the permeability of the geological layers between the surface soil and groundwater.
- Select pesticides carefully—Choose pesticides with the least potential for leaching into groundwater or for runoff into surface water.
- Transport pesticides safely—Have pesticides delivered directly to your pesticide storage facility to avoid liability and potential accidents and spills in transit whenever possible. DOT shipping rules must be followed for transporting large quantities of pesticides, including proper placarding of the vehicle, liability insurance, special handling requirements, etc.
- Follow label directions—The label carries crucial information about the proper rate, timing, and placement of the pesticide.
- Calibrate accurately—Equipment should be calibrated carefully and often.
- Measure accurately—Concentrates need to be carefully measured before they are placed into the spray tank. Do not “add a little extra” to ensure the pesticide will do a better job.
- Avoid back-siphoning —The end of the fill hose should remain above the water level in the spray tank at all times to prevent back-siphoning of chemicals into the water supply. Use an anti-backflow device when siphoning water directly from a well, pond, or stream. These practices also reduce the likelihood of the hose becoming contaminated with pesticides.
- Consider weather and irrigation—if you suspect heavy or sustained rain, delay applying pesticides. Control the quantity of irrigation to minimize the potential for pesticide leaching and runoff.
- Avoid spray drift and volatilization—Do not spray when the wind is greater than 10 miles per hour and/or weather conditions (e.g. inversions) are conducive to pesticide drift from the target area. Make every effort to **AVOID PESTICIDE DRIFT!**
- Clean up spills—Avoid spills. When they do occur, contain and clean them up quickly with an absorbent material like cat litter. Chemicals spilled near wells and sinkholes can move directly and rapidly into ground-water. Chemicals spilled near ditches, streams or lakes can move rapidly into surface water.
- Change the location of mixing areas —Mix and load pesticides on an impervious pad, if possible. If mixing is done in

the field, change the location of the mixing area regularly. Do not mix pesticides adjacent to the water source, and do not let the water run inadvertently on the soil near the mixing area. This will increase pesticide leaching and/or runoff.

- Dispose of wastes and containers properly—All pesticide wastes must be disposed of in accordance with local, state, and federal laws. Pesticide containers are considered hazardous waste until they are cleaned or disposed of properly. When possible, reduce the number of pesticide containers by using bulk or returnable containers.

All pesticide containers can be rendered non-hazardous waste by triple rinsing (or equivalent). The rinsate should be added to the spray tank. After triple rinsing, perforate both ends so the container cannot be reused.

All metal and plastic triple-rinsed containers should be recycled, if possible. If this option is not available, dispose of them in a state licensed sanitary landfill. Dispose of all paper containers in a sanitary landfill or a municipal waste incinerator. Do not bury or burn any pesticide containers. Do not reuse any empty pesticide containers for any purpose.

Store pesticides away from water sources —Pesticide storage facilities should be situated away from wells, cisterns, springs, and other water sources. Pesticides must be stored in a facility that will protect them from temperature extremes, high humidity, and direct sun light. The storage facility should be heated, dry and well ventilated. It should be designed for easy containment and cleanup of pesticide spills and made of materials that will not absorb any pesticide material that leaks out of a container. Store only pesticides in such a facility and always store them in their original containers.

Do not store any protective clothing or equipment in the pesticide storage facility. Store pesticides separately from insecticides and fungicides to avoid contamination of one material by another and accidental misuse.

Keep the facility locked at all times when not in use to prevent animals, children, and irresponsible adults from entering and becoming poisoned. Post the facility as a Pesticide Storage Facility to warn others that the area is off limits. Maintain an accurate inventory of the pesticides stored in the facility at all times in case of emergency.

Always read and follow the Storage and Disposal section of pesticide labels for specific storage and handling instructions.

For additional information on pesticide storage, refer to Midwest Plan Service Bulletin 37, Designing Facilities for Pesticide and Fertilizer Containment, available from Agricultural and Biosystems Engineering Dept., 122 Davidson Hall, Iowa State University, Ames, IA 50011; and MSU Bulletin E-2335 On-Farm Agrichemical Storage and Handling. Your state's water resources currently provide a vast supply of clean water for agriculture, homes, and industry. They can ensure high water quality for future needs only if they are protected now. Be sure to understand how your activities, including pesticide usage, can affect them.

### **Handling and Mixing Pesticides**

Always wear protective clothing and equipment when handling, mixing, and applying pesticides and during the cleanup of application equipment. Protective clothing should include full coverage clothing, chemical resistant gloves and boots, eye protection, hard hat, and a MSHA/NIOSH approved respirator with a chemical absorbent material as specified on the pesticide label.

Mix pesticides downwind and below eye level. Avoid excessive splashing and sloshing. If pesticides are spilled on you, wash them off immediately with lots of water and change clothing.

Resume spraying only after cleaning up any spills. Try to use closed handling/mixing systems when appropriate.

Mix only what is required for the area to be sprayed according to label directions. Avoid mixing excessive amounts. To do otherwise will create a hazardous waste which is difficult and expensive to dispose of. Keep unauthorized persons out of the area in which you handle pesticides.

### **Application Equipment**

Efficient use of application machinery is very important to any pesticide application program. In many cases, improper use of machinery will result in poor pest control. With such occurrences, the grower may blame the efficacy of the pesticide for the failure of the control program when poor coverage is at fault.

Proper equipment and its maintenance are very important for any pesticide control program. Spray equipment should have the following features:

- The equipment should be made of non-corrodible materials.
- A tank with sufficient capacity so that the number of mixing and filling operations are minimized.
- A pump with a capacity of at least 5 gal/minute and pressure up to 100 psi.
- An agitation system from the pressure control to the bottom of the tank.
- A plumbing system with 50-mesh screens in the intake line and at each nozzle.
- A pressure gauge that accurately measures pressures up to 100 psi.
- A spray boom that can be adjusted for distance above application site and nozzle placement along the structure.
- Nozzles of the proper size, arrangement, airstream placement and dispersal pattern.

Pest control on vegetable crops has been applied successfully with standard low-pressure sprayers, air-blast sprayers, aircraft, irrigation systems and soil application equipment. Use the proper implements for the crop and soil situation. In the case of insect and disease control, the location of the pests on the plants determines how the machinery should be adjusted and used. For example, if the pests are on the underside of the leaves, adjust the implement so that the chemical is applied on those areas. A general rule to follow with application implements is that the best control results when the chemical treatments are aimed directly at the pests.

### **Cleaning and Care of Pesticide Application Equipment**

It is important to clean pesticide application equipment, especially if it is used for more than one crop and for applying insecticides, fungicides and herbicides. The need for extensive cleaning can be minimized if one sprayer is only used to apply herbicides and another is used for insecticide and fungicide applications.

When cleaning a sprayer that is used for applying only one type of pesticide, a thorough water rinse is necessary. Rinse the entire sprayer, inside and out, including the boom, hoses and

nozzles. Partially fill the spray tank with water and keep the pump running so that the rinse water circulates throughout the entire system. Spray the water rinsate out through the nozzles, making sure to properly collect the rinsate. To save money and protect the environment, rinse the equipment in the field using a water-filled nurse tank and apply the collected water rinsate to the crop.

To clean application equipment used to apply a variety of pesticides, thoroughly wash the entire spray system with one of the following cleaning agents in 100 gal of water:

- 1 gal household ammonia. Allow to stand in the spray tank and system overnight. **OR**
- 5 lb of sal soda.**OR**
- 8 lb trisodium phosphate.

Run the pump so that the cleaning solution circulates throughout the entire system. Leave the cleaning solution in the spray system for at least 2 hours, and do not apply it to any crop or crop land. Discard the cleaning solution in an appropriate pesticide degradation pit. Rinse the entire system with water at least three times after all the cleaning solution has drained from the sprayer. Do not leave pesticide solutions or cleaning solutions in the tank overnight unless otherwise instructed.

Corrosion and mechanical damage to pumps, tanks, nozzles, etc., may result from leaving water in the spray system over the winter. To prepare the spray equipment for storage, disconnect all hoses and allow all water to drain out. Coat all bare metal parts with oil or a rust inhibitor.

Disassemble metal nozzles and store them in oil. Prepare the spray pump for storage based on the manufacturer's recommendations.

### Notes on Nematode Management

Nematodes are microscopic worms that live in the soil and roots of plants. A few species feed on foliage or modified tissue, like onion bulbs. Nematode-infected vegetables do not grow well, yields are low and quality is often poor. Some nematodes cause root swellings called knots or galls (root-knot nematode), while others cause necrosis (root-lesion nematode, onion bloat nematode), and still others cause root stunting (stubby-root nematode). All of these nematodes can cause reduced yields or quality of various vegetable crops.

Plant parasitic nematodes can be present in most soil types, but usually cause the greatest damage in sandy soils. Some species, however, cause serious problems in muck soils. Nematode damage is frequently blamed on other causes, such as nutrient deficiencies or disease-causing organisms, like fungi and bacteria. Nematodes can also reduce plant resistance to certain fungi and bacteria.

Most soil-borne nematodes are beneficial and help control insects, decompose organic matter and regulate soil nutrition. While plant-parasitic nematodes cannot be eliminated completely from a field, control measures such as crop rotation, fallowing and applying chemical nematicides help prevent nematode damage in vegetable production.

1. Rotate vegetable crops so that plants injured by nematodes are not grown on the same soil more often than once every 3 years. For example, Irish potatoes, tomatoes, peppers, carrots, celery and other crops are injured by root-knot nematodes. Grasses are non-hosts for the northern root-knot nematode therefore no development and reproduction occur on these plants.

Other vegetables are less susceptible than the ones mentioned above but they are still hosts to this species of root-knot nematode.

2. In some cases, fallowing can be used to reduce nematode populations. Fallowed ground must be worked several times to keep it dry and free of weeds.

3. Sudax is a good cover crop for lowering population densities of root-knot and to a lesser extent root-lesion nematodes.

4. Whenever necessary, use an appropriate nematicide. Specific nematicide recommendations for each crop are presented in this bulletin. Information about how to submit soil and root samples for nematode analysis is given in MSU Extension Bulletin E-2199, Detecting and Avoiding Nematode Problems. Use root and soil samples to identify nematode problem sites.

Use chemical nematicides only when nematode population densities exceed specific nematode-crop action thresholds. The rate of nematicide selected for use should be based, in part, on the nematode type and population density present in a specific production site. The procedure for nematode analysis is presented in Appendix C.

### For More Information

For more information on the use of pesticides, see the MSU Extension bulletins available through your local MSU Extension office or the Educational Materials Distribution Center.

<http://web2.msue.msu.edu/bulletins/mainsearch.cfm>

### Useful Web Sites

E-312 On-line

<http://web4.msue.msu.edu/veginfo/E312>

Michigan State University IPM Program:

<http://www.ipm.msu.edu>

Michigan State University Vegetable Crop Advisory Team Newsletter:

<http://www.ipm.msu.edu/veg-cat.htm>

Michigan State University Vegetable Area of Expertise Team:

<http://www.msue.msu.edu/vegetable>

Michigan Department of Agriculture:

<http://www.michigan.gov/mda>

Insecticide Registration, Product Labels and MSDS Sheets:

<http://www.cdms.net>

## LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES

Trade Name	Common Name	Class <sup>1</sup>	LD <sub>50</sub> s <sup>2</sup>		Leaching Potential <sup>3</sup>	Runoff Potential <sup>3</sup>	Restricted Entry Interval <sup>4</sup>
			Oral	Dermal			
Acephate	acephate	1	688-1127	>2000	3	3	24 hrs
Actara	thiamethoxam	4A	>5000	>2000	1	2	12 hrs
• Adjourn	esfenvalerate		458	>2000	3	2	12 hrs
Admire	imidacloprid	4A	609	>2000	1	2	12 hrs
Agree	<i>Bacillus thuringiensis aizawai</i>	11	>5050	>2020	3	1	4 hrs
•	abamectin	6	300	>1800	3	2	12 hrs
• Ambush	permethrin	3A	>5000	>2000	3	2	12 hrs
• Ammo	cypermethrin	3A	137	>2000	3	1	12 hrs
• Asana XL	esfenvalerate	3	458	>2000	3	2	12 hrs
Assail	acetamiprid	4A	805-886	>2000	2	3	12 hrs
Avaunt	indoxacarb	22	687-1867	>5000	3	1	12 hrs
• Aztec	cyfluthrin + tebufenimphos	3A, 1B	132-190	>2000	2	1	48 hrs
• Baythroid XL	beta-cyfluthrin	3	647-695	>2000	3	2	12 hrs
Belay	clothianidin	4A	3044	>5000	1	2	12 hrs
Beleaf	flonicamid	9C	>2000	>2000	3	3	12 hrs
Belt SC	flubendiamide	28	>2000	>4000	-	-	12 hrs
• Bifenthrin	bifenthrin	3A	>250	>2000	3	2	12 hrs
• Bifenture	bifenthrin	3A	262	>2000	3	2	12 hrs
Biobit	<i>Bacillus thuringiensis kurstaki</i>	11	>5000	>2500	3	1	4 hrs
Bracket	acephate	1	688-1127	>2000	3	3	24 hrs
• Brigade	bifenthrin	3A	262	>2000	3	2	12 hrs
• Brigadier	bifenthrin + imidacloprid	3, 4A	175	>5000	1	2	12 hrs
• Capture	bifenthrin	3A	175-7431	>5000	3	2	½ - 18 days
Carbaryl 4L	carbaryl	1A	590-669	>2000	3	3	12-24 days
Confirm 2F	tebufenozide		>5000	>5000	1	2	4 hrs
Coragen	chlorantraniliprole	28	>5000	>5000	-	-	4 hrs
• Counter	terbufos	1B	3.5-10	32-96	3	3	48 hrs
Cruiser	thiamethoxam	4A	>5000	>5050	1	2	12 hrs
• Cypermethrin	cypermethrin	3A	>355	>2000	3	1	12 hrs
• Danitol	fenpropathrin	3A	66	>2000	3	2	24 hrs
Deadline M-Ps	metaldehyde	-	283	>5000	3	3	12 hrs
• Diazinon	diazinon	1B	1960-2040	>2020	3	1	2-4 days
• Dibrom	naled	1B	235	>5050	3	3	48 hrs
Dimethoate	dimethoate	1B	60-571	>2000	2	3	48 hrs
Dipel	<i>Bacillus thuringiensis kurstaki</i>	11	>5050	>2020	3	1	4 hrs
• Discipline	bifenthrin	3A	262	>2000	3	2	12 hrs
Durivo	thiamethoxam + chlorantraniliprole	4A, 28	>5000	>5000	1	2	12 hrs
• Empower 2	bifenthrin + indole-3-butric acid	3A	7431	>5000	2	2	1-18 days
• Endosulfan	endosulfan	2A	50	256	3	1	2-17 days
Entrust	spinosad	5	>5000	>2000	3	3	4 hrs
• Fanfare	bifenthrin	3A	149.6	>2000	3	2	12 hrs
• Force	tefluthrin	3A	969	>2000	3	2	0 hrs
Fulfill	pymetrozine	9B	>5000	>2000	2	1	12 hrs

## LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES

Trade Name	Common Name	Class <sup>1</sup>	LD <sub>50</sub> s <sup>2</sup>		Leaching Potential <sup>3</sup>	Runoff Potential <sup>3</sup>	Restricted Entry Interval <sup>4</sup>
			Oral	Dermal			
• Gaucho	imidacloprid	4A	4070-4690	>5050	1	2	12-24 hrs
• Hero	bifenthrin + zeta cypermethrin	3A	550	>5000	3	2	12 hrs
• Holster	cypermethrin	3A	137	>2000	3	1	12 hrs
Imidan	phosmet	1B	258-275	>2000	3	3	4-5 days
Intrepid	methoxyfenozide	18	>5000	>2000	1	2	4 hrs
Javelin	<i>Bacillus thuringiensis kurstaki</i>	11	>5100	5000	3	1	4 hrs
Kryocide	cryolite	UN	>5000	>2100	3	1	12 hrs
• Lambda-Cy	lambda-cyhalothrin	3	81	>2000	3	2	24 hrs
• Lannate	methomyl	1A	32-89	>2000	1	3	48 hrs
• Larvin	thiodicarb	1A	330-558	>2000	3	3	48 hrs
• Leverage 360	beta-cyfluthrin + imidacloprid	3, 4A	>1044	>2000	1	2	12 hrs
Lorsban	chlorpyrifos	1B	300-2250	>5000	3	2	1-3 days
Malathion	malathion	1B	550	>2000	3	3	12 hrs
Metaldehyde	metaldehyde	8	283	>5000	3	3	12 hrs
• Mocap	ethoprop	1B	15-250	166-2000	1	3	48 hrs
Movento	spirotetramat	23	>2000	>4000	-	-	24 hrs
• Mustang Max	zeta-cypermethrin	3A	157	>5000	3	2	12 hrs
Novodor	<i>Bacillus thuringiensis tenebrionensis</i>	11	>5000	>2500	3	1	4 hrs
Nudrin LV	methomyl	1A	55-174	>2000	1	3	48 hrs
Nudrin SP	methomyl	1A	7.14-14.2	>5050	1	3	48 hrs
Nuprid	imidacloprid	4A	>2000	>2000	1	2	12 hrs
Oberon	spiromesifen	23	>2000	>4000	3	2	12 hrs
Orthene	acephate	1B	688-1127	>2000	3	3	24 hrs
• PennCap-M	methyl parathion (encapsulated)	1B	1237	>1250	3	2	9-31 days
• Perm-Up	permethrin	3A	1030	>2000	3	2	12 hrs
Platinum	thiamethoxam	4A	>5000	>2000	1	2	12 hrs
Poncho 600	chlorthianidin	4A	2000	>4000	1	2	n/a (seed treatment)
Portal	fenpyroximate	21A	810-1004	>5000	3	1	12 hrs
• Pounce	permethrin	3A	1100-5000	>2000	3	1	12 hrs
• Proaxis	Gamma-cyhalothrin	3A	>2500	>5000	3	1	24 hrs
• Proclaim	emamectin benzoate	6	1516	>2000	2	1	12 hrs
Pyrenone	pyrethrin + piperonyl butoxide	3A	4500-4900	>2000	3	2	12 hrs
Radiant SC	spinetoram	5	>5000	>5000	-	-	4 hrs
Regent 4SC	fipronil	2B	336	382	2	2	0 hrs
Rimon	novaluron	15	3914-5000	>2000	3	1	12 hrs
• S-FenvatoStar	esfenvalerate	3	458	>2000	3	2	12 hrs
Scorpion	dinotefuran	4A	>2000	<2000	1	2	12 hrs
Sevin	carbaryl	1A	281-3129	>2000	3	3	12 hrs
• Sniper	bifenthrin	3A	203-699	>4000	3	2	12 hrs
• Steed	bifenthrin + zeta-cypermethrin	3A	310.2	>5000	3	2	12 hrs
• Swagger	bifenthrin + zeta-cypermethrin	3A	1098	>2000	3	2	12 hrs
Synapse WG	flubendiamide	28	>2000	>2000	-	-	12 hrs

## LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES

Trade Name	Common Name	Class <sup>1</sup>	LD <sub>50</sub> s <sup>2</sup>		Leaching Potential <sup>3</sup>	Runoff Potential <sup>3</sup>	Restricted Entry Interval <sup>4</sup>
			Oral	Dermal			
• Telone II	1,3-Dichloropropene	-	>110	333	2	3	See label
• Telone C-17 & C-35	1,3-dichloropropene + chloropicrin	-, 8B	100-519	500-1000	2	3	See label
• Thimet	phorate	1B	5-13	86-113	3	1	48 hrs
• Thionex	endosulfan	2A	41.2 – 44.9	256 – 2000	3	1	4-17 days
Trigard	cyromazine	17	4460	>2010	1	2	12 hrs
• Tundra	bifenthrin	3A	262	>2000	3	2	12 hrs
• Up-Cyde	cypermethrin	3A	355	>2000	3	1	12 hrs
Vapam	metam sodium	-	812	>2020	2	3	See label
Venom	dinotefuran	4A	>5000	>5000	1	2	12 hrs
Vetica	flubendiamide + buprofezin	28, 16	>5000	>5000	-	-	12 hrs
Voliam Flexi	thiamethoxam + chlorantraniliprole	4A, 28	>5000	>5000	-	-	12 hrs
• Vydate	oxamyl	1A	9-10	>5000	3	3	48 hrs
• Warrior	Lambda-cyhalothrin	3	351	>2000	3	2	24 hrs
Xentari	<i>Bacillus thuringiensis aizawai</i>	11	>5000	>2000	3	1	4 hrs
Zeal	etoxazole	10B	>5000	>5000	3	2	12 hrs

1. Insecticide Resistance Action committee Mode of Action Classification ([http://www.irac-online.org/documents/MoA%20classification\\_Aug08\\_v6.1.pdf](http://www.irac-online.org/documents/MoA%20classification_Aug08_v6.1.pdf))
  2. The LD<sub>50</sub> is a standard toxicological term which indicates the number of milligrams (mg) of pesticide per kilogram (kg) of test animal body weight required to kill 50 percent of a test animal population. Values less than 10 indicate extremely high toxicity to mammals. The LD<sub>50</sub> data have been obtained from Material Safety Data Sheets.
  3. 1-high, 2=intermediate, 3=low. These leaching/runoff potential ratings are from the NRCS WIN-PST Pesticide Properties Database at [http://www.wsi.ncrs.usda.gov/products/W2Q/pest/pest\\_mgt](http://www.wsi.ncrs.usda.gov/products/W2Q/pest/pest_mgt)
  4. SL=See Label. Read and follow the label directions. Post areas or give oral warnings that areas have been treated to warn workers not to enter until the REI has elapsed as required by the label.
- = Restricted Use Pesticide. All or certain formulations of these toxicants have been classified Restricted use Pesticides.

## LIST OF FUNGICIDES USED ON COMMERCIAL VEGETABLES

Fungicide	Common Name	LD <sub>50</sub> <sup>1</sup>		Leaching Potential <sup>2</sup>	Runoff Potential <sup>2</sup>	Restricted Entry Interval <sup>3</sup>
		Oral	Dermal			
Aliette WDG	fosetyl-aluminum	2860	>2000	3	3	12 hrs
Allegiance-FL	metalaxyl	2900	>2000	1	2	24 hrs
Amistar 80 WG	azoxystrobin	1230	>5000	3	1	4 hrs
Apron XL LS	mefenoxam	862	>2020	3	3	48 hrs
Armicarb 100	potassium bicarbonate	2700	>5000	1	3	4 hrs
Basic Copper 53	copper sulfate	1000	>2000	3	1	24 hrs
Blocker 4F	PCNB	>5050	>2020	3	2	12 hrs
Botran	DCNA	>4640	>6320	3	2	12 hrs
Bravo	chlorothalonil	3750-9000	>2000	3	2	12 hrs
Cabrio	pyraclostrobin	>2000	>2000	3	1	12 hrs
Catamaran	potassium phosphite + chlorothalonil	>5000	>5000	1	2	12 hrs
C-O-C-S WDG	copper oxychloride sulfate	1131	>2000	3	1	24 hrs
Captan	captan	2000-5000	>2000	3	3	SL
Champ	copper hydroxide	846-1630	>2000	3	1	24 hrs
Champion	copper hydroxide	846-943	>2000	3	1	24 hrs
Copper Count N	copper ammonium carbonate	-	-	-	-	12 hrs
Cuprofix Disperss	copper sulfate	>2000	>4000	3	1	24 hrs
Cuprofix MZ Disperss	mancozeb + copper sulfate	>4470	>2000	3	1	24 hrs
Cuprofix Ultra 40 Disperss	copper sulfate	300-960	>2000	3	1	12 hrs
Curzate	cymoxanil	433	>5000	3	3	12 hrs
Dithane	mancozeb	>5000	>5000	3	1	24 hrs
Echo	chlorothalonil	3260-4100	>2000	3	2	12 hrs
Endura	boscalid	>2000	>2000	2	1	12 hrs
Equus	chlorothalonil	3750-5000	>2000	3	2	12 hrs
Flint 50WG	trifloxytrobin	>5050	>2000	3	2	12 hrs
Folicur	tebuconazole	3710-3776	>2011	2	1	12 hrs – 19 days
Forum	dimethomorph	>500-2000	>4000	2	2	12 hrs
Fosphite	mono- and dipotassium salts of phosphorous acid	-	-	1	3	4 hrs
Gavel	zoxamide + mancozeb	>5000	>5000	3	1	48 hrs
Headline	pyraclostrobin	200-500	>4000	3	1	12 hrs
Inspire Super	Difenconazole + cyprodinil					12 hrs
Iprodione 4L	iprodione	>2000	>1000	3	3	24 hrs
Kocide 3000	copper hydroxide	1847	>2000	3	1	24 hrs
Kodiak	Bacillus subtilis	>5000	>2000	3	2	4 hrs
Kumulus DF	sulfur	>2200	>2000	1	1	24 hrs
Maneb	maneb	>5000	>2000	3	1	24 hrs
Manex	maneb	>5000	>2000	3	1	24 hrs
ManKocide	copper hydroxide + mancozeb	2535	>5000	3	1	24 hrs
Manzate Pro-Stick	mancozeb	>5000	>2000	3	1	24 hrs
Maxim	fludioxonil	>5050	>2020	3	1	12 hrs
Mertect 340-F	thiabendazole	>5000	>5050	3	1	12 hrs
Microthiol Disperss	sulfur	>2000	2000	1	1	24 hrs
Micro Sulf	sulfur	>5000	>2000	1	1	24 hrs
Nu-Cop	copper hydroxide	1200-1300	>2000	3	1	24 hrs
Penncozeb 75 DF	mancozeb	>4470	>2000	3	1	24 hrs
Penncozeb 4 FL	mancozeb	>5000	>2000	3	1	24 hrs
Phostrol	mono- and dibasic sodium, potassium, and ammonium phosphites	>5000	>5000	1	3	4 hrs
Presidio	fluopicolide	>2000	>4000	1	2	12 hrs
Previcur Flex	propamocarb	2000-2900	>3000	3	2	12 hrs
Pristine	boscalid + pyraclostrobin	1490	>2000	2	1	12 hrs

## LIST OF FUNGICIDES USED ON COMMERCIAL VEGETABLES

Fungicide	Common Name	LD <sub>50</sub> <sup>1</sup>		Leaching Potential <sup>2</sup>	Runoff Potential <sup>2</sup>	Restricted Entry Interval <sup>3</sup>
		Oral	Dermal			
Procure	triflumizole	>2000	>2000	2	3	12 hrs
Prophyt	potassium phosphite	>5000	>4000	1	3	4 hrs
Propimax	propiconazole	-	-	2	1	12 hrs
Quadris	azoxystrobin	>5000	>4000	3	1	4 hrs
Quadris Opti	azoxystrobin + chlorothalonil	1750	>5000	3	1	12 hrs
Quadris Top	azoxystrobin + difenoconazole					12 hrs
Quintec	quinoxyfen	>2000	>2000	3	1	12 hrs
Quilt	azoxystrobin + propiconazole	1750	>5000	2	1	12 hrs
Rally 40WSP	myclobutanil	>1600	>5000	2	2	24 hrs
Ranman	cyazofamid	>5000	>2000	3	2	12 hrs
Reason 500 SC	fenamidone	>5000	>5000	3	3	12 hrs
Revus	mandipropamid	>5000	>5000	-	-	4 hrs
Revus Top	mandipropamid + difenoconazole	2958	>5000	-	-	12 hrs
Ridomil Gold/Bravo	mefenoxam + chlorothalonil	2438	>2020	3	2	48 hrs
Ridomil Gold MZ	mefenoxam + mancozeb	>5000	>2000	3	1	48 hrs
Ridomil Gold/Copper	mefenoxam + copper hydroxide	550	>2020	3	1	48 hrs
Ridomil Gold PC	mefenoxam + PCNB	>5050	>2020	3	2	48 hrs
Ridomil Gold GR	mefenoxam	>5000	>2000	3	2	48 hrs
Ridomil Gold SL	mefenoxam	550	>2000	3	2	48 hrs
Rovral	iprodione	1170	>2000	3	3	24 hrs
Scala SC	pyrimethanil	>4505	>5000	2	3	12 hrs
Serenade	<i>Bacillus subtilis</i>	>5000	>2000	3	2	4 hrs
SoilGard	<i>Gliocladium virens</i>	-	-	3	2	-
Sovarn	Kresoxim-methyl	>5000	>2000	-	-	12 hrs
Sulfur DF	sulfur	-	-	1	1	24 hrs
Switch 62.5 WG	cypodinil + fludioxonil	>5000	>2000	3	1	12 hrs
System 3-SeedTreatment	metalaxyl + PCNB + <i>Bacillus subtilis</i>	>5000	>2000	1	2	24 hrs
Tanos	famoxadone + cymoxanil	>5000	>2000	3	2	12 hrs
• Telone C-17	1,3-dichloropropene + chloropicrin	304-519	200-500	2	3	5 days
Tenn-Cop 5E	copper salts of fatty & rosin acid	4000	>2000	-	-	12 hrs
Terraclor	PCNB	3700-5000	>2000	3	2	12 hrs
Thiolux Jet DF	sulfur	>5000	>2000	1	1	24 hrs
Thiram	thiram	>2000	>5000	3	3	24 hrs
Tilt	propiconazole	1310	>5000	2	1	12 hrs
Topsin M	thiophanate-methyl	>5000	>2000	3	2	12 hrs - 3 days
Trilogy	neem oil	>5000	-	3	2	4 hrs
Ultra Flourish	mefenoxam	>1172	>2020	3	3	48 hrs
Vapam	metam-sodium	812	>2020	2	3	48 hrs
Ziram 76DF	ziram	1889	>5000	2	3	48 hrs

1. The LD<sub>50</sub> is a standard toxicological term which indicates the number of milligrams (mg) of pesticide per kilogram (kg) of test animal body weight required to kill 50 percent of a test animal population. Values less than 10 indicate extremely high toxicity to mammals. The LD<sub>50</sub> data have been obtained from Material Safety Data Sheets.
  2. 1=high, 2=intermediate, 3=low. These leaching/runoff potential ratings are from the NRCS WIN-PST Pesticide Properties Database at <http://www.wsi.nrcc.usda.gov/products/W2Q/pest/WinPST.html>
  3. SL=See Label. Read and follow the label directions. Post areas or give oral warnings that areas have been treated to warn workers not to enter until the REI has elapsed as required by the label.
- = Restricted Use Pesticide. All or certain formulations of these toxicants have been classified as Restricted Use Pesticides.

## Conversion Equivalents and Abbreviations

Measurements	Label Key
1 fluid ounce (fl oz)=2 tablespoons (Tbsp) = 6 teaspoons	B means Bait D means Dust DF means Dry Flowable DG means Dispersable Granule EC means Emulsifiable Concentrate, or Emulsion
1 cup (c)=8 fluid ounces (fl oz)	F means Flowable G means Granule
1 pint (pt)= 16 fluid ounces (fl oz) = 32 tablespoons (Tbsp)	L or LC means Liquid Concentrate LS means Liquid Solution S means Sprayable SC means Suspension Concentrate
1 quart (qt)=2 pints (pts) = 32 fluid ounces (fl oz)	SP means Soluble Powder $\mu$ means micro $\mu\text{m}$ means micrometer
1 gallon (gal)=4 quarts (qt) = 128 fluid ounces (fl oz)	W or WP means Wettable Powder
1 pound (lb)=16 ounces (oz)	RUP means Restricted Use Pesticide
1 Acre (A)=43,560 square feet (sq ft) =17,424 row feet (ft) for 30 in. rows	
ppm=parts per million	

### Calculation of Banded Rates

To calculate a banded rate from a given broadcast rate, use the following formula:

$$\text{Rate/A needed for banded application} = \frac{\text{Band width in inches} \times \text{Broadcast Rate/A}}{\text{Row spacing in inches}}$$

# Asparagus

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## INSECTS

### SOIL TREATMENT:

#### CUTWORM:

- 10% Sevin Granules, 20 lb. (1 day)

#### FOLIAR TREATMENT:

##### CUTWORM: Apply if >5% of crowns are infested.

###### Carbaryl

- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern). (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)

or

###### Chlorpyrifos

- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) (RUP)

or

###### Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)

or

###### Permethrin

- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)

##### ASPARAGUS BEETLE: Apply during harvest season if >2% of spears have eggs or >5% of plants are infested with common asparagus beetle. Treat after harvest if defoliation exceeds 10%.

###### Carbaryl

- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern). (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day) Apply treatments no closer than 3 days apart.

Maximum of 3 applications to spears and 5 applications total per year. Apply 2 qt. of 4 F or XLR Plus on ferns post-harvest.

or

###### Chlorpyrifos

- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) Limited to 1 pre-harvest application and 2 applications to fern per season. (RUP)

or

###### Dimethoate

- Dimethoate 2.67 EC (1.5 pt.) or Dimethoate 4 EC (1 pt.) or Dimethoate 400 (1 pt.) or Dimethoate 4E (1 pt.) (180

or

###### Entrust, 1.25 to 2 oz. (60 days) Fern treatment only.

or

###### Malathion 57 EC, 1.5 to 2 pt. (1 day)

or

###### Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)

or

###### Permethrin

- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)

or  
Radiant SC, 4 to 8 fl oz. (60 days) Fern Treatment Only. Minimum of 4 days between applications; do not apply more than 24 fl oz. per season.

### ASPARAGUS APHIDS: Apply if >5% of ferns show injury.

#### Chlorpyrifos

- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) Limited to 1 pre-harvest application and 2 applications to fern per year. (RUP)

or

#### Dimethoate

- Dimethoate 2.67 EC (1.5 pt.) or Dimethoate 4 EC (1 pt.) or Dimethoate 400 (1 pt.) or Dimethoate 4E (1 pt.) (180) Post harvest only.

or  
Fulfill, 2.75 oz. (170 days) Fern application only. May require 5 to 7 days for aphid mortality.

or  
Malathion 57 EC, 1.5 to 2 pt. (1 day)

### PLANT BUGS: Apply if >5% of new growth shows tip die-back injury.

#### Permethrin. Fern treatment only.

- Perm-UP 25DF (6.4 oz.) or Perm-UP 3.2 EC (4 oz.) (7 days) (RUP)
- Pounce 25 WP, 6.4 oz. (7 days) (RUP)

### THRIPS:

Malathion 57 EC, 1.5 to 2 pt. (1 day)

## DISEASES

### PRE-PLANT FUMIGATION:

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### CROWN NURSERY:

#### FUSARIUM CROWN ROT, ROOT ROT:

##### 1,3 Dichloropropene/chloropicrin

- Telone C35, 13-35 gal. (RUP)

or

##### Metam Sodium

- Sectagon 42, Vapam HL, 37.5-75 gal.

or

##### Potassium N-methylidithiocarbamate

- Sectagon-K54, 30-60 gal.

### FOLIAR TREATMENT:

#### RUST (*Puccinia asparagi*): Apply after harvest (fern growth only).

##### \* Tebuconazole

- Folicur 3.6F, 4-6 fl oz. (180 days) Maximum 3 applications per season. Maximum 18 fl oz/acre/season. 12 hr REI.

or

##### Chlorothalonil

- Bravo Ultrex, Equus DF, 1.8 to 3.6 lb. (190 days) Every 14 to 28 days.

- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 4 pt. (190 days)

or

##### Mancozeb

- Dithane DF Rainshield, Dithane M-45, 2 lb. (180 days)

## Beans, Snap

- *Dithane F-45 Rainshield*, 1.6 qt. (180 days)
- *Manzate Pro-Stick*, 2 lb. (180 days) Maximum 8 lb/season.
- *Penncozeb 4 F*, 1.6 qt. (180 days)
- *Penncozeb 75 DF*, *Penncozeb 80 WP*, 2 lb. (180 days) Maximum 8 lb/season.  
or  
**Myclobutanil**
- *Rally 40 WSP*, 5 oz. (180 days) At least every 14 days, 6 applications maximum.  
or  
**Sulfur**

- *Kumulus DF*, *Thiolux Jet*, 10 to 30 lb. (0 days)
- *Sulfur DF*, 10 to 30 lb. (0 days)

Note: Control will be limited under heavy disease pressure.

**PHYTOPHTHORA SPEAR ROT, CROWN ROT:** Apply 30 to 60 days before first cutting, and another application just before harvest in a minimum of 10 gal of water.

- Mefenoxam**
- *Ridomil Gold SL*, 1 pt. (1 day)
- *Ultra Flourish*, 2 pt. (1 day)  
or

**Mono-, dibasic sodium salts of phosphorous acid**

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or

**Mono-, dibasic sodium, potassium and ammonium phosphites**

- *Phostrol*, 2.5 to 5 pt. (0 days) Apply to full fern.
- *Prophyt*, 2 to 4 pt. (0 days)

**PURPLE SPOT (*Stemphylium vesicarium*):**

- \* **Chlorothalonil**
- *Bravo Ultrex*, *Equus DF*, 1.8 to 3.6 lb. (190 days) Every 14 to 28 days.
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 4 pt. (190 days)  
or  
**Trifloxystrobin**
- *Flint*, 3 to 4 oz. (180 days) No more than 12 oz year, rotate with other non-strobilurin products.  
or

**Azoxystrobin**

- *Amistar*, 2 to 5 oz every 7-14 days. (100 days)
- *Quadris*, 6.0-15.0 fl oz every 7-14 days. (100 days)

Do not apply more than one foliar application of Amistar or Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Note:** Products labeled for rust control may be helpful for purple spot control

## Beans, Snap

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

### SOIL TREATMENT:

*Mocap 15 G*, 40 to 54 lb/A. Broadcast from 3 days prior to planting to at-planting time and incorporate to a depth of 4 inches. (RUP)

### PLANTING TREATMENT:

*Mocap 15 G*, 13 to 20 lb. (36 inch row spacing) In a 12- to 15-inch band over the row. Do not allow spray or granules to contact the seed. (RUP)

## INSECTS

### SEED TREATMENT:

Treatments are applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions. Handle seed carefully to prevent cracking.

**MEXICAN BEAN BEETLE, APHIDS, SEED CORN MAGGOT, BEAN LEAF BEETLE, LEAFHOPPERS:** Early season control.

*Cruiser 5 FS*, 1.28 fl oz per 100 lb seed.

### SOIL TREATMENT:

#### CUTWORM:

10% *Sevin Granules*, 15 lb. (3 days)

### PLANTING TREATMENT:

#### LEAFHOPPERS, APHIDS:

**Imidacloprid**

- *Admire Pro*, 7 to 10.5 fl oz. (21 days) See label for application method.
- *Nuprid 2 F*, 16 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.

#### CUTWORM:

*Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

or

*Diazinon 50 W*, 4 to 8 lb. (RUP)

#### APHIDS, LEAFHOPPERS, PLANT BUGS, SEEDCORN MAGGOT:

*Thimet 20 G*, 4.5 to 7.0 oz/1000 row ft. (RUP)

#### MEXICAN BEAN BEETLE:

*Thimet 20 G*, 4.9 to 9.4 oz/1000 row ft. (RUP)

#### SEEDCORN MAGGOT:

**Bifenthrin**

- *Brigade WSB*, 8 to 16 oz. (RUP)
- *Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

### FOLIAR TREATMENT:

**LEAFHOPPERS:** Apply when 5 or more are seen per ft of row (2/ft for seedlings).

\* **Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)  
or

**Acephate**

- *Acephate 90 WDG*, or *Acephate 90 WSP* (8 to 17.6 oz.) or *Acephate 97* (8 to 16 oz.) or *Acephate 97 UP* (8 to 16 oz.) (14 days)
- *Bracket 97*, 8 to 16 oz. (14 days)
- *Orthene 97*, 8 to 16 oz. (14 days)  
or
- *Assail 30 SG*, 2.5 to 5.3 oz. (7 days)  
or

**Bifenthrin**

- *Bifenthrin 2EC AG*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (1.6 to 6.4 fl oz.) or *Brigade WSB* (4 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare 2EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 1.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)  
or

## Beans, Snap

*Brigadier*, 3.8 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)  
or  
*Carbaryl*

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F, *Sevin XLR Plus*, 1 qt.. (3 days) See label for pre-harvest intervals for forage and fodder.  
or

*Dibrom* 8 Emulsive, 1 pt. (1 day) Note: Do not feed treated vines to livestock. (RUP)  
or

*Dimethoate*  
• *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) (0 days) Note: Do not feed treated forage to livestock.  
• *Dimethoate* 4E, 0.5 to 1 pt. (2 days)  
or

*Esfenvalerate*

- *Adjourn*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *Asana XL*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder or hay.  
or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)  
or

*Imidacloprid*

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.  
or

*Leverage* 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or

*Methomyl*

- *Lannate* LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (0.75 to 3 pt (1.5 pt or less, 1 day; over 1.5 pt, 3 days)) or *Nudrin* SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) (RUP)  
or

*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

**EUROPEAN CORN BORER:** Treat at bud-bloom stage. Use higher rates and/or more frequent application during periods of high adult activity and egg laying.

\* *Acephate*

- *Acephate* 90 WDG, or *Acephate* 90 WSP (12.8 to 17.6 oz.) or *Acephate* 97 (12 to 16 oz.) or *Acephate* 97 UP (12 to 16 oz.) (14 days)
- *Bracket* 97, 12 to 16 oz. (14 days)
- *Orthene* 97, 12 to 16 oz. (14 days)  
or

\* *Bifenthrin*

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or

\* *Esfenvalerate*

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.  
or

\* *Lambda-cyhalothrin*

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)  
or

*Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

or  
*Carbaryl*

- *Carbaryl* 4L, 1 to 1.5 qt. (3 days)
- *Sevin* 4 F, *Sevin XLR Plus*, 1 to 1.5 qt.. (3 days)  
or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)  
or

*Leverage* 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or

*Methomyl*

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) Note: Do not graze or feed treated bean vines to livestock within 3 days nor bean hay within 7 days of last application. (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)  
or

*Radiant* SC, 3 to 8 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 28 fl oz. per season.

**BEAN LEAF BEETLE:** Feeding on seedlings can cause severe defoliation. Treat if numbers exceed 1 per plant or defoliation exceeds 50%. A preharvest application may also be necessary to prevent pod damage.

*Acephate*

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz.) or *Acephate* 97 (8 to 16 oz.) or *Acephate* 97 UP (8 to 16 oz.) (14 days)
- *Bracket* 97, 8 to 16 oz. (14 days)
- *Orthene* 97, 8 to 16 oz. (14 days)  
or

*Assail* 30 SG, 2.5 to 5.3 oz. (7 days)  
or

*Bifenthrin*

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or

*Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

or  
*Carbaryl*

- *Carbaryl* 4L, 0.5 to 1 qt. (3 days)
- *Sevin* 4 F, *Sevin XLR Plus*, 0.5 to 1 qt.. (3 days)  
or

## Beans, Snap

### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) (0 days)
- *Dimethoate* 4E, 0.5 to 1 pt. (2 days)  
or  
*Hero*, 4 to 10.3 oz. (3 days) (RUP)  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or  
*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

**CORN EARWORM:** Treat from bud stage to 7 days before harvest if significant numbers of adults are being trapped in pheromone traps.

### Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (12.8 to 17.6 oz.) or *Acephate* 97 (12 to 16 oz.) or *Acephate* 97 UP (12 to 16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.
- *Bracket 97*, 12 to 16 oz. (14 days)
- *Orthene 97*, 12 to 16 oz. (14 days)  
or

### Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or  
*Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)  
or

### Carbaryl

- *Carbaryl* 4L, 0.5 to 1.5 qt. (3 days)
- *Sevin* 4 F, *Sevin XLR Plus*, 0.5 to 1.5 qt.. (3 days)  
or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)  
or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or

### Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

or

*Radiant SC*, 4 to 8 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 28 fl oz. per season.

**CUTWORM:** Cutworm feed on plants close to soil surface. Control may be applied when the crop first comes up and as needed.

### \* Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Empower*, 3.5 to 8.7 lb. (3 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or

### \* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.

### \* Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (7 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)  
or

### Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz.) or *Acephate* 97 (8 to 16 oz.) or *Acephate* 97 UP (8 to 16 oz.) (14 days)
- *Bracket 97*, 8 to 16 oz. (14 days)
- *Orthene 97*, 8 to 16 oz. (14 days)  
or

*Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)  
or

### Carbaryl

- *Carbaryl* 4L, 1 to 1.5 qt. (3 days)
- *Sevin* 4 F, *Sevin XLR Plus*, 1 to 1.5 qt.. (3 days) See label for pre-harvest intervals for forage and fodder.

or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

### Methomyl

- *Lannate* LV (1.5 pt.) or *Lannate* SP (0.5 lb.) (1 day) Note: Do not graze or feed treated bean vines to livestock within 3 days nor bean hay within 7 days of last application. (RUP)
- *Nudrin* LV (1.5 pt.) or *Nudrin* SP (0.5 lb.) (1 day) (RUP)  
or

*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

**MEXICAN BEAN BEETLE:** Apply if there is more than 1 adult/2 plants or 1 egg mass/ft. of row.

Acephate. Also registered for bean leaf beetle.

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz.) or *Acephate* 97 (8 to 16 oz.) or *Acephate* 97 UP (8 to 16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.
- *Bracket 97*, 8 to 16 oz. (14 days)
- *Orthene 97*, 8 to 16 oz. (14 days)

or  
Assail 30 SG, 2.5 to 5.3 oz. (7 days)

or  
Carbaryl. Also registered for bean leaf beetle.

- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days) See label for pre-harvest intervals for forage and fodder.

or  
Dimethoate

- Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) (0 days)
- Dimethoate 4E, 0.5 to 1 pt. (2 days)

or  
Endosulfan 3 EC, 2 pt. (3 days) Apply only 3 times per season.

Note: Do not feed threshings to livestock or allow them to graze. See label for further restrictions. (RUP)

or  
Esfenvalerate

- Adjourn, 2.9 to 5.8 fl oz. (3 days) (RUP)
- Asana XL, 2.9 to 5.8 fl oz. (3 days) (RUP)
- S-FenvaStar, 2.9 to 5.8 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder or hay.

or  
Hero, 4 to 10.3 oz. (3 days) (RUP)

or  
Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

or  
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

or  
Malathion 57 EC, 1 1/2 pt. (1 day) Also registered for bean leaf beetle.

or  
Methomyl

- Lannate LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) Note: Do not graze or feed treated bean vines to livestock within 3 days, nor bean hay within 7 days of last application. (RUP)
- Nudrin LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) (RUP)

or  
Mustang Max, 2.8 to 4.0 oz. (1 day) (RUP)

#### TARNISHED PLANT BUG: Treat if numbers exceed 1 per 5ft of row.

Acephate

- Acephate 90 WDG, or Acephate 90 WSP (8 to 17.6 oz.) or Acephate 97 (8 to 16 oz.) or Acephate 97 UP (8 to 16 oz.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

or  
Bifenthrin

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

or

Brigadier, 3.8 to 5.5 fl oz. (7 days) (RUP)

or  
Carbaryl

- Carbaryl 4L, 1 to 1.5 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)

or  
Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)

or  
Dimethoate

- Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) (0 days)
- Dimethoate 4E, 0.5 to 1 pt. (2 days)

or  
Hero, 10.3 oz. (3 days) (RUP)

or  
Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or  
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

or  
Methomyl

- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (1 day) Note: Do not graze or feed treated bean vines to livestock within 3 days, nor bean hay within 7 days of last application. (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

#### GREEN CLOVERWORM: Apply when damage to leaves is seen.

Acephate

- Acephate 90 WDG, or Acephate 90 WSP (8 to 17.6 oz.) or Acephate 97 (8 to 16 oz.) or Acephate 97 UP (8 to 16 oz.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

or  
Bifenthrin

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

or  
Brigadier, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

or  
Carbaryl

- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)

or  
Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not allow harvest treated bean vines for livestock forage, fodder, or hay.

or  
Hero, 4 to 10.3 oz. (3 days) (RUP)

or

## Beans, Snap

### Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)  
or  
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or  
Mustang Max, 2.8 to 4.0 oz. (1 day) (RUP)

### APHIDS: Apply if numbers exceed 1 per leaf.

#### \* Acephate

- Acephate 90 WDG, or Acephate 90 WSP (8 to 17.6 oz.) or Acephate 97 (8 to 16 oz.) or Acephate 97 UP (8 to 16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)  
or
- \* Dimethoate
- Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) (0 days) Note: Do not feed treated forage to livestock.
- Dimethoate 4E, 0.5 to 1 pt. (2 days)  
or

#### \* Imidacloprid

- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.  
or

#### Bifenthrin

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or

*Brigadier*, 3.8 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)  
or

*Dibrom* 8 Emulsive, 1 pt. (1 day) Note: Do not feed treated vines to livestock. (RUP)  
or

#### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not allow harvest treated bean vines for livestock forage, fodder, or hay.  
or

#### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)  
or

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or

Malathion 57 EC, 2 pt. (1 day)  
or

#### Methomyl

- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

## MITES

Apply to underside of leaves as needed. Most serious in dry years.

- \* Kelthane MF, 3/4 to 1 pt. (7 days)

or

#### Bifenthrin

- Bifenture EC, Brigade 2EC, Capture 2 EC, 5.1 to 6.4 oz. (3 days) (RUP)

or

#### Dimethoate

- Dimethoate 4 EC, 1 pt. (7 days) Note: Do not feed treated forage to livestock.

or

#### Naled

- Dibrom 8 Emulsive, 1 pt. (1 day) Note: Do not feed treated vines to livestock. (RUP)

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*, early season

#### *Phytophthora, Fusarium* spp.):

#### Bacillus subtilis GB03

- Kodiak, 0.125 oz/100 lb seed. Fusarium, Rhizoctonia.

or

#### Captan

- Captan 30-DD (2 1/4 oz/100 lb seed) or Captan 400 (2 to 3 oz/100 lb seed)

or

#### Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only. (Fusarium, Rhizoctonia).

or

#### Mefenoxam

- Apron XL LS, 0.32 to 0.64 fl oz/100 lb seed. Pythium and Phytophthora only.

or

#### Metaxylo

- Allegiance-FL, 0.75 to 1.5 oz/100 lb seed. Pythium and Phytophthora.

- Apron 50 W, 1/2 to 1 oz/100 lb seed. Phytophthora.

- System 3-Seed Treatment, 2 to 3 oz.

or

#### Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 2 oz/100 lb seed.

### PREPLANT INCORPORATED:

#### DAMPING OFF (*Pythium* and *Phytophthora* spp. and *Rhizoctonia solani*):

#### Mefenoxam/PCNB

- Ridomil Gold PC, 3/4 lb/1,000 linear feet of row. Apply at the time of planting (Pythium and Rhizoctonia only). Note: Do not feed treated vines to livestock.

### SOIL TREATMENT AT PLANTING:

#### ROOT and STEM ROT (*Rhizoctonia solani*):

#### PCNB

- Blocker 4 F, 2.2 to 3.3 oz/100 row feet.
- Terraclor 2 E (1/2 to 3/4 gal) or Terraclor 75 WP (1 1/3 to 2 lb) or Terraclor F (2 to 3 pt) Use in 8 to 10 gallons of water. Avoid spraying directly to seed; otherwise delayed emergence may occur. Note: Do not feed treated vines to livestock.

**FOLIAR TREATMENT:****ANTHRACNOSE (*Colletotrichum lindemuthianum*):****\* Thiophanate-Methyl**

- Topsin 4.5 FL, 20-40 fl oz. (14 days) Apply at 10 to 30% bloom, repeat once 4 to 7 days or at peak bloom.
- Topsin M WSB, 1 to 1 1/2 lb. (14 days) Apply at 10 to 30% bloom, repeat once 4 to 7 days or at peak bloom.  
or

**Azoxystrobin**

- Amistar, 2 - 5 oz every 7-14 days. (0 days)
- Quadris, 6.2 - 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

**Copper Oxychloride / Copper Sulfate**

- C-O-C-S WDG, 2 to 4 lb. (0 days)  
or

**Copper Sulfate**

- Basic Copper 53 (2 to 4 lb) or Basicop (2 lb) (0 days) Apply at 7 to 10 day intervals when plants are 5 inches.  
or

**Neem Oil**

- Trilogy, 2 pt. (0 days)

**BACTERIAL BLIGHT (*Pseudomonas phaseolicola*):** Apply as a protective spray and continue at 7- to 14-day intervals through harvest. The treatment is particularly important during wet weather.

**Copper Ammonium Carbonate**

- Copper Count N, 1 to 3 qt. (0 days)  
or

**Copper Hydroxide**

- Champ DP, 0.67 to 2 lb. (0 days)
- Champ Formula 2 F, 2/3 to 2 pt. (0 days)
- Champion WP, Nu-Cop 50 DF, 1 to 3 lb. (0 days)
- Kocide 2000, 3/4 to 2 1/4 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 2/3 to 4 pt. (0 days)  
or

**Copper Oxychloride / Copper Sulfate**

- C-O-C-S WDG, 2 to 4 lb. (0 days)  
or

**Copper Resinate**

- Tenn-Cop 5 E, 3 pt. (0 days)  
or

**Copper Sulfate**

- Basic Copper 53 (2 to 4 lb) or Basicop (4 lb) (0 days)
- Cuprofix Ultra, 3/4 to 2 lb. (0 days)

**RUST (*Uromyces phaseoli typica*):** Apply when there are fewer than 10 pustules per plant and repeat every 7 days.

**Chlorothalonil**

- Bravo Ultrex, Equus DF, 1.25 to 2.7 lb. (7 days)
- Bravo Weather Stik, 1 3/8 to 3 pt. (7 days) Note: Do not feed treated tops to livestock.
- Echo 720, Equus 720 SST, 1.375 to 3 pt/A. (7 days)
- Echo 90 DF, 1.2 to 2.4 lb. (7 days)  
or

**Myclobutanil**

- Rally 40 WSP, 4 to 5 oz. (0 days) Note: Do not apply more than 1.25 lb/acre/crop.  
or

**Neem Oil**

- Trilogy, 2 pt. (0 days)  
or

**Sulfur**

- Thiolux Jet, 3 to 10 lb. (0 days)  
or

**Tebuconazole**

- Folicur 3.6F, 4-6 fl oz. (7 days) Maximum 24 fl oz/acre/season. 12 hr REI.

**GRAY MOLD (*Botrytis cinerea*):**

- \* **Chlorothalonil.** Begin applications during early bloom stage and repeat every 7 days. Note: Observe restrictions on feeding of forage.

- Bravo Ultrex, Equus DF, 2.7 lb.

- Bravo Weather Stik, 3 pt.

- Echo 720, Equus 720 SST, 3 pt. (7 days)

- Echo 90 DF, 2.4 lb. (7 days) Every 7-10 days.  
or

\* **Iprodione.** Apply at early bloom and again at peak bloom if conditions are favorable for disease development. Note: Observe restrictions on feeding of forage. See label for permissible crop rotations.

- Iprodione 4L AG, 1.5 to 2 pt.

- Rovral, 1 1/2 to 2 lb. (14 days)

- Rovral 4 F, 1/2 to 2 pt. (14 days)  
or

**\* Thiophanate-Methyl**

- Topsin 4.5 FL, 20-30 fl oz (2 applications), 30-40 fl oz (1 application). (14 days)

- Topsin 70 W, Topsin M WSB, 1 1/2 to 2 lb. (14 days) Apply once using the higher rate at 50-70% of full bloom or apply twice using the lower rate with first application at 10 to 30% of full bloom and a second application 4 to 7 days later or at peak bloom. Note: Observe restrictions on feeding of forage.

or

**Boscalid**

- Endura, 8 to 11 oz. (7 days)  
or

**Neem Oil**

- Trilogy, 2 pt. (0 days)

**WHITE MOLD (*Sclerotinia sclerotiorum*):****Boscalid**

- Endura, 8 to 11 oz. (7 days)  
or

**DCNA**

- Botran 75 W, 2 1/4 lb (bush beans) or 4 lb (pole beans), (2 days) Begin applications when disease is anticipated and continue at 7-day intervals during periods favorable to development of disease. Note: Observe restrictions on feeding of forage.

or  
Iprodione. See label for permissible crop rotations. Note: Observe restrictions on feeding of forage.

- Iprodione 4L AG, 1.5 to 2 pt. (0 days)

- Rovral, 1 1/2 to 2 lb. (14 days)

- Rovral 4 F, 1 1/2 to 2 pt. (14 days) Apply at early bloom and again at peak bloom if conditions are favorable for disease development.

or

**Neem Oil**

- Trilogy, 2 pt. (0 days)  
or

**Thiophanate-Methyl**

- Topsin 4.5 FL, 20-40 fl oz. (14 days) Apply at 10 to 30% bloom, repeat once 4 to 7 days or at peak bloom.

- Topsin 70 W, Topsin M WSB, 1 to 2 lb. (14 days) Apply once using the higher rate at 50 to 70% of full bloom or apply twice using the lower rate with first applicatin at 10 to 30% of full bloom and a second application 4 to 7 days later or at peak bloom.

Note: Observe restrictions on feeding of forage.

## Beets

### Beets

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Sugar beet cyst and northern root-knot nematodes can reduce red beet yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for red beets, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of sugar beet cyst and northern root-knot nematodes in red beet production.

### FALL SOIL FUMIGATION (BROADCAST):

#### 1,3-D

- *Telone II*, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).

#### 1,3-D and chloropicrin

- *Telone C-17*, 27-30 gal/A (muck soil), 10-21 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8-inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping. (RUP)

All soil fumigants were re-registered in 2011, resulting in new labels.

Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## INSECTS

### SOIL TREATMENT:

#### LEAFHOPPERS, APHIDS, FLEA BEETLE:

##### Imidacloprid

- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days) See label for application method.
- *Nuprid 2 F*, 10 to 24 fl oz. (21 days) Apply preplant or in furrow.  
or  
*Platinum*, 5 to 12 fl oz.

#### CUTWORM:

10% Sevin Granules, 20 lb. (7 days (roots); 14 days (tops))  
or

##### Diazinon

- *Diazinon 50 W* (4 to 8 lb.) or *Diazinon AG 500* (2 to 4 qt.) or *Diazinon AG600* (51 to 102 fl oz.) (RUP)

### FOLIAR TREATMENT:

**CUTWORM:** Usually damage plants soon after they come up. Apply if damage is observed.

\* *Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)  
or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (1 day) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (1 day) (RUP)

- *Tundra EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)

##### Carbaryl

- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

##### or

##### Methomyl

- *Lannate LV* (1.5 pt. (0 days, roots; 10 days, tops)) or *Lannate SP* (0.5 lb. (0 days, roots; 10 days, tops)) (RUP)
- *Nudrin LV* (1.5 pt. (0 days, roots; 10 days, tops)) or *Nudrin SP* (0.5 lb. (0 days, roots; 10 days, tops)) (RUP)

### FLEA BEETLE: Apply if damage is noted on leaves.

*Actara*, 1.5 to 3 oz. (7 days)

##### or

*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)

##### or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (1 day) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)

##### or

##### Carbaryl

- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (7 days) See label for pre-harvest intervals for forage and fodder.

##### or

##### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

### APHIDS: Apply as soon as they appear.

*Actara*, 1.5 to 3 oz. (7 days)

##### or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (1 day) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (1 day) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (1 day) (RUP)

##### or

*Diazinon AG 500*, 1 pt. (14 days) (RUP)

##### or

##### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

##### or

*Malathion 57 EC*, 2 pt. (7 days)

### LEAFHOPPER:

##### Carbaryl

- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

##### or

##### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days)

## DISEASES

### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):** Treatments are applied to seed prior to planting. Use Thiram and Captan as seed treatments only. Use only as directed; over-treatment may cause injury.

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).

or

Captan

- Captan 30-DD, 9 1/2 oz.

- Captan 400, 8 to 12 oz.

or

Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).

Commercial seed treatment plants only.

or

Mefenoxam

- Apron XL LS, 0.32 to 0.64 fl oz/100 lb seed (*Pythium*).

or

Metalaxyl

- Allegiance-FL, 0.75 fl oz/100 lb seed (*Pythium*).

or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz.

### PREPLANT INCORPORATED:

**DAMPING OFF (*Pythium* and *Phytophthora* spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 2 in. of sprinkler irrigation.

- Ridomil Gold SL, 1-2 pt.
- Ridomil Gold WSP, 1 to 2 lb.

### FOLIAR TREATMENT:

**CERCOSPORA LEAF SPOT (*Cercospora beticola*):** Apply every 7 to 10 days.

\* Azoxystrobin

- Amistar, 3 to 5 oz every 7 - 14 days. (0 days)
- Quadris, 9.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Trifloxystrobin

- Flint, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

or

Copper Hydroxide

- Champ 2FL, 1 1/3 to 2 2/3 pt. (0 days)
- Champ DP, 1 1/3 to 2 2/3 lb. (0 days)
- Champ WP, 2 to 5 lb. (0 days)
- Kocide 2000, 1 1/2 to 3 3/4 lb. (0 days)
- Kocide 3000, 0.75-2.0 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 6 2/3 pt. (0 days)

or

Copper Sulfate

- Basicop 53 WP, 3 lb. (0 days)

or

Tebuconazole

- Folicur 3.6F, 3-7.2 fl oz. (7 days) Maximum 28.8 fl oz/acre/season.  
12 hr REI.

### RUST:

Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (7 days)

### POWDERY MILDEW:

Sulfur

- Microthiol Disperss, 3 to 5 lb. (0 days) 24 hr REI.

## Broccoli

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Sugar beet cyst, root-knot and lesion nematodes can reduce broccoli yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for broccoli, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of sugar beet cyst, root-knot and lesion nematodes in broccoli production.

### FALL SOIL FUMIGATION (BROADCAST):

1,3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### INSECTS

#### SEEDBED TREATMENT:

Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

#### CABBAGE MAGGOT: Apply to seedbed surface and incorporate to 3 to 4 inches.

Diazinon

- Diazinon 50 W (4 to 6 lb.) or Diazinon AG 500 (2 to 3 qt.) or Diazinon AG600 (51 to 76.5 fl oz.) Apply only as directed. (RUP)

#### CUTWORM:

Diazinon

- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Apply only as directed. (RUP)

#### SOIL TREATMENT:

##### APHIDS:

Venom 20 SG, 1.13 to 1.34 lb. (21 days) See label as application methods.

## Broccoli

### FLEA BEETLE, THRIPS:

*Scorpion* 35SL, 9 to 10.5 fl oz. (21 days) See label for application method.

### CUTWORM:

10% *Sevin* Granules, 20 lb. (3 days)

### APHIDS and THRIPS:

Imidacloprid

- *Admire Pro*, 4.4 to 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 fl oz. (21 days)

### TRANSPLANT WATER TREATMENT:

### CABBAGE MAGGOT:

Diazinon

- *Diazinon 50 W* (1 to 2 lb/200 gal) or *Diazinon AG 500* (4 to 8 oz/50 gal) or *Diazinon AG600* (3.25 to 6.5 fl oz/50 gal) Use only as directed. (RUP)

### ARMYWORM, DIAMONDBACK MOTH, CABBAGE LOOPERS,

### IMPORTED CABBAGE WORM:

*Coragen*, 3.5 to 5 fl oz. (3 days) See label for application methods.

### PLANTING TREATMENT:

Treatments applied at seeding.

### CABBAGE MAGGOT:

*Brigade WSB*, 8 to 16 oz. (RUP)

or

Chlorpyrifos

- *Lorsban 15 G* (4.6 to 9.2 oz /1,000 row ft.) or *Lorsban 4 E* /  
*Lorsban Advanced* (1.6 to 2.75 fl oz / 1,000 row ft.) or *Lorsban 75 WG* (1.1 to 1.8 oz/1000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

### ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:

*Coragen*, 3.5 to 5 fl oz. (3 days) See label for application methods.

### APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THRIPS:

*Durivo*, 10 to 13 fl oz. (30 days)

### APHIDS, FLEA BEETLE, THRIPS:

*Belay*, 9 to 12 fl oz. (21 days)

or

Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days)

### ARMYWORM, CABBAGE MAGGOT, CUTWORM:

*Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods.  
(RUP)

### SOIL TREATMENT AFTER TRANSPLANTING:

Apply to the soil at the base of plants after transplanting. Adequate water is needed to wet the soil surface.

### APHIDS: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.

Imidacloprid. Additional generic brands available.

- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 oz. (21 days)

### CABBAGE MAGGOT:

*Lorsban 4 E* / *Lorsban Advanced*, 1.6 to 2.75 fl oz / 1,000 row ft.  
(RUP)

### APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THRIPS:

*Durivo*, 10 to 13 fl oz. (30 days)

### APHIDS, FLEA BEETLE, THRIPS:

Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days)

### FOLIAR TREATMENT:

#### FLEA BEETLE: Apply as needed soon after plants come up.

*Actara*, 1.5 to 3 oz. (0 days)

or

*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

*Belay*, 3 to 4 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 12.0 fl oz. per season.

or

Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

Carbaryl

- *Carbaryl 4L*, 0.5 to 1 qt. (3 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin 80 WSP* (0.67 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (3 days)

or

Chlorpyrifos

- *Lorsban 50 W* (2 lb.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days)

or

Cypermethrin

- *Ammo 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Holster*, 2.5 to 5 fl oz. (1 day) (RUP)
- *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)

or

Consult label for rotation restrictions.

*Endosulfan 3 EC*, 1 to 1.33 qt. (7 days) (RUP)

or

Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

Imidacloprid. Additional generic brands available.

- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

or

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

*Larvin 3.2 EC*, 24 to 40 oz. (7 days)

or

*Leverage 360*, 3 fl oz. (7 days) (RUP)

or

*Malathion 8*, 1.5 to 2.5 pt.. (3 days)

or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)  
 or  
*Scorpion 35SL*, 2 to 7 fl oz. (1 day)  
 or  
*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)  
 or  
*Voliam Flexi*, 4 to 7 oz. (3 days)

**CUTWORM, ARMYWORM:** Apply when damage is first seen. Repeat as needed.

\* Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)  
 or  
*Bifenthrin + Imidacloprid*

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)  
 or  
*Chlorpyrifos*

- *Lorsban 50 W* (2 lb.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days) (RUP)  
 or  
*Chlorpyrifos*

Consult label for rotation restrictions.

*Endosulfan 3 EC*, 1.33 qt.. (7 days) (RUP)  
 or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)  
 or

*Leverage 360*, 3 fl oz. (7 days) (RUP)  
 or

*Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)  
 or

*Rimon*, 6 to 12 fl oz. (7 days)  
 or

*Synapse WG*, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.  
 or

*Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**IMPORTED CABBAGE WORM:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm" or 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after first flowering.

*Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.  
 or

*Bacillus thuringiensis*

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)  
 or  
*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)  
 or  
*Bifenthrin*
- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)  
 or  
*Bifenthrin + Imidacloprid*
- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

• *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)  
 or  
*Carbaryl*

- *Carbaryl 4L*, 1 to 2 qt. (3 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)  
 or  
*Chlorpyrifos*

- *Lorsban 50 W* (2 lb.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days) (RUP)  
 or  
*Confirm 2F*, 6 to 8 fl oz. (7 days)

*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.  
 or  
*Cypermethrin*

- *Ammo 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Holster*, 2.5 to 5 fl oz. (1 day) (RUP)
- *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)  
 or  
*Danitol 2.4 EC*, 10.66 to 16 fl oz. (7 days) (RUP)

- or  
*Diazinon AG 500*, 0.5 to 1 pt. (7 days) (RUP)
- or  
*Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)

*Endosulfan 3 EC*, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)  
 or  
*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days.

or  
*Esfenvalerate*

- *Adjourn*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *Asana XL*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (3 days) (RUP)  
 or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)

*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
 or  
*Lambda-cyhalothrin*

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Warrior II* with *Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior* with *Zeon Technology* (1.92 to 3.2 fl oz.) (1 day) (RUP)  
 or  
*Larvin 3.2 EC*, 24 to 40 oz. (7 days)

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

or  
*Malathion*

- *Malathion 5* (2 pt.) or *Malathion 5 EC* (1 to 2 pt.) or *Malathion 57 EC* (1 to 2 pt) or *Malathion 8* (1.5 to 2.5 pt.) (3 days)  
 or  
*Methomyl*

- *Lannate LV* (0.75 to 3 pt.) or *Lannate SP* (0.25 to 1 lb.) (3 days) (RUP)
- *Nudrin LV* (0.75 to 3 pt.) or *Nudrin SP* (0.25 to 1 lb.) (3 days) (RUP)

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)  
 or  
*Permethrin*

- *Ambush 25 W*, 3.2 to 6.4 oz. (1 day) (RUP)
- *Perm-UP 25DF* (3.2 to 6.4 oz.) or *Perm-UP 3.2 EC* (2 to 4 oz.) (1 day) (RUP)

## Broccoli

- *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
  - or
  - Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)
  - or
- Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
  - or
  - Rimon*, 6 to 12 fl oz. (7 days)
  - or
- Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)
  - or
- Synapse* WG, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.
  - or
  - Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.
    - or
    - Voliam Flexi*, 4 to 7 oz. (3 days)
- DIAMONDBACK MOTH: Apply treatments if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after 1st flowering. Use *Bacillus thuringiensis* to avoid killing important natural enemies of diamondback moth.**
  - \* *Avaunt*, 3.5 oz. (3 days) Do not apply more than twice to one generation. Do not exceed 14 oz/acre per crop.
    - or
  - \* ***Bacillus thuringiensis***
  - *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)
    - or
  - \* *Entrust*, 0.5 to 1.3 oz. (1 day) Do not apply more than 3 times in 30 days.
    - or
    - Baythroid* XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
    - or
  - Bifenthrin**
    - *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
    - *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - or
  - Bifenthrin + Imidacloprid**
    - *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
    - *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)
      - or
  - Carbaryl**
    - *Carbaryl* 4L, 1 to 2 qt. (3 days)
    - *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)
      - or
  - Chlorpyrifos**
    - *Lorsban* 50 W (2 lb.) or *Lorsban* 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
      - or
    - Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.
      - or
    - Diazinon* AG 500, 0.5 to 1 pt. (7 days) (RUP)
      - or
    - Dibrom* 8 Emulsive, 1 pt. (1 day) (RUP)
      - or
    - Endosulfan* 3 EC, 1 to 1.33 qt.. (1 day) Consult label for rotation restrictions. (RUP)
      - or
  - Entrust*, 0.5 to 1.25 oz.. (1 day) Do not apply more than 3 times in 30 days.
    - or
    - Hero*, 4 to 10.3 oz. (7 days) (RUP)
    - or
  - Lambda-cyhalothrin**
    - *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
    - *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
    - *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
      - or
      - Larvin* 3.2 EC, 24 to 40 oz. (7 days)
      - or
  - Malathion* 5 EC, 2 pt.. (3 days)
    - or
  - Methomyl**
    - *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (3 days) (RUP)
    - *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (3 days) (RUP)
      - or
      - Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)
      - or
  - Permethrin**
    - *Ambush* 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
    - *Perm-UP* 25DF (3.2 to 6.4 oz.) or *Perm-UP* 3.2 EC (2 to 4 oz.) (1 day) (RUP)
    - *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
      - or
    - Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)
      - or
    - Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
      - or
      - Rimon*, 6 to 12 fl oz. (7 days)
      - or
    - Synapse* WG, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.
      - or
      - Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.
        - or
        - Voliam Flexi*, 4 to 7 oz. (3 days)
  - CABBAGE LOOPERS: Apply treatments if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) if >5% of plants are infested before flowering, or 3) if 10% of plants are infested at or after 1st flowering. Most controls are less effective on larger worms.**
    - Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.
      - or
      - Bacillus thuringiensis***
    - *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)
      - or
    - Baythroid* XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
      - or
    - Bifenthrin**
      - *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (3 days) (RUP)
      - *Bifenture* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
      - *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (3 days) (RUP)
      - *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Discipline* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
      - *Fanfare* 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
      - *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
      - *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
        - or
    - Bifenthrin + Imidacloprid**
      - *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
      - *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)
        - or

\*Materials marked with an asterisk are particularly recommended for problem infestations.

*Confirm* 2F, 6 to 8 fl oz. (7 days)  
 or  
*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

- or  
Cypermethrin
- *Ammo* 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  - *Cypermethrin*, 3.75 to 5 fl oz. (1 day) (RUP)
  - *Holster*, 3.75 to 5 fl oz. (1 day) (RUP)
  - *UP-Cyde* 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)

or  
*Danitol* 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)

or  
*Dibrom* 8 Emulsive, 2 pt. (1 day) (RUP)

or  
*Endosulfan* 3 EC, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)

or  
*Entrust*, 1 to 2 oz.. (1 day) Do not apply more than 3 times in 30 days.

or  
Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or  
*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or  
Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

or  
*Larvin* 3.2 EC, 24 to 40 oz. (7 days)

or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)

or  
Malathion

- *Malathion* 5, *Malathion* 5 EC, or *Malathion* 57 EC (1 to 2 pt.) or *Malathion* 8 (1.5 to 2.5 pt.) (3 days)

or  
Methomyl

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (3 days) (RUP)
- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (3 days) (RUP)

or  
*Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)

or  
Permethrin

- *Ambush* 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- *Perm-UP* 25DF (3.2 to 6.4 oz.) or *Perm-UP* 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)

or  
*Proclaim*, 3.2 to 4.8 oz. (7 days) (RUP)

or  
*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or  
*Synapse* WG, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
Vetica, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

or  
*Voliam Flexi*, 4 to 7 oz. (3 days)

**APHIDS: Apply if there are >100 aphids per plant before flowering or >5/plant at flowering or beyond.**

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or  
*Assail* 30 SG, 1.9 to 2.8 oz. (7 days)

or  
*Belay*, 3 to 4 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 12 fl oz. per season.

or  
*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)

or  
Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

or  
Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

or  
Chlorpyrifos

- *Lorsban* 50 W (2 lb.) or *Lorsban* 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)

or  
*Diazinon* AG 500, 0.5 to 1 pt. (7 days) (RUP)

or  
*Dibrom* 8 Emulsive, 1 pt. (1 day) (RUP)

or  
Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) or *Dimethoate* 4E (0.5 to 1 pt.) (7 days)

or  
*Endosulfan* 3 EC, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)

or  
*Fulfill*, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.

or  
Imidacloprid. Additional generic brands available.

- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.8 fl oz. (7 days)

Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.

or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)

or  
Malathion

- *Malathion* 5 (1.5 to 2 pt.) or *Malathion* 5 EC (1 to 2 pt.) or *Malathion* 57 EC (1 to 2 pt.) or *Malathion* 8 (1.5 to 2.5 pt.) (3 days)

or  
*Movento*, 4 to 5 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or  
*Venom* 20 SG, 0.44 to 0.895 lb. (1 day)

or  
*Voliam Flexi*, 4 to 7 oz. (3 days)

## Broccoli

### CUTWORM:

\* *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

\* Cypermethrin

• *Ammo 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)

• *Cypermethrin*, 2.5 to 5 fl oz. (1 day) (RUP)

• *Holster*, 2.5 to 5 fl oz. (1 day) (RUP)

• *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)

or

\* Esfenvalerate

• *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

• *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

• *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

*Empower*, 3.5 to 8.7 lb. (7 days) (RUP)

or

Lambda-cyhalothrin

• *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)

• *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)

• *Warrior II* with *Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior* with *Zeon Technology* (1.92 to 3.2 fl oz.) (1 day) (RUP)

or

*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

### THRIPS:

*Actara*, 3 to 5.5 oz. (0 days)

or

*Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

Bifenthrin

• *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Brigade 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)

• *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

Cypermethrin

• *Ammo 2.5 EC*, 3.75 to 5 fl oz. (1 day) (RUP)

• *Cypermethrin*, 3.75 to 5 fl oz. (1 day) (RUP)

• *Holster*, 3.75 to 5 fl oz. (1 day) (RUP)

• *UP-Cyde 2.5 EC*, 3.75 to 5 fl oz. (1 day) (RUP)

or

*Entrust*, 1.25 to 3 oz.. (1 day) Do not apply more than 3 times in 30 days.

or

*Leverage 360*, 3 fl oz. (7 days) (RUP)

or

Permethrin

• *Perm-UP 25DF* (3.2 to 6.4 oz.) or *Perm-UP 3.2 EC* (2 to 4 oz.) (1 day) (RUP)

• *Pounce 25 WP*, 3.2 to 12.8 oz. (1 day) (RUP)

or

*Radiant SC*, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Scorpion 35SL*, 2 to 7 fl oz. (1 day)

or

*Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

or

*Voliam Flexi*, 4 to 7 oz. (3 days)

### ARMYWORM:

\* *Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

\* Cypermethrin

• *Ammo 2.5 EC*, 3.75 to 5 fl oz. (1 day) (RUP)

• *Cypermethrin*, 3.75 to 5 fl oz. (1 day) (RUP)

• *Holster*, 3.75 to 5 fl oz. (1 day) (RUP)

• *UP-Cyde 2.5 EC*, 3.75 to 5 fl oz. (1 day) (RUP)

or

Carbaryl

• *Carbaryl 4L*, 1 to 2 qt. (3 days)

• *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)

or

*Confirm 2F*, 6 to 8 fl oz. (7 days)

or

*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

*Entrust*, 1.25 to 3 oz. (1 day) Do not apply more than 3 times in 30 days.

or

Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

Permethrin

• *Perm-UP 25DF* (3.2 to 6.4 oz.) or *Perm-UP 3.2 EC* (2 to 4 oz.) (1 day) (RUP)

• *Pounce 25 WP*, 3.2 to 12.8 oz. (1 day) (RUP)

or

*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Voliam Flexi*, 4 to 7 oz. (3 days)

## DISEASES

### SEED TREATMENT:

**BLACK LEG (*Phoma lingam*), DAMPING OFF, WIRE STEM (*Pythium* spp., *Rhizoctonia* spp.):**

Captan

• *Captan 30-DD*, 1 1/4 fl oz/100 lb seed.

• *Captan 400*, 1 to 2 fl oz/100 lb seed.

or

Fludioxinil

• *Maxim 4 FS*, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (*Rhizoctonia*).

or

Thiram

• 42-S *Thiram*, *Thiram 50 WP Dyed*, 8 oz/100 lb seed.

### SEEDBED TREATMENT:

**CLUBROOT (*Plasmodiophora brassicae*):**

Fluazinam

• *Omega 500 F*, 2.6 pt. (50 days)

or

PCNB

• *Terraclor 75 WP* (40 lb in 35 gal of water (broadcast)) or *Terraclor 75 WP* (30 lb in 25 gal of water (band)) Band application: 40 inch row spacing. Spray as a 12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches immediately prior to planting. Broadcast application: Apply as a preplant broadcast prior to planting. Thoroughly incorporate to a depth of 4 to 6 inches using a disc harrow or other suitable equipment. May be used on direct seeded crops.

or

PCNB

• *Terraclor F* (7.5 gal in 30 gal of water (broadcast)) or *Terraclor F* (5.6 gal in 30 gal of water (band)) Band application: Spray as a

12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches prior to planting. May be used on direct seeded crops. Broadcast application: Apply as a preplant broadcast prior to planting. Incorporate to a depth of 4 to 6 inches. May be used on direct seeded crops.

#### **WIRE STEM (*Corticium solani*):**

PCNB. Broadcast drench application: Apply in 50 gal of water as a soil drench at the time of or immediately after seeding. For smaller areas use 1 level tablespoon per gallon of water as a soil drench per 50 sq ft of seed bed. Apply with watering can or similar equipment.

- *Terraclor* 75 WP, 15 to 20 lb.
- *Terraclor* F, 2.8 to 3.8 gal.  
or

PCNB. Row drench treatment: Spray as an 8-inch band centered on the row at the time of or immediately after seeding (40-inch row spacings).

- *Blocker* 4 F, 2.8 to 3.75 gal.
- *Terraclor* 75 WP, 10 to 15 lb in 35 gal of water.
- *Terraclor* F, 1.9 to 2.8 gal in 35 gal water.

#### **DAMPING OFF (*Pythium* spp.), BASAL ROT (*Phytophthora* spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold SL, 0.25-0.5 pt (*Pythium*) 1-2 pt (*Phytophthora*).
- *Ultra Flourish*, 1 to 1.5 pt (*Pythium*), 2 to 4 pt (*Phytophthora*).

#### **GREENHOUSE SOIL DRENCH:**

##### **ROOT/STEM ROT (*Rhizoctonia solani*):**

PCNB

- *Terraclor* 400, see label for rates specific to soil depth.

#### **GREENHOUSE PREPLANT INCORPORATION:**

##### **DAMPING OFF (*Pythium* spp.), ROOT ROT (*Rhizoctonia* spp.):**

Gliocladium virens GL-21

- *SoilGard* 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

#### **TRANSPLANT DRENCH:**

##### **CLUBROOT (*Plasmodiophora brassicae*):**

Fluazinam

- *Omega* 500 F, 6.45 fl oz. (50 days)

#### **TRANSPLANT WATER TREATMENT:**

##### **CLUBROOT (*Plasmodiophora brassicae*):**

PCNB. Treatments applied in 100 gal water using 1/2 pt per plant around roots at time plants are being set in the field. Note: Frequent agitation is needed with wettable powders.

- *Terraclor* 75 WP (2 lb) or *Terraclor* F (3 pt)

#### **FOLIAR TREATMENT:**

##### **BLACK ROT (*Xanthomonas campestris*): Apply treatment (lowest rates) in fields as soon as transplants are established.**

Acibenzolar-S-methyl

- *Actigard*, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

Copper Ammonium Carbonate

- *Copper Count* N, 1 to 3 qt. (0 days) Note: Reddening of older leaves may occur.  
or

Copper Hydroxide

- *Champ* DP, 1/3 to 2/3 lb. (0 days)

- *Champ* Formula 2 F, 1/3 to 2/3 pt. (0 days)

• *Champion* WP, 1 to 2 lb. (0 days)

• *Kocide* 2000, 3/4 to 1 1/2 lb. (0 days)

• *Kocide* 3000, 0.5-0.75 lb. (0 day)  
or

Copper Oxychloride / Copper Sulfate

- C-O-C-S WDG, 3 to 4 lb. (0 days)

or

Copper Sulfate

- *Cuprofix* Ultra, 3/4 to 1 1/4 lb. (0 days)

##### **ALTERNARIA LEAF SPOT (*Alternaria brassicae*): Apply when conditions favor disease and repeat every 7 to 10 days.**

\* Azoxystrobin

- *Amistar*, 2 to 5 oz. (0 days) Every 7-14 days

• *Quadris*, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of *Amistar* and *Quadris* or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Difenoconazole

- *Quadris* Top, 14 fl oz. (1 day)

or

\* Chlorothalonil

- *Bravo Ultrex*, 1.4 lb. (7 days)

• *Bravo Weather Stik*, *Equis* 720 SST, 1 to 1.5 pt. (7 days)

- *Echo* 720, 2 to 4 pt. (7 days)

• *Echo* 90 DF, 1.3 lb. (7 days)

- *Equis* DF, 1.4 to 1.8 lb. (7 days)

or

\* Difenoconazole/Cyprodinil

- *Inspire* Super, 16 to 20 fl oz. (7 days)

or

\* Maneb

- *Maneb* 75 DF, *Maneb* 80 WP, 1 1/2 to 2 lb. (7 days)

• *Manex*, 1 1/5 to 1 3/5 qt. (7 days)

or

Boscalid

- *Endura*, 6 to 9 oz. (0 days)

or

Copper Ammonium Carbonate

- *Copper Count* N, 1 to 3 qt. (0 days) Note: Reddening of older leaves may occur.

or

Copper Hydroxide

- *Champ* DP, 1/3 to 2/3 lb. (0 days)

• *Champ* Formula 2 F, 1/3 to 2/3 pt. (0 days)

- *Champion* WP, 1 to 2 lb. (0 days)

• *Kocide* 2000, 3/4 to 1 1/2 lb. (0 days)

or

Copper Resinate

- *Tenn-Cop* 5 E, 3 pt. (0 days)

or

Copper Sulfate

- *Basicop*, 1 to 3 lb. (0 days)

• *Cuprofix* Ultra, 3/4 to 1 1/4 lb. (0 days)

or

Cyprodinil/Fludioxonil

- *Switch* 62.5 WG, 11 to 14 oz. (7 days)

or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

Potassium phosphite/chlorothalonil

- *Catamaran*, 4 pt. (7 days)

or

Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## Brussels Sprouts

### BLACK LEG (*Phoma lingam*):

Iprodione. Apply immediately after thinning (2 to 4 leaf stage) as a directed spray to the base of the plant and adjacent soil surface. If disease persists or recurs a second application may be made up to day of harvest. Note: See label for permissible crop rotations.

- Iprodione 4L AG, 2 pt. (0 days)
- Rovral, 2 lb. (0 days)
- Rovral 4 F, 2 pt. (0 days)

### DOWNTY MILDEW (*Peronospora parasitica*): Begin applications when conditions are favorable for disease but before infection.

#### \* Fluopicolide

- Presidio, 3-4 fl oz. (2 days) Must tank mix with other fungicide.  
or

#### \* Fosetyl-Aluminum

- Alette WDG, 2 to 5 lb. (3 days) Apply at 7 to 10 day intervals. Do not tank mix with copper fungicides.  
or

#### \* Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 lb. (7 days) Apply at 14 day intervals (maximum 4 applications/crop).  
or

#### Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

#### Dimethomorph

- Forum, 6 fl oz. (7 days)  
or

#### Fenamidone

- Reason 500 SC, 8.2 fl oz. (2 days) No more than 1 application before alternating.  
or

#### Mandipropamid

- Revus, 8 fl oz. (1 day)  
or

#### Mefenoxam

- Ridomil Gold SL, 0.125-0.25 pt. (7 days)  
or

#### Mono-, dibasic sodium salts of phosphorous acid

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)

or

#### Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt. (0 days) Every 7-21 days
- Prophyt, 2 to 4 pt. (0 days)  
or

#### Neem Oil

- Trilogy, 2 pt. (0 days)  
or

#### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (7 days)

**Note:** Most fungicides that protect against Alternaria may also provide limited downy mildew protection.

### WHITE RUST:

#### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

### CERCOSPORA LEAF SPOT (*Cercospora beticola*):

#### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## Brussels Sprouts

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Sugar beet cyst, root-knot and lesion nematodes can reduce Brussels sprouts yield. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for Brussels sprouts, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of sugar beet cyst, root-knot and lesion nematodes in Brussels sprouts production.

### FALL SOIL FUMIGATION (BROADCAST):

#### 1,3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants may be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### INSECTS

### SOIL TREATMENT:

#### APHIDS:

##### Imidacloprid

- Admire Pro, 4.4 to 10.5 fl oz. (21 days)

- Nuprid 2 F, 10 to 24 fl oz. (21 days)  
or

Platinum, 5 to 11 fl oz. (30 days) See label for application methods.

#### FLEA BEETLE:

Platinum, 5 to 11 fl oz. (30 days) See label for application methods.

#### CABBAGE MAGGOT:

##### Diazinon

- Diazinon 50 W (4 to 6 lb.) or Diazinon AG 500 (2 to 3 qt.)  
or Diazinon AG600 (51 to 76.5 fl oz.) (RUP)

#### CUTWORM:

10% Sevin Granules, 20 lb. (3 days)

or

##### Diazinon

- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.)  
or Diazinon AG600 (51 to 102 fl oz.) (RUP)

**TRANSPLANT WATER TREATMENT:**

Treatments applied in water around roots at time plants are set in the field.

**CABBAGE MAGGOT:**Diazinon

- *Diazinon 50 W* (1 to 2 lb/200 gal.) or *Diazinon AG 500* (4 to 8 oz/50 gal.) or *Diazinon AG600* (3.25 to 6.5 fl oz/50 gal.) Use only as directed. (RUP)

Treatment rates are given in amount of formulation per 100 gal of water. Apply at rate of 1 cup of solution per plant. Frequent agitation is needed with wettable powders.

**ARMYWORM:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**IMPORTED CABBAGE WORM:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**DIAMONDBACK MOTH:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**CABBAGE LOOPERS:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**PLANTING TREATMENT:**

Treatments are applied at seeding.

**CABBAGE MAGGOT:**Bifenthrin

- *Brigade WSB*, 8 to 16 oz. (RUP)
- *Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

Chlorpyrifos

- *Lorsban 15 G* (4.6 to 9.2 oz/1,000 ft of row) or *Lorsban 4 E / Lorsban Advanced* (1.6 to 2.75 fl oz / 1,000 ft of row) Use only as directed. Apply in a 4-inch band over row at time of seeding. (RUP)

**APHIDS, FLEA BEETLE, THIRPS:**

*Belay*, 9 to 12 fl oz. (21 days)

**APHIDS, FLEA BEETLE:**

*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**ARMYWORM, CUTWORM:**

*Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

**APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THIRPS:**

*Durivo*, 10 to 13 fl oz. (30 days)

**SOIL TREATMENT AFTER TRANSPLANTING:**

Apply to the soil at base of plants after transplanting. Apply water to wet soil surface.

**APHIDS: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.**

*Admire Pro*, 4.4 - 10.5 fl oz. (21 days)

or

*Nuprid 2 F*, 10 to 24 oz. (21 days)

**CABBAGE MAGGOT:**Chlorpyrifos

- *Lorsban 15 G* (4.6 to 9.2 oz per 1,000 ft of row) or *Lorsban 4 E / Lorsban Advanced* (1.6 to 2.75 fl oz / 1,000 ft of row) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

**APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THIRPS:**

*Durivo*, 10 to 13 fl oz. (30 days)

**FOLIAR TREATMENT:****FLEA BEETLE: Apply as needed soon after plants come up when field seeded.**

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or

*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

Carbaryl

- *Carbaryl 4L*, 0.5 to 1 qt. (3 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin 80 WSP* (0.67 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (3 days)

or

Chlorpyrifos

- *Lorsban 4 E / Lorsban Advanced* (1 to 2 pt) or *Lorsban 50 W* (2 lb) (21 days) (RUP)

or

Cypermethrin

- *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) (RUP)

or

*Endosulfan 3 EC*, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

Imidacloprid

- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

or

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

*Leverage 360*, 3 fl oz. (7 days) (RUP)

or

*Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)

or

*Perm-UP 3.2 EC*, 2 to 4 oz. (1 day) (RUP)

or

*Venom*, 3 to 4 oz. (1 day)

**CUTWORM, ARMYWORM: Apply when damage is first seen. Repeat as needed.**

\* *Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

## Brussels Sprouts

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- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - or
- \* Cypermethrin
  - *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (7 days) (RUP)
    - or
  - \* Permethrin
    - *Ambush 25 W*, 6.4 oz. (1 day) (RUP)
    - *Perm-UP 3.2 EC*, *Pounce 25 WP*, 4 oz. (1 day) (RUP)
      - or
  - Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)
    - or
  - Chlorpyrifos
    - *Lorsban 4 E* / *Lorsban Advanced* (1 to 2 pt) or *Lorsban 50 W* (2 lb) (21 days) (RUP)
      - or
    - Endosulfan 3 EC*, 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)
      - or
    - Entrust*, 1.3 to 3 oz. (1 day) Do not apply more than 3 times in 30 days.
      - or
    - Hero*, 4 to 10.3 oz. (7 days) (RUP)
      - or
    - Leverage 360*, 3 fl oz. (7 days) (RUP)
      - or
    - Mustang Max*, 3.2 to 4.0 oz. (1 day) (RUP)
      - or
    - Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
      - or
    - Rimon*, 6 to 12 fl oz. (7 days)
      - or
    - Synapse WG*, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.
      - or
    - Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.
  - IMPORTED CABBAGE WORM: Apply treatments if >10% of plants are infested with any cabbage "worm".**
    - Acephate
      - *Acephate 90 WDG*, or *Acephate 90 WSP* (17.6 oz.) or *Acephate 97* (16 oz.) or *Acephate 97 UP* (16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.
      - *Bracket 97*, 16 oz. (14 days)
      - *Orthene 97*, 16 oz. (14 days)
        - or
    - Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.
      - or
    - Bacillus thuringiensis
      - *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)
        - or
      - Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)
        - or
    - Bifenthrin
      - *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
      - *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
      - *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
        - or
    - Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)
      - or
    - Carbaryl
      - *Carbaryl 4L*, 1 to 2 qt. (3 days)
      - *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)
        - or
    - Chlorpyrifos
      - *Lorsban 4 E* / *Lorsban Advanced* (1 to 2 pt) or *Lorsban 50 W* (2 lb) (21 days) (RUP)
        - or
      - Confirm 2F*, 6 to 8 fl oz. (7 days)
        - or
      - Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.
        - or
    - \* Cypermethrin
      - *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (7 days) (RUP)
        - or
      - Danitol 2.4 EC*, 10 2/3 to 16 fl oz. (7 days) (RUP)
        - or
      - Diazinon AG 500*, 0.5 to 1 pt. (7 days) (RUP)
        - or
      - Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)
        - or
      - Endosulfan 3 EC*, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)
        - or
      - Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days.
        - or
      - Hero*, 4 to 10.3 oz. (7 days) (RUP)
        - or
      - Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
        - or
    - Lambda-cyhalothrin
      - *Lambda-Cy*, 1.92 to 3.2 fl oz. (RUP)
      - *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
      - *Warrior II* with *Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior* with *Zeon Technology* (1.92 to 3.2 fl oz.) (1 day) (RUP)
        - or
      - Leverage 360*, 3 fl oz. (7 days) (RUP)
        - or
      - Malathion 57 EC*, 2 pt. (7 days)
        - or
    - Methomyl
      - *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (3 days) (RUP)
      - *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (3 days) (RUP)
        - or
      - Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)
        - or
    - Permethrin
      - *Ambush 25 W*, 3.2 to 6.4 oz. (1 day) (RUP)
      - *Perm-UP 3.2 EC* (2 to 8 oz) or *Pounce 25 WP* (3.2 to 6.4 oz) (1 day) (RUP)
        - or
      - Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)
        - or
      - Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
        - or
      - Rimon*, 6 to 12 fl oz. (7 days)
        - or
    - Synapse WG*, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.
      - or

<p><i>Vetica</i>, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.</p> <p><b>DIAMONDBACK MOTH:</b> Apply if &gt;10% of plants are infested with any cabbage "worm". Use <i>Bacillus thuringiensis</i> to avoid killing important natural enemies of diamondback "moth".</p> <ul style="list-style-type: none"> <li>* <i>Avaunt</i>, 3.5 oz. (3 days) Do not apply more than twice to one generation. Do not exceed 14 oz/acre per crop. or</li> <li>* <i>Bacillus thuringiensis</i></li> <li>• <i>Agree</i>, <i>Biobit</i>, <i>Dipel</i>, <i>Javelin</i>, <i>Xentari</i>, . (0 days) or</li> <li>* <i>Entrust</i>, 0.5 to 1.3 oz. (1 day) Do not apply more than 3 times in 30 days. or</li> <li><b>Acephate</b> <ul style="list-style-type: none"> <li>• <i>Acephate</i> 90 WDG, or <i>Acephate</i> 90 WSP (17.6 oz.) or <i>Acephate</i> 97 (16 oz.) or <i>Acephate</i> 97 UP (16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.</li> <li>• <i>Bracket</i> 97, 16 oz. (14 days)</li> <li>• <i>Orthene</i> 97, 16 oz. (14 days) or</li> <li><i>Baythroid XL</i>, 2.4 to 3.2 fl oz. (0 days) (RUP) or</li> </ul> </li> <li><b>Bifenthrin</b> <ul style="list-style-type: none"> <li>• <i>Bifenthrin</i> 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Bifenture</i> EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Brigade</i> 2EC (2.1 to 6.4 fl oz.) or <i>Brigade</i> WSB (5.3 to 16 oz.) (7 days) (RUP)</li> <li>• <i>Capture</i> 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Discipline</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Fanfare</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Sniper</i>, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Tundra</i> EC, 2.1 to 6.4 fl oz. (7 days) (RUP) or</li> </ul> </li> <li><i>Brigadier</i>, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP) or</li> <li><b>Carbaryl</b> <ul style="list-style-type: none"> <li>• <i>Carbaryl</i> 4L, 1 to 2 qt. (3 days)</li> <li>• <i>Sevin</i> 4 F (1 to 2 qt.) or <i>Sevin</i> 80 S (1.25 to 2.5 lb.) or <i>Sevin</i> 80 WSP (1.25 to 2.5 lb.) or <i>Sevin</i> XLR Plus (1 to 2 qt.) (3 days) or</li> </ul> </li> <li><i>Coragen</i>, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season. or</li> <li><i>Diazinon</i> AG 500, 0.5 to 1 pt. (7 days) (RUP) or</li> <li><i>Dibrom</i> 8 Emulsive, 1 pt. (1 day) (RUP) or</li> <li><i>Endosulfan</i> 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP) or</li> <li><i>Hero</i>, 4 to 10.3 oz. (7 days) (RUP) or</li> <li><b>Lambda-cyhalothrin</b> <ul style="list-style-type: none"> <li>• <i>Lambda-Cy</i>, 2.56 to 3.84 fl oz. (RUP)</li> <li>• <i>Proaxis</i>, 2.56 to 3.84 fl oz. (1 day) (RUP)</li> <li>• <i>Warrior II</i> with Zeon Technology (1.28 to 1.92 fl oz.) or <i>Warrior</i> with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP) or</li> </ul> </li> <li><i>Malathion</i> 57 EC, 2 pt. (7 days) or</li> <li><b>Methomyl</b> <ul style="list-style-type: none"> <li>• <i>Lannate</i> LV (1.5 to 3 pt.) or <i>Lannate</i> SP (0.5 to 1 lb.) (3 days) (RUP)</li> <li>• <i>Nudrin</i> LV (1.5 to 3 pt.) or <i>Nudrin</i> SP (0.5 to 1 lb.) (3 days) (RUP) or</li> <li><i>Mustang Max</i>, 2.2 to 4.0 oz. (1 day) (RUP)</li> </ul> </li> </ul>	<p><b>Permethrin</b></p> <ul style="list-style-type: none"> <li>• <i>Ambush</i> 25 W, 3.2 to 6.4 oz. (1 day) (RUP)</li> <li>• <i>Perm-UP</i> 3.2 EC (2 to 8 oz.) or <i>Pounce</i> 25 WP (3.2 to 6.4 oz) (1 day) (RUP) or</li> <li><i>Proclaim</i>, 2.4 to 4.8 oz. (7 days) (RUP) or</li> </ul> <p><i>Radiant</i> SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season. or</p> <p><i>Rimon</i>, 6 to 12 fl oz. (7 days) or</p> <p><i>Synapse</i> WG, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season. or</p> <p><i>Vetica</i>, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.</p> <p><b>CABBAGE LOOPERS:</b> Apply if &gt;10% of plants are infested with any cabbage "worm". Most controls are less effective on larger worms.</p> <p><b>Acephate</b></p> <ul style="list-style-type: none"> <li>• <i>Acephate</i> 90 WDG, or <i>Acephate</i> 90 WSP (17.6 oz.) or <i>Acephate</i> 97 (16 oz.) or <i>Acephate</i> 97 UP (16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.</li> <li>• <i>Bracket</i> 97, 16 oz. (14 days)</li> <li>• <i>Orthene</i> 97, 16 oz. (14 days) or</li> </ul> <p><i>Avaunt</i>, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop. or</p> <p><b>Bacillus thuringiensis</b></p> <ul style="list-style-type: none"> <li>• <i>Agree</i>, <i>Biobit</i>, <i>Dipel</i>, <i>Javelin</i>, <i>Xentari</i>, . (0 days) or</li> <li><i>Baythroid XL</i>, 1.6 to 2.4 fl oz. (0 days) (RUP) or</li> </ul> <p><b>Bifenthrin</b></p> <ul style="list-style-type: none"> <li>• <i>Bifenthrin</i> 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Bifenture</i> EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Brigade</i> 2EC (2.1 to 6.4 fl oz.) or <i>Brigade</i> WSB (5.3 to 16 oz.) (7 days) (RUP)</li> <li>• <i>Capture</i> 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Discipline</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Fanfare</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Sniper</i>, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Tundra</i> EC, 2.1 to 6.4 fl oz. (7 days) (RUP) or</li> </ul> <p><i>Brigadier</i>, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP) or</p> <p><i>Confirm</i> 2F, 6 to 8 fl oz. (7 days) or</p> <p><i>Coragen</i>, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season. or</p> <p><b>Cypermethrin</b></p> <ul style="list-style-type: none"> <li>• <i>Ammo</i> 2.5 EC, <i>UP-Cyde</i> 2.5 EC, 5 oz. (1 day) (RUP) or</li> <li><i>Danitol</i> 2.4 EC, 10 2/3 to 16 fl oz. (7 days) (RUP) or</li> <li><i>Dibrom</i> 8 Emulsive, 2 pt. (1 day) (RUP) or</li> </ul> <p><i>Endosulfan</i> 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP) or</p> <p><i>Entrust</i>, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days. or</p> <p><i>Hero</i>, 4 to 10.3 oz. (7 days) (RUP) or</p> <p><i>Intrepid</i> 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)</p>
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## Brussels Sprouts

### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

### Methomyl

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (3 days) (RUP)
- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (3 days) (RUP)

or  
*Mustang Max*, 3.2 to 4.0 oz. (1 day) (RUP)

### Permethrin

- *Perm-UP* 3.2 EC (4 oz) or *Pounce 25 WP* (6.4 oz) (1 day) (RUP)

or  
*Proclaim*, 3.2 to 4.8 oz. (7 days) (RUP)

or  
*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Synapse WG*, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
*Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

### **APHIDS: Apply if needed to prevent infestations on edible parts.**

#### Acephate

- *Acephate 90 WDG*, or *Acephate 90 WSP* (8 to 17.6 oz.) or *Acephate 97* (8 to 16 oz.) or *Acephate 97 UP* (8 to 16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.
- *Bracket 97*, 8 to 16 oz. (14 days)
- *Orthene 97*, 8 to 16 oz. (14 days)

or  
*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or  
*Assail 30 SG*, 1.9 to 2.8 oz. (7 days)

or  
*Belay*, 3 to 4 fl oz. (21 days)

or  
*Beleaf 50 SG*, 2 to 2.8 oz. (0 days)

#### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or  
*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or  
*Diazinon AG 500*, 0.5 to 1 pt. (7 days) (RUP)

or  
*Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)

or  
*Dimethoate 400*, 1 pt. (10 days)

*Endosulfan 3 EC*, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or  
*Fulfill*, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.

#### Imidacloprid

- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

or  
*Malathion 57 EC*, 2 pt. (7 days)

or  
*Movento*, 4.0 to 5.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

### **THRIPS:**

*Belay*, 3 to 4 fl oz. (21 days)

#### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

or  
*Radiant SC*, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

### **ARMYWORM:**

#### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (3 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)

or  
*Confirm 2F*, 6 to 8 fl oz. (7 days)

or  
*Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

#### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

### **CUTWORM:**

*Empower*, 3.5 to 8.7 lb. (7 days) (RUP)

#### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

#### Methomyl

- *Lannate LV* (1.5 pt.) or *Lannate SP* (0.5 lb.) (3 days) (RUP)
- *Nudrin LV* (1.5 pt.) or *Nudrin SP* (0.5 lb.) (3 days) (RUP)

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF, WIRE STEM (*Pythium* spp., *Rhizoctonia* spp.):

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

Captan

- Captan 30-DD, 1 1/4 oz/100 lb seed.
- Captan 400, 1 to 2 oz/100 lb seed.  
or

Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (*Rhizoctonia*).  
or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

### SEEDBED TREATMENT:

#### CLUBROOT (*Plasmodiophora brassicae*):

Fluazinam

- Omega 500 F, 2.6 pt. (50 days)  
or

PCNB. Before planting, sterilize seedbeds (Appendix A) or apply to soil surface as a drench.

- *Terraclor* 10 G, 200 lb (row) or 300 lb (broadcast). Row application: Apply as a 12- to 15-inch band and rototil to a depth of 4 to 6 inches immediately prior to planting. Broadcast application: Apply to the soil surface prior to planting. Disc and cross disc to a depth of 4 to 6 inches.
- *Terraclor* 75 WP, 30 lb in 25 gal of water (band) or 40 lb in 35 gal of water (broadcast). Band application (40 inch row spacing): Spray as a 12- to 15 inch band centered on the row and incorporate to a depth of 4 to 6 inches immediately prior to planting. Broadcast application: Apply as a preplant broadcast prior to planting. Thoroughly incorporate to a depth of 4 to 6 inches using a disc or other suitable equipment.
- *Terraclor* F, 5.6 gal in 25 gal of water (band) or 7.5 gal in 30 gal of water (broadcast). Band application: Spray as a 12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches prior to planting. May be used on cole crops that are direct seeded. Broadcast application: Apply as preplant broadcast. Incorporate to a depth of 4 to 6 inches. May be used on direct seeded crops.

#### WIRE STEM or BLACK ROOT (*Corticium solani*):

PCNB. Row treatment: Apply as an 8-inch band centered on the row (40-inch row spacing) at the time of or immediately after seeding.

- *Terraclor* 10 G, 110 to 150 lb before seeding.
- *Terraclor* 75 WP, 10 to 15 lb in 35 gal of water.  
or

PCNB. Broadcast drench application: Apply in 50 gal of water as a soil drench at the time of or immediately after seeding. For smaller areas use 1 level tablespoon/gal water as a soil drench per 50 sq ft of seedbed. Apply with watering can or similar equipment.

- *Terraclor* 75 WP, 15 to 20 lb.
- *Terraclor* F, 2.8 to 3.8 gal.

### SOIL TREATMENT:

#### TRANSPLANT DRENCH:

#### CLUBROOT (*Plasmodiophora brassicae*):

Fluazinam

- Omega 500 F, 6.45 fl oz. (50 days)

### TRANSPLANT WATER TREATMENT:

#### CLUBROOT (*Plasmodiophora brassicae*):

PCNB. Applied in 100 gal of water using 1/2 pt per acre around roots at time plants are set in the field. Note: Apply at rate of 1 cup of solution per plant. Frequent agitation is needed.

- *Terraclor* 75 WP, 2 lb.
- *Terraclor* F, 3 pt.

### FOLIAR TREATMENT:

**BLACK ROT (*Xanthomonas campestris*)**: Apply treatment (lowest rate) in fields as soon as transplants are established.

Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days)  
or

Copper Hydroxide

- Champ 2FL, 1/3 to 2/3 pt. (0 days)
- Champ DP, 1/3 to 2/3 lb. (0 days)
- Champ WP, 1 to 2 lb. (0 days)
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)  
or

Copper Sulfate

- Cuprofix Ultra, 3/4 to 1 1/4 lb. (0 days)

**BLACK LEG (*Phoma lingam*)**: There are presently no chemicals registered for use on this disease.

**ALTERNARIA LEAF SPOT (*Alternaria brassicae*)**: Apply when conditions favor disease development and repeat every 7 to 10 days.

\* Azoxystrobin

- Amistar, 2 to 5 oz every 7 - 14 days. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Difenoconazole

- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.

or

\* Chlorothalonil

- Bravo Ultrex, 1.4 lb. (7 days)
- Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)  
or

\* Difenoconazole/Cyprodinil

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

\* Maneb

- Maneb 75 DF, Maneb 80 WP, 1 1/2 to 2 lb. (7 days)
- Manex, 1 1/5 to 1 3/5 qt. (7 days)  
or

Boscalid

- Endura, 6 to 9 oz. (0 days)  
or

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days)  
or

Copper Sulfate

- Basicop 53 WP, 1 to 3 lb. (0 days)
- Cuprofix Ultra, 3/4 to 1 1/4 lb. (0 days)  
or

Cyprodinil/Fludioxonil

- Switch 62.5 WG, 11 to 14 oz. (7 days)  
or

## Cabbage

### Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 lb, 14-day intervals. (7 days) Maximum 4 applications.  
or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (7 days)  
or

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

**DOWNTY MILDEW (*Peronospora parasitica*): Apply when conditions favor disease development and repeat every 7 to 10 days.**

### \* Fluopicolide

- Presidio, 3-4 fl oz. (2 days) Must tank mix with other fungicide.  
or

### \* Fosetyl-Aluminum

- Alette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Note: Do not tank mix with copper fungicides.  
or

### \* Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 lb, 14-day intervals. (7 days) Maximum 4 applications.  
or

### Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do no apply more than 4 applications per crop per year.  
or

### Dimethomorph

- Forum, 6 fl oz. (7 days)  
or

### Fenamidone

- Reason 500 SC, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating. 12 hr REI.  
or

### Mandipropamid

- Revus, 8 fl oz. (1 day)  
or

### Mefenoxam

- Ridomil Gold SL, 0.125-0.25 pt. (7 days)  
or

### Mono-, dibasic sodium salts of phosphorous acid

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or

### Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt every 7 - 21 days. (0 days)
- Prophyt, 2 to 4 pt. (0 days)  
or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (7 days)

**Note:** Fungicides that protect against Alternaria also provide limited downy mildew protection.

## CERCOSPORA LEAF SPOT (*Cercospora beticola*):

### Fenamidone

- Reason 500 SC, 8.2 fl oz. (2 days) Suppression. 12 hr REI.  
or

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## WHITE RUST:

### Fenamidone

- Reason 500 SC, 8.2 fl oz. (2 days) 12 hr REI.  
or

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## Cabbage

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Sugar beet cyst, northern root-knot and root-lesion nematodes can reduce cabbage yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for cabbage, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of sugar beet cyst, root-knot and lesion nematodes in cabbage production. It is best not to plant cabbage on land infested with sugar beet cyst nematodes.

## FALL SOIL FUMIGATION (BROADCAST):

### 1.3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## PREPLANT SOIL TREATMENT:

*Mocap* 15 G, . Apply 34 lb/A up to one week before planting and incorporate to a depth of 3 inches. (RUP)

## SOIL TREATMENT AT PLANTING:

*Mocap* 15 G (13 lb) or *Mocap* 6 EC (1.3 to 2 qt) (36 inch row spacing) Apply in a 12- to 15-inch band over the row. Do not allow material to contact the seed. (RUP)

## INSECTS

### SEEDBED TREATMENT:

Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

### CABBAGE MAGGOT: Apply to seedbed surface and incorporate to 3 to 4 inches.

#### Diazinon

- Diazinon 50 W (4 to 6 lb.) or Diazinon AG 500 (2 to 3 qt.) or Diazinon AG600 (51 to 76.5 fl oz.) Apply only as directed. (RUP)

### CUTWORM:

#### Diazinon

- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) (RUP)

## SOIL TREATMENT:

### APHIDS:

*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.  
or

**Venom** 20 SG, 1.13 to 1.34 lb. (21 days) See label for application methods.

#### FLEA BEETLE, THRIPS:

**Scorpion** 35SL, 9 to 10.5 fl oz. (21 days) See label for application methods.

#### CUTWORM:

10% **Sevin** Granules, 20 lb. (3 days)

#### APHIDS and THRIPS:

##### Imidacloprid

- **Admire Pro**, 4.4 to 10.5 fl oz. (21 days)
- **Nuprid** 2 F, 10 to 24 fl oz. (21 days)

#### TRANSPLANT WATER TREATMENT:

Treatments are applied in water around roots at time plants are set in field.

#### CABBAGE MAGGOT:

##### Diazinon

- **Diazinon** 50 W (1 to 2 lb/200 gal) or **Diazinon** AG 500 (4 to 8 oz/50 gal) or **Diazinon** AG600 (3.25 to 6.5 fl oz/50 gal) Use only as directed. (RUP)

#### ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, IMPORTED CABBAGE WORM:

**Coragen**, 3.5 to 5 fl oz. (3 days) See label for application methods.

#### PLANTING TREATMENT:

Treatments applied at seeding.

#### CABBAGE MAGGOT:

**Brigade** WSB, 8 to 16 oz. Apply infurrow with seed or transplant. (RUP)

or

##### Chlorpyrifos

- **Lorsban** 15 G (4.6 to 9.2 oz /1,000 row ft.) or **Lorsban** 4 E / **Lorsban** Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) or **Lorsban** 75 WG (1.1 to 1.8 oz/1000 row ft.) See label for application methods. (RUP)

#### ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:

**Coragen**, 3.5 to 5 fl oz. (3 days) See label for application methods.

#### APHIDS, FLEA BEETLE, THRIPS:

**Belay**, 9 to 12 fl oz. (21 days)

or

##### Thiamethoxam

- **Platinum** (5 to 11 fl oz.) or **Platinum** 75 SG (1.66 to 3.67 oz.) (30 days)

#### APHIDS, ARMYWORM, CABBAGE LOOPERS, CORN EARWORM, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THRIPS:

**Durivo**, 10 to 13 fl oz. (30 days)

#### ARMYWORM, CABBAGE MAGGOT, CUTWORM:

**Capture** LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

#### SOIL TREATMENT AFTER TRANSPLANTING:

**APHIDS:** Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.

##### Imidacloprid. Additional generic brands available.

- **Admire Pro**, 4.4 - 10.5 fl oz. (21 days)
- **Nuprid** 2 F, 10 to 24 oz. (21 days)

**CABBAGE MAGGOT:** Apply to the soil at base of plants after transplanting. Apply water to wet soil surface.

##### Chlorpyrifos

- **Lorsban** 15 G (4.6 to 9.2 oz /1,000 row ft.) or **Lorsban** 4 E / **Lorsban** Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

#### APHIDS, ARMYWORM, CABBAGE LOOPERS, CORN EARWORM, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM, THRIPS:

**Durivo**, 10 to 13 fl oz. (30 days)

#### APHIDS, FLEA BEETLE, THRIPS:

##### Thiamethoxam

- **Platinum** (5 to 11 fl oz.) or **Platinum** 75 SG (1.66 to 3.67 oz.) (30 days)

#### FOLIAR TREATMENT:

#### FLEA BEETLE: Apply as needed soon after plants come up.

**Actara**, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or

**Baythroid** XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

**Belay**, 3 to 4 fl oz. (21 days)

or

##### Bifenthrin

- **Bifenthrin** 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Bifenture** EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Brigade** 2EC (2.1 to 6.4 fl oz.) or **Brigade** WSB (5.3 to 16 oz.) (7 days) (RUP)
- **Capture** 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Discipline** 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare** 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra** EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

##### Carbaryl

- **Carbaryl** 4L, 0.5 to 1 qt. (3 days)
- **Sevin** 4 F (0.5 to 1 qt.) or **Sevin** 80 S (0.63 to 1.25 lb.) or **Sevin** 80 WSP (0.67 to 1.25 lb.) or **Sevin** XLR Plus (0.5 to 1 qt.) (3 days)

##### Chlorpyrifos

- **Lorsban** 50 W (2 lb.) or **Lorsban** 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)

or

##### Cypermethrin

- **Ammo** 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- **Cypermethrin**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Holster**, 2.5 to 5 fl oz. (1 day) (RUP)
- **UP-Cyde** 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)

##### Endosulfan

- **Endosulfan** 3 EC, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)
- **Thionex** 3EC, 1 to 1.33 qt. (17 days) (RUP)
- **Thionex** 50W, 1.5 to 2 lb. (21 days) (RUP)

##### Esfenvalerate

- **Adjourn**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Asana** XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **S-FenvaStar**, 5.8 to 9.6 fl oz. (3 days) (RUP)

**Hero**, 4 to 10.3 oz. (7 days) (RUP)

or

##### Imidacloprid. Additional generic brands available.

- **Admire Pro**, 1.3 fl oz. (7 days)
- **Nuprid** 1.6 F, 3.8 fl oz. (7 days)

Do not exceed 19.2 oz/Acre per season.

## Cabbage

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### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or  
*Larvin* 3.2 EC, 16 to 32 oz. (7 days)

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

or  
*Malathion* 8, 1.5 to 2.5 pt.. (7 days)

or  
*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

### Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)
  - *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)
- or  
*Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- or  
*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)
- or  
*Voliam Flexi*, 4 to 7 oz. (3 days)

**CUTWORM, ARMYWORM:** Apply when damage is first seen. Repeat as needed

### \* Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
  - *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- or  
\* *Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)

or  
\* *Warrior with Zeon Technology*, 2.6 to 3.8 fl oz. (1 day) (RUP)

### Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

### Chlorpyrifos

- *Lorsban 50 W* (2 lb.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days) (RUP)

### Endosulfan

- *Endosulfan 3 EC*, 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)
- *Thionex 3EC*, 1.33 qt. (17 days) (RUP)
- *Thionex 50W*, 2 lb. (21 days) (RUP)

Consult label for rotation restrictions.

or  
*Entrust*, 1.3 to 3 oz. (1 day) Do not apply more than 3 times in 30 days.

or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)

### Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)

or  
*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Synapse WG*, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
*Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**IMPORTED CABBAGE WORM:** Apply if 20% or more are infested with any cabbage "worm" before heading or if >10% are infested at or after heading.

*Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.

### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)
- or  
*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)

### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

### Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (3 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)

### Chlorpyrifos

- *Lorsban 50 W* (2 lb.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days) (RUP)

or  
*Confirm 2F*, 6 to 8 fl oz. (7 days)

or  
*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

### Cypermethrin

- *Ammo 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Holster*, 2.5 to 5 fl oz. (1 day) (RUP)
- *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (1 day) (RUP)

or  
*Danitol 2.4 EC*, 10.66 to 16 fl oz. (7 days) (RUP)

or  
*Diazinon AG 500*, 0.5 to 1 pt. (21 days) (RUP)

or  
*Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)

### Endosulfan

- *Endosulfan 3 EC*, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)
- *Thionex 3EC*, 1 to 1.33 qt. (17 days) (RUP)
- *Thionex 50W*, 1.5 to 2 lb. (21 days) (RUP)

or  
*Entrust*, 1 to 2 oz.. (1 day) Do not apply more than 3 times in 30 days.

or

Esfenvalerate

- *Adjourn*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *Asana XL*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (3 days) (RUP)  
or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)  
or

*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or

Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)  
or  
*Larvin* 3.2 EC, 16 to 32 oz. (7 days)

or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)

Malathion

- *Malathion* 5 (2 pt.) or *Malathion* 5 EC (1 to 2 pt.) or *Malathion* 57 EC (1 to 2 pt.) or *Malathion* 8 (1.5 to 2.5 pt.) (7 days)  
or

Methomyl

- *Lannate* LV (0.75 to 3 pt.) or *Lannate* SP (0.25 to 1 lb.) (1 day) (RUP)
- *Nudrin* LV (0.75 to 3 pt.) or *Nudrin* SP (0.25 to 1 lb.) (1 day) (RUP)  
or  
*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

Permethrin

- *Ambush* 25 W, 3.2 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 25DF (3.2 to 12.8 oz.) or *Perm-UP* 3.2 EC (2 to 8 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)  
or  
*Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)

or  
*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or

*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or  
*Synapse* WG, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
*Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

or  
*Voliam Flexi*, 4 to 7 oz. (3 days)

**DIAMONDBACK MOTH:** Apply if 20% or more are infested with any cabbage "worm" before heading or if >10% are infested at or after heading. Use *Bacillus thuringiensis* to avoid killing important natural enemies of diamondback moth.

\* *Avaunt*, 3.5 oz. (3 days) Do not apply more than twice to one generation. Do not exceed 14 oz/acre per crop.

\* *Bacillus thuringiensis*

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)

or  
\* *Entrust*, 0.5 to 1.3 oz. (1 day) Do not apply more than 3 times in 30 days.

or  
*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)  
or

Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (3 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (3 days)  
or

Chlorpyrifos

- *Lorsban* 50 W (2 lb.) or *Lorsban* 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)  
or

*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or  
*Diazinon* AG 500, 0.5 to 1 pt. (21 days) (RUP)

or  
*Dibrom* 8 Emulsive, 1 pt. (1 day) (RUP)  
or

Endosulfan

- *Endosulfan* 3 EC, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)
- *Thionex* 3EC, 1 to 1.33 qt. (17 days) (RUP)
- *Thionex* 50W, 1.5 to 2 lb. (21 days) (RUP)  
or

*Entrust*, 0.5 to 1.25 oz. (1 day) Do not apply more than 3 times in 30 days.

or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

*Larvin* 3.2 EC, 24 to 40 oz. (7 days)

Malathion

- *Malathion* 5, *Malathion* 5 EC, 2 pt. (7 days)  
or

Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (1 day) (RUP)  
or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)  
or

Permethrin

- *Ambush* 25 W, 3.2 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 25DF (3.2 to 12.8 oz.) or *Perm-UP* 3.2 EC (2 to 8 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)  
or

*Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)

or

*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

## Cabbage

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*Rimon*, 6 to 12 fl oz. (7 days)

or

*Synapse WG*, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or

*Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

or

*Voliam Flexi*, 4 to 7 oz. (3 days)

**CABBAGE LOOPERS:** Apply if 20% or more are infested with any cabbage "worm" before heading or if >10% are infested at or after heading. Most controls are less effective on larger worms.

*Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.

or

*Bacillus thuringiensis*

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)

or

*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)

or

*Bifenthrin*

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)

- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

*Bifenthrin + Imidacloprid*

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

or

*Confirm 2F*, 6 to 8 fl oz. (7 days)

or

*Coragen*, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

*Cypermethrin*

- *Ammo 2.5 EC*, 3.75 to 5 fl oz. (7 days) (RUP)

- *Cypermethrin*, 3.75 to 5 fl oz. (7 days) (RUP)

- *Holster*, 3.75 to 5 fl oz. (7 days) (RUP)

- *UP-Cyde 2.5 EC*, 3.75 to 5 fl oz. (7 days) (RUP)

or

*Danitol 2.4 EC*, 10.66 to 16 fl oz. (7 days) (RUP)

or

*Dibrom 8 Emulsive*, 2 pt. (1 day) (RUP)

or

*Endosulfan*

- *Endosulfan 3 EC*, 1 to 1.33 qt. (7 days) Consult label for rotation restrictions. (RUP)

- *Thionex 3EC*, 1 to 1.33 qt. (17 days) (RUP)

- *Thionex 50W*, 1.5 to 2 lb. (21 days) (RUP)

or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days.

or

*Esfenvalerate*

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

*Lambda-cyhalothrin*

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Warrior II* with *Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior* with *Zeon Technology* (1.92 to 3.2 fl oz.) (1 day) (RUP)

or

*Larvin 3.2 EC*, 24 to 40 oz. (7 days)

or

*Leverage 360*, 3 fl oz. (7 days) (RUP)

or

*Malathion*

- *Malathion 5*, *Malathion 5 EC*, or *Malathion 57 EC* (1 to 2 pt.) or *Malathion 8* (1.5 to 2.5 pt.) (3 days)

or

*Methomyl*

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (1 day) (RUP)

- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (1 day) (RUP)

- *Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)

or

*Permethrin*

- *Ambush 25 W*, 3.2 to 12.8 oz. (1 day) (RUP)

- *Perm-UP 25DF* (3.2 to 12.8 oz.) or *Perm-UP 3.2 EC* (2 to 8 oz.) (1 day) (RUP)

- *Pounce 25 WP*, 3.2 to 12.8 oz. (1 day) (RUP)

or

*Proclaim*, 3.2 to 4.8 oz. (7 days) (RUP)

or

*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Rimon*, 6 to 12 fl oz. (7 days)

or

*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or

*Synapse WG*, 2 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or

*Vetica*, 11 to 13 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

or

*Voliam Flexi*, 4 to 7 oz. (3 days)

**APHIDS: Apply if there are >5 per plant.**

*Actara*, 1.5 to 3 oz. (0 days)

or

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or

*Assail 30 SG*, 1.9 to 2.8 oz. (7 days)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

*Beleaf 50 SG*, 2 to 2.8 oz. (0 days)

or

*Bifenthrin*

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)

- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

*Bifenthrin + Imidacloprid*

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

- *Swagger*, 8.48 to 12.2 fl oz. (7 days) (RUP)

or

**Chlorpyrifos**

- Lorsban 50 W (2 lb.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- or

Diazinon AG 500, 0.5 to 1 pt. (21 days) (RUP)

or

Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)

or

**Endosulfan**

- Endosulfan 3 EC, 1 to 1.33 qt. (7 days) (RUP)
- Thionex 3EC, 1 to 1.33 qt. (17 days) Consult label for rotation restrictions. (RUP)
- Thionex 50W, 1.5 to 2 lb. (21 days) (RUP)
- or

Fulfill, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.

or

Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 fl oz. (7 days)
- Nuprid 1.6 F, 3.8 fl oz. (7 days)

Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.

or

Leverage 360, 3 fl oz. (7 days) (RUP)

or

**Malathion**

- Malathion 5 (1.5 to 2 pt.) or Malathion 5 EC (1 to 2 pt.)
- or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) (7 days)
- or

Movento, 4 to 5 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or

Venom 20 SG, 0.44 to 0.895 lb. (21 days)

or

Voliam Flexi, 4 to 7 oz. (3 days)

**THrips:** Apply insecticide if thrips are present at cupping. Use resistant cabbage varieties.

**\* Bifenthrin**

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- or

**\* Cypermethrin**

- Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
- Holster, 3.75 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- or

Actara, 3 to 5.5 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or

Assail 30 SG, 4 oz. (7 days)

or

Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

**Bifenthrin + Imidacloprid**

- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)
- or

Entrust, 1.25 to 3 oz.. (1 day) Do not apply more than 3 times in 30 days.

or

Hero, 10.3 oz. (7 days) (RUP)

or  
Leverage 360, 3 fl oz. (7 days) (RUP)

or  
Radiant SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
Scorpion 35SL, 2 to 7 fl oz. (1 day)

or  
Voliam Flexi, 4 to 7 oz. (3 days)

**CUTWORM:**

\* Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

**\* Cypermethrin**

- Ammo 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)
- Holster, 2.5 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- or

**\* Esfenvalerate**

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- or
- Empower, 3.5 to 8.7 lb. (7 days) (RUP)
- or

**Lambda-cyhalothrin**

- Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- or

**Methomyl**

- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (1 day) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (1 day) (RUP)
- or
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

**ARMYWORM:**

\* Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

**Carbaryl**

- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- or
- Confirm 2F, 6 to 8 fl oz. (7 days)
- or

Coragen, 3.5 to 5 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

**Cypermethrin**

- Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
- Holster, 3.75 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- or

Entrust, 1.25 to 3 oz.. (1 day)

or

**Lambda-cyhalothrin**

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- or

**Methomyl**

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- or

## Cabbage

Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or  
Voliam Flexi, 4 to 7 oz. (3 days)

## SLUGS

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF, WIRE STEM (*Pythium* spp., *Rhizoctonia solani*):

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

Captan

- Captan 30-DD, 1 1/4 oz/100 lb seed.
- Captan 400, 1 to 2 oz/100 lb seed.  
or

Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (*Rhizoctonia*).  
or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

#### BLACK LEG (*Phoma lingam*):

There are presently no chemicals registered for use on this disease.

### SEEDBED TREATMENT:

Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

#### CLUBROOT (*Plasmodiophora brassicae*):

Fluazinam

- Omega 500 F, 2.6 pt. (50 days)  
or

PCNB. Sterilize seedbed before planting (Appendix A) or apply to soil surface as a drench.

- Terraclor 10 G, 200 lb (row) or 300 lb (broadcast). Row application: Apply in a 12 to 15 inch band by means of a suitable applicator and rototil to a depth of 4 to 6 inches. Broadcast application: Apply and disc and cross disc to depth of 4 to 6 inches. May be used on direct seeded crops.
- Terraclor 75 WP, 30 lb in 25 gal of water (band) or 40 lb in 35 gal of water (broadcast). Band application: Spray as a 12 to 15 inch band centered on the row and incorporate to a depth of 4 to 6 inches. Broadcast application: Apply and thoroughly incorporate to a depth of 4 to 6 inches. May be used on directly seeded crops.
- Terraclor F, 5.6 gal in 25 gal of water (band) or 7.5 gal in 30 gal of water (broadcast). Band application: Spray as a 12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches prior to planting. Broadcast application: Apply as a preplant broadcast prior to planting. Incorporate to a depth of 4 to 6 inches. May be used on direct seeded crops.

#### DAMPING OFF (*Pythium* spp.), BASAL STEM ROT (*Phytophthora* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold SL, 0.25-0.5 pt (*Pythium*) 1-2 pt (*Phytophthora*).
- Ridomil Gold WSP, 1 to 2 lb (1/4 to 1/2 lb, surface application, *Pythium* only).

#### WIRE STEM or BLACK ROOT (*Corticium solani*):

PCNB

- Terraclor 10 G, 110 to 150 lb. Row application (40 in. row spacing): Apply in an 8 in. band immediately prior to seeding.
- Terraclor 75 WP, 10 to 15 lb in 35 gal of water (row) or 15 to 20 lb in 50 gal of water (broadcast). Row drench treatment: Apply 10 to 15 lb in 35 gal of water. Spray as an 8 inch band centered on the row.
- Terraclor F, 1.9 to 2.8 gal in 35 gal of water (row) or 2.8 to 3.8 gal in 50 gal of water (broadcast). Row drench treatment: Spray as an 8 inch band centered on the row.

#### TRANSPLANT DRENCH:

#### CLUBROOT (*Plasmodiophora brassicae*):

Fluazinam

- Omega 500 F, 6.45 fl oz. (50 days)

#### TRANSPLANT WATER TREATMENT:

#### CLUBROOT (*Plasmodiophora brassicae*):

PCNB. Apply in 100 gal of water using 1/2 pt per plant around roots at time plants are set in field. Note: Frequent agitation is needed.

- Terraclor 75 WP, 2 lb.
- Terraclor F, 3 pt.

#### FOLIAR TREATMENT:

#### BLACK ROT (*Xanthomonas campestris*): Apply treatment (lowest rate) in the field as soon as transplants are established.

Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days) Flecking of wrapper leaves may occur.  
or

Copper Hydroxide

- Champ Formula 2 F, 1 1/3 pt. Flecking of wrapper leaves may occur.
- Champion WP, Nu-Cop 50 DF, 2 lb. (0 days) Flecking of wrapper leaves may occur.
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

#### ALTERNARIA LEAF SPOT (*Alternaria brassicae*): Apply when conditions favor disease development and repeat every 7 to 10 days.

\* Azoxystrobin

- Amistar, 2 to 5 oz 7 - 14 days. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Difenoconazole

- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.

or

\* Chlorothalonil

- Bravo Ultrex, 1.4 lb. (7 days)

- Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)  
or

\* Difenoconazole/Cyprodinil

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

**\* Maneb**

- *Maneb* 75 DF, 1 to 1 1/2 lb. (10 days) Loose-headed Chinese cabbage only.
  - *Maneb* 75 DF, *Maneb* 80 WP, 1 1/2 to 2 lb. (7 days) Cabbage and tight-headed Chinese cabbage.
  - *Manex*, 1 1/5 to 1 3/5 qt (cabbage and tight-headed Chinese cabbage) or 4/5 to 1 1/5 qt.. (7 days) Cabbage and tight-headed Chinese cabbage.
- or

**Boscalid**

- *Endura*, 6 to 9 oz. (0 days)
- or

**Copper Ammonium Carbonate**

- Copper Count N, 2 qt. (0 days) Flecking of wrapper leaves may occur.
- or

**Copper Hydroxide**

- *Champ* Formula 2 F, 1 1/3 pt. (0 days) Flecking of wrapper leaves may occur.
  - *Champ* WP, *Nu-Cop* 50 DF, 2 lb. (0 days) Flecking of wrapper leaves may occur.
  - *Kocide* 2000, 3/4 to 1 1/2 lb. (0 days)
  - *Nu-Cop* 3 L, 1 1/3 to 2 2/3 pt. (0 days) Minimum of 25 GPA.
- or

**Copper Sulfate**

- *Basicop* 53 WP, 1 to 3 lb. (0 days)
  - *Cuprofix* Ultra, 3/4 to 1 1/4 lb. (0 days)
- or

**Cyprodinil/Fludioxonil**

- *Switch* 62.5 WG, 11 to 14 oz. (7 days)
- or

**Mefenoxam/Chlorothalonil**

- *Ridomil* Gold Bravo, 1 1/2 lb, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Maximum 4 applications. Do not tank mix with copper fungicides.
- or

**Potassium phosphite/chlorothalonil**

- *Catamaran*, 4 pt. (7 days)
- or
- *Cabrio*, 12-16 oz. (0 days)

**DOWNTY MILDEW (*Peronospora parasitica*): Apply when conditions favor disease development and repeat every 7 to 10 days.**

**\* Fluopicolide**

- *Presidio*, 3-4 fl oz. (2 days) Must tank mix with other fungicide.
- or

**\* Fosetyl-Aluminum**

- *Alette* WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.
- or

**\* Mefenoxam/Chlorothalonil**

- *Ridomil* Gold Bravo, 1 1/2 lb, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Maximum 4 applications.
- or

**Acibenzolar-S-methyl**

- *Actigard*, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.
- or

**Dimethomorph**

- *Forum*, 6 fl oz. (7 days)
- or

**Fenamidone**

- *Reason* 500 SC, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating. 12 hr REI.
- or

**Mandipropamid**

- *Revus*, 8 fl oz. (1 day)
- or

**Mefenoxam**

- *Ridomil* Gold SL, 0.125-0.25 pt. (7 days)
- or
- Mono-, dibasic sodium salts of phosphorous acid

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)
- or

**Mono-, dibasic sodium, potassium and ammonium phosphites**

- *Phostrol*, 2.5 to 5 pt every 7 - 21 days.

- *Prophyt*, 2 to 4 pt. (0 days)
- or

**Potassium phosphite/chlorothalonil**

- *Catamaran*, 4 pt. (7 days)

**Note:** Fungicides that protect against Alternaria also provide limited downy mildew protection.

**CERCOSPORA LEAF SPOT (*Cercospora beticola*):****Fenamidone**

- *Reason* 500 SC, 8.2 fl oz. (2 days) Suppression. 12 hr REI.
- or

**Pyraclostrobin**

- *Cabrio*, 12-16 oz. (0 days)

**WHITE RUST:****Fenamidone**

- *Reason* 500 SC, 8.2 fl oz. (2 days) 12 hr REI.
- or

**Pyraclostrobin**

- *Cabrio*, 12-16 oz. (0 days)

**Carrots**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Northern root-knot, pin and carrot cyst nematodes severely reduce carrot quality and yields. Crop rotation is an essential part of nematode management in carrot production in Michigan. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present, crop rotation or application of a nematicide will be recommended. The following nematicides are suitable for control of root-knot nematodes in carrot production.

**FALL SOIL FUMIGATION (BROADCAST):****1,3-D**

- *Telone* II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**Metam Sodium**

- *Vapam* HL, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with shanks spaced 5 inches apart or to a depth of 4 to 10 inches in well prepared soil. If shanked, roll and irrigate treated surface to prevent escape of gas.

**All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at**

## Carrots

[epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### PREPLANT TREATMENT:

Vydate L, Broadcast. Apply 2 to 4 gal in a minimum of 20 gallons of water as a broadcast treatment. Apply within one week of planting and thoroughly incorporate to a depth of 4 to 6 inches. (RUP)

### PLANTING TREATMENT:

Vydate L, in-row. Apply 1 to 2 gal in a minimum of 20 gallons of water in the seed furrow at planting. (RUP)

### POST-PLANT TREATMENT:

Vydate L, Broadcast. Apply 2 gal/A in at least 20 gal water/A before emergence. Incorporate into the soil. (RUP)

## INSECTS

### PRE-PLANT TREATMENT:

**WIREWORM:** May be found in grassy or weedy fields. If wireworm are present, apply evenly to the soil surface and incorporate 4 to 8 inches deep prior to planting.

Diazinon

- *Diazinon* 50 W (6 to 8 lb.) or *Diazinon* AG 500 (3 to 4 qt.) or *Diazinon* AG600 (76.5 to 102 fl oz.) Preplant soil application only. (RUP)

### CUTWORM:

10% Sevin Granules, 20 lb. (7 days)  
or

Diazinon

- *Diazinon* 50 W (4 to 8 lb.) or *Diazinon* AG 500 (2 to 4 qt.) or *Diazinon* AG600 (51 to 102 fl oz.) Use only as directed. (RUP)

### APHIDS, FLEA BEETLE, LEAFHOPPERS:

Imidacloprid

- *Admire Pro*, 4.4 to 10.5 fl oz. (21 days)
- *Nuprid* 2 F, 10 to 24 fl oz. (21 days)  
or

Thiamethoxam

- *Platinum* (5 to 12 fl oz.) or *Platinum* 75 SG (1.7 to 4.01 oz.)

### FOLIAR TREATMENT:

#### CUTWORM: Apply when cutworm are first seen.

\* *Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or

\* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) Ground application only. (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)  
or

Bifenthrin

- *Bifenture* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade* 2EC (5.12 to 6.4 fl oz.) or *Brigade* WSB (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare* 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or

Carbaryl

- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (7 days)  
or

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

Methomyl

- *Lannate* LV (0.75 to 1.5 pt.) or *Lannate* SP (0.25 to 0.5 lb.) (1 day) (RUP)

- *Nudrin* LV (0.75 to 1.5 pt.) or *Nudrin* SP (0.25 to 0.5 lb.) (1 day) (RUP)

#### CARROT WEEVIL ADULTS: Apply early in the spring when adults are first detected. Repeat weekly as needed.

\* *Baythroid* XL, 2.8 fl oz. (0 days) (RUP)  
or

\* Esfenvalerate

- *Asana* XL, 9.6 fl oz. (7 days) Ground application only. (RUP)
- *S-FenvatoStar*, 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 9.6 fl oz. (7 days) (RUP)  
or  
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

#### CARROT WEEVIL LARVAE: Apply when larvae are first seen or 3 to 5 days after appearance of first eggs. Repeat in 2 to 3 weeks, up to 3 applications.

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

Vydate L, 4 pt. (14 days) Special Michigan SLN label. (RUP)

#### LEAFHOPPERS (*Aster yellows*): Treat fields if numbers exceed 20/100 sweeps. Repeat as needed (every 3 to 6 days) depending on the number of leafhoppers.

\* *Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or

\* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) Ground application only. (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)  
or  
Actara, 1.5 to 3 oz. (7 days)

Carbaryl

- *Sevin* 4 F (0.5 to 2 qt.) or *Sevin* 80 S (0.63 to 2.5 lb.) or *Sevin* XLR Plus (0.5 to 2 qt.) (0 days)  
or

*Endosulfan* 3 EC, 0.66 to 1.33 qt. (7 days) Only 1 application per year. (RUP)  
or

Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.5 fl oz. (7 days)  
or  
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or
- *Malathion* 57 EC, 2.5 pt. (7 days)  
or
- Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (1 day) (RUP)

#### APHIDS: Apply if needed.

Actara, 1.5 to 3 oz. (7 days)

or

Bifenthrin

- *Bifenture* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade* 2EC (5.12 to 6.4 fl oz.) or *Brigade* WSB (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare* 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or

*Diazinon* AG 500, 1 pt. (14 days) (RUP)

or

*Endosulfan* 3 EC, 0.66 to 1.33 qt. (7 days) Only 1 application per year. (RUP)  
or

Imidacloprid. Additional generic brands available.

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.5 fl oz. (7 days)
- Do not exceed 10.5 oz/Acre per season.  
or  
*Leverage* 360, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or  
*Malathion* 57 EC, 1.5 to 2 pt/100 gal. (7 days)

#### FLEA BEETLE:

- Actara*, 1.5 to 3 oz. (7 days)  
or  
*Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or  
Bifenthrin
  - *Bifenture* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - *Brigade* 2EC (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
  - *Fanfare* 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - *Tundra* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or  
Carbaryl
  - *Sevin* 4 F (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (7 days)  
or  
*Endosulfan* 3 EC, 1.33 qt. (7 days) (RUP)  
or  
*Entrust*, 1 to 2 oz. (3 days)  
or  
Imidacloprid
    - *Admire Pro*, 1.2 fl oz. (7 days)
    - *Nuprid* 1.6 F, 3.5 fl oz. (7 days)  
or  
*Leverage* 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

#### TARNISHED PLANT BUG:

- Carbaryl
  - *Sevin* 4 F (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)  
or  
*Leverage* 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

## DISEASES

#### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*): Use only as directed; overtreatment may cause injury.**

Fludioxinil

- *Maxim* 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (*Rhizoctonia*).  
or

Mefenoxam

- *Apron XL LS*, 0.32 to 0.64 fl oz/100 lb seed (*Pythium*).  
or

Metalaxyl

- *Allegiance-FL*, 0.75 fl oz/100 lb seed.  
or

Thiram

- 42-S *Thiram*, *Thiram* 50 WP Dyed, 8 oz/100 lb seed.

#### PREPLANT INCORPORATED:

**CAVITY SPOT (*Pythium violae*):**

Mefenoxam

- *Ridomil Gold SL*, 0.5-2 pt.

#### PREPLANT OR PLANTING TREATMENT:

**CAVITY SPOT (*Pythium* spp. and *Phytophthora* spp.):**

Mefenoxam

- *Ultra Flourish*, 2 to 4 pt.

#### FOLIAR TREATMENT:

**POWDERY MILDEW (*Sphaerotheca fuliginea* or *Erysiphe cichoracearum*): Apply at early leaf stage and repeat every 14 days.**

\* Pyraclostrobin/Boscalid

- *Pristine*, 8 to 10.5 oz. (0 days)  
or

\* Trifloxystrobin

- *Flint*, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.  
or

Neem Oil

- *Trilogy*, 2 pt. (0 days)  
or

Propiconazole

- *Propimax* EC, 4 fl oz. (14 days)
- *Tilt*, 4 fl oz. (14 days)  
or

Sulfur

- *Kumulus DF*, *Microthiol Disperss*, *Thiolux Jet*, 3 to 10 lb. (0 days)
- *Micro Sulf*, 3 to 10 lb. (0 days)

**ALTERNARIA LEAF BLIGHT (*Alternaria dauci*): Apply every 7 to 14 days after emergence.**

\* Azoxystrobin

- *Amistar*, 3 to 5 oz every 7-14 days. (0 days)
- *Quadris*, 6.2 - 15.4 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 2.4 pt every 7-14 days. (0 days)  
or

\* Azoxystrobin/Propiconazole

- *Quilt*, *Quilt Xcel*, 14 fl oz. (14 days)  
or

\* Boscalid

- *Endura*, 4.5 oz. (0 days)  
or

\* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb every 7 to 10 days. (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (0 days)
- *Echo 90 DF*, 1.3 to 1.5 lb. (0 days)  
or

\* Iprodione

- *Iprodione 4L AG*, *Rovral 4 F*, 1 to 2 pt. (0 days) Maximum 4 applications. See label for permissible rotation crops. Or 1 pt as a tank mix with another fungicide, maximum 10 applications.
- *Rovral*, 1 to 2 lb. (0 days) Maximum 4 applications. See label for permissible rotation crops. Or 1 lb as a tank mix with another fungicide, maximum 10 applications.  
or

\* Pyraclostrobin

- *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

\* Pyraclostrobin/Boscalid

- *Pristine*, 8 to 10.5 oz. (0 days)  
or

\* Trifloxystrobin

- *Flint*, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.  
or

Copper Ammonium Carbonate

- *Copper Count N*, 2 to 3 qt. (0 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## Cauliflower

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)

or

### Copper Resinate

- Tenn-Cop 5 E, 3 to 4.5 pt. (0 days)

or

### Copper Sulfate

- Basic Copper 53 (2 to 4 lb) or Basicop (3 to 4 lb) (0 days)
- Cuprofix Ultra, 1.25 lb. (0 days)

or

### Cyprodinil/Fludioxonil

- Switch 62.5 WG, 11 to 14 oz. (7 days)

or

### Neem Oil

- Trilogy, 2 pt. (0 days)

or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (0 days)

or

### Propiconazole

- Propimax EC, 4 fl oz. (14 days)
- Tilt, 4 fl oz. (14 days)

**WHITE MOLD (*Sclerotinia sclerotiorum*):** Apply when disease first appears and repeat every 7 to 10 days.

### Neem Oil

- Trilogy, 2 pt. (0 days)

**CERCOSPORA LEAF SPOT (*Cercospora carotae*):** Apply every 7 to 14 days after emergence.

### \* Azoxystrobin

- Amistar, 3 to 5 oz. (0 days)
- Quadris, 9.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

### \* Azoxystrobin/Chlorothalonil

- Quadris Opti, 2.4 pt every 7-14 days. (0 days)

or

### \* Azoxystrobin/Propiconazole

- Quilt, Quilt Xcel, 14 fl oz. (14 days)

or

### \* Chlorothalonil

- Bravo Ultrex, Equus DF, 1.4 to 1.8 lb. (0 days) May be applied through sprinkler irrigation equipment.
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
- Echo 90 DF, 1.3 to 1.5 lb. (0 days)

or

### \* Pyraclostrobin

- Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

### \* Pyraclostrobin/Boscalid

- Pristine, 8 to 10.5 oz. (0 days)

or

### \* Trifloxystrobin

- Flint, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

or

### Copper Ammonium Carbonate

- Copper Count N, 2 to 3 qt. (0 days)

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, Nu-Cop 50 DF, 2 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

or

### Copper Resinate

- Tenn-Cop 5 E, 3 to 4.5 pt. (0 days)

or

### Copper Sulfate

- Basic Copper 53, 2 to 4 lb. (0 days)
- Basicop, 3 to 4 lb. (1 day)
- Cuprofix Ultra, 1.25 lb. (0 days)

or

### Neem Oil

- Trilogy, 2 pt. (0 days)

or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (0 days)

or

### Propiconazole

- Propimax EC, 4 fl oz. (14 days)
- Tilt, 4 fl oz. (14 days)

**BACTERIAL LEAF BLIGHT (*Xanthomonas campestris* pv. *carotae*):**

Apply every 7 to 10 days after first appearance.

### Copper Hydroxide

- Champ Formula 2 F, 2/3 to 2 pt. (0 days)
- Champion WP, 1 to 3 lb. (0 days)

**CAVITY SPOT (*Pythium violae*):** Apply 2 to 4 times at 14-day intervals beginning 40-50 days after Ridomil at-planting treatment.

Maximum 4 applications.

### Fenamidone

- Reason 500 SC, 8.2 fl oz. (14 days) Alternate with mefenoxam-containing fungicide.

or

### Mefenoxam

- Ridomil Gold SL, 0.2 pt. (7 days)

or

### Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 to 2 lb. (7 days)

or

### Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 lb. (7 days)

## Cauliflower

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

### FALL SOIL FUMIGATION (BROADCAST):

**SUGAR BEET CYST, ROOT-KNOT and LESION NEMATODES:** Sugar beet cyst, root-knot and lesion nematodes can reduce cauliflower yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for cauliflower, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of sugar beet cyst, root-knot and lesion nematodes in cauliflower production.

**1,3-D**

- *Telone II*, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some situations soil fumigation can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.**

**INSECTS****SEEDBED TREATMENT:**

Apply treatments to the soil according to directions to protect young seedlings in the seedbed before transplanting in field.

**CABBAGE MAGGOT: Apply equivalent amount to seedbed surface and incorporate to 3 to 4 inches.**

Diazinon

- *Diazinon* 50 W (4 to 6 lb.) or *Diazinon* AG 500 (2 to 3 qt.) or *Diazinon* AG600 (51 to 76.5 fl oz.) Apply only as directed. (RUP)

**CUTWORM:**Diazinon

- *Diazinon* 50 W (4 to 8 lb.) or *Diazinon* AG 500 (2 to 4 qt.) or *Diazinon* AG600 (51 to 102 fl oz.) (RUP)

**SOIL TREATMENT:****APHIDS:**Imidacloprid

- *Admire Pro*, 4.4 to 10.5 fl oz. (21 days)
- *Nuprid* 2 F, 10 to 24 fl oz. (21 days)  
or  
*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.

**FLEA BEETLE:**

*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.

**CUTWORM:**

- 10% *Sevin* Granules, 20 lb. (3 days)

**TRANSPLANT WATER TREATMENT:**

Treatments are applied in water around roots at time plants are being set in the field.

**CABBAGE MAGGOT:**Diazinon

- *Diazinon* 50 W (1 lb/100 gal) or *Diazinon* AG 500 (1/2 to 1 pt/100 gal) Use only as directed. (RUP)

Treatment rates are given in the amount of formulation per 100 gals of water. Apply at rate of 1 cup solution/plant. Frequent agitation is needed with wettable powders.

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**PLANTING TREATMENT:**

Treatments applied at seeding.

**CABBAGE MAGGOT: Apply in a 4 inch band over row at time of seeding.**

*Capture LFR*, 3.4 to 6.8 oz. See label for application methods.  
(RUP)  
or

Chlorpyrifos

- *Lorsban* 15 G (4.6 to 9.2 oz/1,000 ft of row) or *Lorsban* 4 E / *Lorsban* Advanced (1.6 to 2.4 fl oz/1,000 ft of row) (RUP)

**APHIDS and FLEA BEETLE:**

*Belay*, 9 to 12 fl oz. (21 days)  
or  
*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:**

*Coragen*, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

**APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM:**

*Durivo*, 10 to 13 fl oz. (30 days)

**SOIL TREATMENT AFTER TRANSPLANTING:**

**APHIDS: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.**

Imidacloprid

- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)
- *Nuprid* 2 F, 10 to 24 fl oz. (21 days)

**CABBAGE MAGGOT: Apply to the soil at base of plants after transplanting. Apply water to wet soil surface.**

*Lorsban* 4 E / *Lorsban* Advanced, 1.6 to 2.4 fl oz/1,000 ft of row.  
(RUP)

**APHIDS, ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, FLEA BEETLE, IMPORTED CABBAGE WORM:**

*Durivo*, 10 to 13 fl oz. (30 days)

**FOLIAR TREATMENT:**

**FLEA BEETLE: Apply as needed soon after plants come up.**

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.  
or  
*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

*Belay*, 3 to 4 fl oz. (21 days)

Bifenthrin

- *Bifenture* EC, *Brigade* 2EC, *Capture* 2 EC, 2.1 to 6.4 oz. (7 days)  
(RUP)  
or  
*Carbaryl*

- *Carbaryl* 4L, 0.5 to 1 qt. (3 days)
- *Sevin* 4 F (0.5 to 1 qt.) or *Sevin* 80 S (0.63 to 1.25 lb.) or *Sevin* 80 WSP (0.67 to 1.25 lb.) or *Sevin* XLR Plus (0.5 to 1 qt.) (3 days)  
or  
*Cypermethrin*

- *Ammo* 2.5 EC, *UP-Cyde* 2.5 EC, 2.5 to 5 oz. (1 day) (RUP)  
or  
*Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)  
or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)  
or

## Cauliflower

### Imidacloprid

- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

### Larvin 3.2 EC, 24 to 40 oz. (7 days)

or

### Leverage 360, 3 fl oz. (7 days) (RUP)

or

### Lorsban 50 W, 2 lb. (21 days) (RUP)

or

### Mustang Max, 2.2 to 4.0 oz. (1 day) (RUP)

or

### Perm-UP 3.2 EC, 2 to 4 oz. (1 day) (RUP)

or

### Venom, 3 to 4 oz. (1 day)

**CUTWORM, ARMYWORM:** Apply when damage is first seen. Repeat as needed.

### \* Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

### \* Bifenthrin

- *Bifenture EC*, *Brigade 2EC*, *Capture 2 EC*, 6.4 oz. (7 days) (RUP)

or

### \* Cypermethrin

- *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) (RUP)

or

### \* Mustang Max, 3.2 to 4.0 oz. (1 day) (RUP)

or

### \* Permethrin

- *Ambush 25 W*, 6.4 oz. (1 day) (RUP)

- *Perm-UP 3.2 EC* (4 oz) or *Pounce 25 WP* (6.4 oz) (1 day) (RUP)

or

*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or

*Endosulfan 3 EC*, 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or

*Entrust*, 1.3 to 3 oz. (1 day) Do not apply more than 3 times in 30 days.

or

### Hero, 4 to 10.3 oz. (7 days) (RUP)

or

### Leverage 360, 3 fl oz. (7 days) (RUP)

or

### Lorsban 50 W, 2 lb. (21 days) (RUP)

or

*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

### Rimon, 6 to 12 fl oz. (7 days)

or

*Synapse WG*, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or

*Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**IMPORTED CABBAGE WORM:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after 1st flowering.

### Acephate

- *Acephate 90 WDG*, or *Acephate 90 WSP* (17.6 oz.) or *Acephate 97* (16 oz.) or *Acephate 97 UP* (16 oz.) (14 days)

- *Bracket 97*, 16 oz. (14 days)

- *Orthene 97*, 16 oz. (14 days)

or

*Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.

or

### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)

or

### Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)

or

### Bifenthrin

- *Bifenture EC*, *Brigade 2EC*, *Capture 2 EC*, 2.1 to 6.4 oz. (7 days) (RUP)

or

*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or

### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (3 days)

- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)

or

### Confirm 2F, 6 to 8 fl oz. (7 days)

or

*Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

### Cypermethrin

- *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) (RUP)

or

### Danitol 2.4 EC, 2.4 EC, 10 2/3 to 16 fl oz. (7 days) (RUP)

or

### Diazinon AG 500, 0.5 to 1 pt. (5 days) (RUP)

or

### Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)

or

*Endosulfan 3 EC*, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days.

or

### Esfenvalerate

- *Adjourn*, 2.9 to 5.8 fl oz. (3 days) (RUP)

- *Asana XL*, 2.9 to 5.8 fl oz. (3 days) (RUP)

- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (3 days) (RUP)

or

### Hero, 4 to 10.3 oz. (7 days) (RUP)

or

*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (RUP)

- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

or

### Larvin 3.2 EC, 24 to 40 oz. (7 days)

or

### Leverage 360, 3 fl oz. (7 days) (RUP)

or

### Lorsban 50 W, 2 lb. (21 days) (RUP)

## Cauliflower

or  
*Malathion* 57 EC, 1 to 2 pt. (7 days)

or  
Methomyl

- *Lannate* LV (0.75 to 3 pt.) or *Lannate* SP (0.25 to 1 lb.) (3 days) (RUP)

- *Nudrin* LV (0.75 to 3 pt.) or *Nudrin* SP (0.25 to 1 lb.) (3 days) (RUP)

or  
*Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)

or  
Permethrin

- *Ambush* 25 W, 3.2 to 6.4 oz. (1 day) (RUP)

- *Perm-UP* 3.2 EC (2 to 8 oz) or *Pounce* 25 WP (3.2 to 6.4 oz) (1 day) (RUP)

or  
*Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)

or  
*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Synapse* WG, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
*Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**DIAMONDBACK MOTH:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after 1st flowering. Use *Bacillus thuringiensis* to avoid killing important natural enemies of diamondback moth.

- \* *Avaunt*, 3.5 oz. (3 days) Do not apply more than twice to one generation. Do not exceed 14 oz/acre per crop.

or  
*\* Bacillus thuringiensis*

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)

or  
*\* Entrust*, 0.5 to 1.3 oz. (1 day)

or  
Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (17.6 oz.) or *Acephate* 97 (16 oz.) or *Acephate* 97 UP (16 oz.) (14 days)

- *Bracket* 97, 16 oz. (14 days)

- *Orthene* 97, 16 oz. (14 days)

or  
*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or  
Bifenthrin

- *Bifenture* EC, *Brigade* 2EC, *Capture* 2 EC, 2.1 to 6.4 oz. (7 days) (RUP)

or  
*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or  
Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (3 days)

- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (3 days)

or  
*Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or  
*Diazinon* AG 500, 0.5 to 1 pt. (5 days) (RUP)

or  
*Dibrom* 8 Emulsive, 1 pt. (1 day) (RUP)

or  
*Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or  
*Fulfill*, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.

or  
*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or  
*Kryocide*, 8 to 16 lb. (14 days) Apply with maximum tank agitation. Allow at least 14 days between applications. Do not irrigate within 48 to 72 hrs after treatment (14 days).

or  
Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz) (1 day) (RUP)

or  
*Larvin* 3.2 EC, 24 to 40 oz. (7 days)

or  
Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (3 days) (RUP)

- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (3 days) (RUP)

or  
*Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)

or  
Permethrin

- *Ambush* 25 W, 3.2 to 6.4 oz. (1 day) (RUP)

- *Perm-UP* 3.2 EC (2 to 8 oz) or *Pounce* 25 WP (3.2 to 6.4 oz) (1 day) (RUP)

or  
*Proclaim*, 2.4 to 4.8 oz. (7 days) (RUP)

or  
*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
*Rimon*, 6 to 12 fl oz. (7 days)

or  
*Synapse* WG, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or  
*Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**CABBAGE LOOPERS:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after 1st flowering. Most controls are less effective on larger worms.

Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (17.6 oz.) or *Acephate* 97 (16 oz.) or *Acephate* 97 UP (16 oz.) (14 days)

- *Bracket* 97, 16 oz. (14 days)

- *Orthene* 97, 16 oz. (14 days)

or  
*Avaunt*, 2.5 to 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.

or  
Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, .

or  
*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) (RUP)

or  
Bifenthrin

- *Bifenture* EC, *Brigade* 2EC, *Capture* 2 EC, 2.1 to 6.4 oz. (7 days) (RUP)

or  
*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or  
*Confirm* 2F, 6 to 8 fl oz. (7 days)

## Cauliflower

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*Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

### Cypermethrin

- *Ammo* 2.5 EC, *UP-Cyde* 2.5 EC, 3.75 to 5 oz. (1 day) (RUP)

or

*Danitol* 2.4 EC, 2.4 EC, 10 2/3 to 16 fl oz. (7 days) (RUP)

or

*Dibrom* 8 Emulsive, 2 pt. (1 day) (RUP)

or

*Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 30 days.

or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

or

*Larvin* 3.2 EC, 24 to 40 oz. (7 days)

or

*Leverage* 360, 3 fl oz. (7 days) (RUP)

or

### Methomyl

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (3 days) (RUP)

- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (3 days) (RUP)

or

*Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)

or

### Permethrin

- *Perm-UP* 3.2 EC (4 oz) or *Pounce* 25 WP (6.4 oz) (1 day) (RUP)

or

*Proclaim*, 3.2 to 4.8 oz. (7 days) (RUP)

or

*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Rimon*, 6 to 12 fl oz. (7 days)

or

*Synapse WG*, 2.0 oz. (1 day) Do not apply more than 2.0 oz/Acre per 3-day interval; do not apply more than 4.0 oz/Acre per crop season.

or

*Vetica*, 11.0 to 13.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 26 fl oz. per season.

**APHIDS: Apply if there are >100 aphids per plant before flowering or >5/plant at flowering or beyond.**

### Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz.) or *Acephate* 97 (8 to 16 oz.) or *Acephate* 97 UP (8 to 16 oz.) (14 days) Do not apply more than 2-1/8 lb per season.

- *Bracket* 97, 8 to 16 oz. (14 days)

- *Orthene* 97, 8 to 16 oz. (14 days)

or

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

or  
*Assail* 30 SG, 1.9 to 2.8 oz. (7 days)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)

or

*Brigadier*, 3.8 to 6.1 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 30.72 fl oz. per season. (RUP)

or

*Diazinon AG* 500, 0.5 to 1 pt. (5 days) (RUP)

or

*Dibrom* 8 Emulsive, 1 pt. (1 day) (RUP)

or

### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) or *Dimethoate* 4E (0.5 to 1 pt.) (7 days)

or

*Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)

or

### Imidacloprid

- *Admire Pro*, 1.3 fl oz. (7 days)

- *Nuprid* 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.

or

*Leverage* 360, 3 fl oz. (7 days) (RUP)

or

*Movento*, 4.0 to 5.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

## ARMYWORM:

### Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (3 days)

- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days)

or

*Confirm* 2F, 6 to 8 fl oz. (7 days)

or

*Coragen*, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

## CUTWORM:

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Proaxis*, 1.92 to 3.2 fl oz. (1 day) (RUP)

- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

or

### Methomyl

- *Lannate LV* (1.5 pt.) or *Lannate SP* (0.5 lb.) (3 days) (RUP)

- *Nudrin LV* (1.5 pt.) or *Nudrin SP* (0.5 lb.) (3 days) (RUP)

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF, WIRE STEM (*Pythium* spp., *Rhizoctonia solani*):

##### Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

##### Captan

- Captan 30-DD, 1 1/4 oz/100 lb seed.
- Captan 400, 1 to 2 oz/100 lb seed.  
or

##### Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.

##### Thiram

- 42-S Thiram, *Thiram* 50 WP Dyed, 8 oz/100 lb seed.

**BLACK LEG (*Phoma lingam*):** There are presently no chemicals registered for use on this disease.

### SEEDBED TREATMENT:

Apply treatments to the soil according to directions to protect young seedlings in the seedbed before transplanting in field.

#### CLUBROOT (*Plasmodiophora brassicae*): Sterilize seedbed before planting (Appendix A) or apply to soil surface as a drench.

##### Fluazinam

- Omega 500 F, 2.6 pt. (50 days)  
or

##### PCNB

- *Terraclor* 10 G, 200 lb (row) or 300 lb (broadcast). Row application: Apply in a 12- to 15-inch band by means of a suitable applicator and rototil to a depth of 4 to 6 inches. Broadcast application: Apply and disc and cross disc to depth of 4 to 6 inches. May be used on direct seeded crops.
- *Terraclor* 75 WP, 30 lb in 25 gal of water (band) or 40 lb in 35 gal of water (broadcast). Band application: Spray as 12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches. Broadcast application: Apply and thoroughly incorporate to a depth of 4 to 6 inches. May be used on direct seeded crops.
- *Terraclor* F, 5.6 gal in 25 gal of water (band) or 7.5 gal in 30 gal of water (broadcast). Band application: Spray as a 12- to 15-inch band centered on the row and incorporate to a depth of 4 to 6 inches prior to planting. Broadcast application: Apply as preplant broadcast. Incorporate to a depth of 4 to 6 inches. May be used on direct seeded crops.

#### WIRE STEM or BLACK ROOT (*Corticium solani*):

##### PCNB

- *Terraclor* 10 G, 110 to 150 lb. Row application in an 8 in. band prior to seeding.
- *Terraclor* 75 WP, 10 to 15 lb in 35 gal of water (row) or 15 to 20 lb in 50 gal of water (broadcast). Row drench treatment: Spray as an 8 inch band centered on the row.
- *Terraclor* F, 1.9 to 2.8 gal in 35 gal of water (row) or 2.8 to 3.8 gal in 50 gal of water (broadcast). Row drench treatment: Apply as an 8-inch band centered on the row.

#### DAMPING OFF (*Pythium* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold SL, 0.25-0.5 pt.

- *Ridomil* Gold WSP, 1 to 2 lb (1/4 to 1/2 lb, surface application, *Pythium* only).

### TRANSPLANT DRENCH:

#### CLUBROOT (*Plasmodiophora brassicae*):

##### Fluazinam

- Omega 500 F, 6.45 fl oz. (50 days)

### TRANSPLANT WATER TREATMENT:

Apply in 100 gal of water using 1/2 pt per plant around roots at time plants are being set in the field. **Note:** Frequent agitation is needed.

#### CLUBROOT (*Plasmodiophora brassicae*):

##### PCNB

- *Terraclor* 75 WP, 2 lb.
- *Terraclor* F, 3 pt.

For best results, use with disease free (clubroot) seedlings.

### FOLIAR TREATMENT:

#### BLACK ROT (*Xanthomonas campestris*): Apply treatment (lowest rates) in the field as soon as transplants are established.

##### Acibenzolar-S-methyl

- *Actigard*, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

##### Copper Ammonium Carbonate

- *Copper Count* N, 2 qt. (0 days)  
or

##### Copper Hydroxide

- *Champ* 2FL, 1/3 to 2/3 pt. (0 days)
- *Champ* DP, 1/3 to 2/3 lb. (0 days)
- *Champ* WP, 1 to 2 lb. (0 days)
- *Kocide* 2000, 3/4 to 1 1/2 lb. (0 days)
- *Kocide* 3000, 0.5-0.75 lb. (0 day)  
or

##### Copper Sulfate

- *Cuprofix* Ultra, 3/4 to 1 1/4 lb. (0 days)

#### ALTERNARIA LEAF SPOT (*Alternaria brassicace*): Apply when conditions favor disease and repeat every 7 to 10 days.

##### \* Azoxystrobin

- *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 6.2 to 15.4 fl oz.

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

##### \* Azoxystrobin/Difenoconazole

- *Quadris* Top, 14 fl oz. (1 day) One application before alternating with another chemical.  
or

##### \* Boscalid

- *Endura*, 6 to 9 oz. (0 days)  
or

##### \* Chlorothalonil

- *Bravo Ultrex*, 1.4 lb. (7 days)
- *Bravo Weather Stik*, *Equus* 720 SST, 1.5 pt. (7 days)  
or

##### \* Difenoconazole/Cyprodinil

- *Inspire* Super, 16 to 20 fl oz. (7 days)  
or

##### \* Maneb

- *Maneb* 75 DF, *Maneb* 80 WP, 1.5 to 2 lb. (7 days)
- *Manex*, 1 1/5 to 1 3/5 qt. (7 days)  
or

##### Copper Ammonium Carbonate

- *Copper Count* N, 2 qt. (0 days)  
or

##### Copper Hydroxide

- *Kocide* 2000, 3/4 to 1 1/2 lb. (0 days)
- *Kocide* 3000, 0.5-0.75 lb. (0 day)

## Celery

or

### Copper Sulfate

- Basicop 53 WP, 1 to 3 lb. (0 days)
- Cuprofix Ultra, 3/4 to 1 1/4 lb. (0 days)

or

### Cyprodinil/Fludioxonil

- Switch 62.5 WG, 11 to 14 oz. (7 days)

or

### Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 lb. (7 days) Apply at 14-day intervals. Maximum 4 applications.

or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (7 days)

or

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

**DOWNTY MILDEW (*Peronospora parasitica*): Apply when conditions favor disease.**

### \* Fluopicolide

- Presidio, 3-4 fl oz. (2 days) Must tank mix with other fungicide.

or

### \* Fosetyl-Aluminum

- Alette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Note: Do not tank mix with copper fungicides.

or

### \* Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 1 1/2 lb. (7 days) Apply at 14-day intervals. Maximum 4 applications.

or

### Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.

or

### Dimethomorph

- Forum, 6 fl oz. (7 days)

or

### Fenamidone

- Reason 500 SC, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating.

or

### Mandipropamid

- Revus, 8 fl oz. (1 day)

or

### Mefenoxam

- Ridomil Gold SL, 0.125-0.25 pt. (7 days)

or

### Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt every 7 - 21 days.
- Prophyt, 2 to 4 pt. (0 days)

or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (0 days)

**Note:** Fungicides that protect against Alternaria also provide limited downy mildew protection.

## CERCOSPORA LEAF SPOT (*Cercospora beticola*):

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## WHITE RUST:

### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## Celery

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Root-knot, pin, needle and root-lesion nematodes can reduce celery yields. Fields with root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for celery, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot, pin, needle and lesion nematodes in celery production. Nematode-free transplants must be used to prevent serious losses.

## FALL SOIL FUMIGATION (BROADCAST):

### 1,3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

### or

### Metam Sodium

- Vapam HL, 37.5 to 75 gal/A. Use higher rate for muck soil. Inject with shanks spaced 5 inches apart or to a depth of 4-10 inches in well prepared soil. If shanked, roll and irrigate treated surface to prevent escape of gas.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## PREPLANT TREATMENT:

Vydate L, Apply 2 gal/acre in 20 gal of water in 8- to 16-inch band. Incorporate to a depth of 4 inches. (RUP)

## PLANTING TREATMENT:

Vydate L, apply 0.5 to 1 gal/acre in at least 100 gal of water immediately after transplanting seedlings in the field. (RUP)

## POST-PLANT TREATMENT:

Vydate L, apply 1 gal/acre in at least 100 gal of water as a foliar spray 3 weeks after transplanting. Apply again 3 weeks after first treatment. (RUP)

## INSECTS

## SOIL TREATMENT:

### LEAF MINERS, LEAFHOPPER:

### Dinotefuran

- Venom, 5 to 6 oz. (21 days)
- Venom (5 to 6 oz.) or Venom 20 SG (1.13 to 1.34 lb.) (21 days)

See label for application methods.

### CABBAGE LOOPERS, ARMYWORM:

Coragen, 3.5 to 5 fl oz. (1 day) See label for application methods.

**VEGETABLE LEAFMINER:**

*Coragen*, 5 to 7.5 fl oz. (1 day) See label for application methods.

**APHIDS, LEAFHOPPERS:**

*Belay*, 9 to 12 fl oz.

or

Imidacloprid

- *Admire Pro*, 4.4 to 10.5 fl oz. (45 days)

- *Nuprid 2 F*, 10 to 24 fl oz. (45 days)

or

Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days)

**APHIDS, ARMYWORM, CABBAGE LOOPERS, LEAFHOPPERS:**

*Durivo*, 10 to 13 fl oz. (30 days)

**CUTWORM:**

10% *Sevin Granules*, 20 lb. (14 days)

**FOLIAR TREATMENT:****CUTWORM, ARMYWORM: Apply preventive treatments within 4 weeks of harvest.**

- \* *Mustang Max*, 2.4 to 4.3 oz. (1 day) (RUP)

or

Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)

- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)

or

*Brigade WSB*, 5.3 to 16 oz. (7 days) (RUP)

or

*Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.

or

*Vetica*, 12.0 to 17.0 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

**CARROT WEEVIL LARVAE: Apply as a directed spray. Start when eggs or larvae are first seen and repeat in 2 to 3 weeks.**

*Vydate L*, 4 pt. (21 days) May also be used for nematode control at same time. (Special Michigan SLN label.) (RUP)

**CARROT WEEVIL ADULTS: Apply when adults are first caught in traps or eggs are first seen. No materials are labeled specifically for this area, however, permethrin at the rates given below will give some control of carrot weevil adults.****ASTER LEAFHOPPER (*Aster yellows*): Apply if numbers exceed 14/100 sweeps. Repeat as needed, depending on number of leafhoppers. Over-treatment with permethrin or Guthion may cause increased aphid problems.**

- \* *Mustang Max*, 2.4 to 4.3 oz. (1 day) (RUP)

or

Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) (RUP)

- *Perm-UP 25DF* (3.2 to 12.8 oz.) or *Perm-UP 3.2 EC* (2 to 8 oz.) (1 day) (RUP)

- *Pounce 25 WP*, 3.2 to 12.8 oz. (1 day) (RUP)

or

*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11 oz/Acre per season Do not exceed 11 oz/Acre per season.

or

*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

*Brigade WSB*, 5.3 to 16 oz. (7 days) (RUP)

or

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**Carbaryl**

- *Sevin 4 F* (0.5 to 2 qt.) or *Sevin 80 S* (0.63 to 2.5 lb.) or *Sevin 80 WSP* (0.67 to 2.5 lb.) or *Sevin XLR Plus* (0.5 to 2 qt.) (14 days)

or

**Dimotefuran**

- *Scorpion 35SL*, 2 to 5.25 fl oz. (7 days)

or

- *Venom* (1 to 3 oz.) or *Venom 20 SG* (0.44 to 0.67 lb.) (7 days)

or

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (4 days) (RUP)

or

**Methomyl**

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (7 days)

(RUP)

- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (7 days) (RUP)

or

- *Voliam Flexi*, 4 to 7 oz. (7 days)

**TARNISHED PLANT BUG: Apply if numbers exceed 2 to 4 per 20 plants.**

*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

*Beleaf 50 SG*, 2 to 2.8 oz. (0 days)

or

**Carbaryl**

- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (14 days)

or

- *Mustang Max*, 3.4 to 4.3 oz. (1 day) (RUP)

**APHIDS: Apply if more than 3% of plants are infested or if there are more than 6/100 sweeps. Over-treatment with pyrethroids may cause increased aphid problems.**

- \* *Assail 30 SG*, 1.9 to 2.8 oz. (7 days)

or

**Acephate**

- *Acephate 90 WDG*, or *Acephate 90 WSP* (8 to 17.6 oz.) or *Acephate 97* (8 to 16 oz.) or *Acephate 97 UP* (8 to 16 oz.) (21 days)

- *Bracket 97*, 8 to 16 oz. (21 days)

- *Orthene 97*, 8 to 16 oz. (21 days)

or

- *Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11 oz/Acre per season.

or

- *Belay*, 3 to 4 fl oz. (21 days)

or

- *Beleaf 50 SG*, 2 to 2.8 oz. (0 days)

or

- *Brigade WSB*, 5.3 to 16 oz. (7 days) (RUP)

or

- *Dibrom 8 Emulsive*, 1 to 1.5 pt. (1 day) (RUP)

or

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (4 days for one application, 7 days for 2 applications at 0.66 qt.) Limited to 1 application per year. (RUP)

- *Fulfill*, 2.75 oz. (7 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.

or

**Malathion**

- *Malathion 5*, or *Malathion 5 EC* (1.5 pt.) or *Malathion 57 EC* (1.5 pt) or *Malathion 8* (1 to 1.5 pt.) (7 days)

or

- *Movento*, 4 to 5 fl oz. (3 days) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or

**Permethrin**

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)

- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)

or

- *Pyrellin EC*, 1 to 2 pt. (0 days)

## Celery

- or  
Pyrenone, 2 to 12 oz. (0 days)  
or  
Venom 20 SG, 0.44 to 0.67 lb. (7 days)  
or  
Voliam Flexi, 4 to 7 oz. (7 days)
- LOOPERS (CELERY and CABBAGE): Apply if needed to protect plants within 4 weeks of harvest.**
- \* Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)  
or
  - \* Permethrin
    - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
    - Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (1 day) (RUP)
    - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)  
or
  - Acephate
    - Acephate 90 WDG, or Acephate 90 WSP (17.6 oz.) or Acephate 97 (16 oz.) or Acephate 97 UP (16 oz.) (21 days)
    - Bracket 97, 16 oz. (21 days)
    - Orthene 97, 16 oz. (21 days)  
or
  - Avaunt, 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.  
or
- Bacillus thuringiensis
- Agree, Biobit, Dipel, Javelin, Xentari, . (0 days)  
or
  - Brigade WSB, 5.3 to 16 oz. (7 days) (RUP)  
or
  - Confirm 2F, 6 to 8 fl oz. (7 days)  
or
- Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.  
or
- Dibrom 8 Emulsive, 1 to 1.5 pt. (1 day) (RUP)  
or
- Endosulfan 3 EC, 0.66 to 1.33 qt. (4 days) (RUP)  
Limited to one application per year.  
or
- Entrust, 1 to 2 oz. (1 day) Do not apply more than 3 times in 21 days.  
or
- Intrepid 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or
- Methomyl
- Lannate LV (3 pt.) or Lannate SP (1 lb.) (7 days) (RUP)
  - Nudrin LV (3 pt.) or Nudrin SP (1 lb.) (7 days) (RUP)  
or
- Mustang Max, 3.4 to 4.3 oz. (1 day) (RUP)  
or
- Proclaim, 3.2 to 4.8 oz. (RUP)  
or
- Pyrellin EC, 1 to 2 pt. (0 days)  
or
- Pyrenone, 2 to 12 oz. (0 days)  
or
- Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or
- Vetica, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.  
or
- Voliam Flexi, 4 to 7 oz. (7 days)
- VEGETABLE LEAFMINER: Apply as soon as visible mines appear and repeat every 7 days as needed.**
- Agri-Mek 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)  
or
  - Coragen, 5.0 to 7.5 fl oz. (1 day)  
or
- Dibrom 8 Emulsive, 1 to 1.5 pt. (1 day) (RUP)  
or
- Dimethoate
- Dimethoate 2.67 EC (1.5 pt.) or Dimethoate 4 EC (1 pt.)  
or
  - Dimethoate 4E (1 pt.) (7 days)  
or
- Dinotefuran
- Scorpion 35SL, 2 to 5.25 fl oz. (7 days)
  - Venom (1 to 3 oz.) or Venom 20 SG (0.44 to 0.67 lb.) (7 days)  
or
- Entrust, 2 to 3 oz. (1 day) Do not apply more than 3 times in 21 days.  
or
- Permethrin
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)  
or
- Radiant SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or
- Trigard, 2.66 oz. (7 days)
- ARMYWORM:**
- \* Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)  
or
- Acephate
- Acephate 90 WDG, or Acephate 90 WSP (17.6 oz.) or Acephate 97 (16 oz.) or Acephate 97 UP (16 oz.) (21 days)
  - Bracket 97, 16 oz. (21 days)
  - Orthene 97, 16 oz. (21 days)  
or
- Carbaryl
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)  
or
- Confirm 2F, 6 to 8 fl oz. (7 days)  
or
- Coragen, 3.5 to 5 fl oz. (1 day)  
or
- Dibrom 8 Emulsive, 1 to 1.5 pt. (1 day) (RUP)  
or
- Endosulfan 3 EC, 1.33 qt. (4 days) (RUP)  
or
- Entrust, 1.25 to 2.5 oz. (1 day) Do not apply more than 3 times in 21 days.  
or
- Methomyl
- Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (7 days) (RUP)
  - Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (7 days) (RUP)  
or
- Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or
- Voliam Flexi, 4 to 7 oz. (7 days)
- CUTWORM:**
- Methomyl
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (7 days) (RUP)
  - Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (7 days) (RUP)
- MITES**
- Agri-Mek 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## SLUGS

*Deadline M-Ps* 4% (20 to 40 lb) or *Metaldehyde* 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

## DISEASES

### PREPLANT TREATMENT:

#### DAMPING OFF (*Pythium* spp.):

##### Mefenoxam

- *Ridomil* Gold SL, 1-2 pt.

#### PLANTING TREATMENT:

#### DAMPING OFF (*Pythium* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold GR, 20 to 40 lb.
- *Ultra Flourish*, 2 to 4 pt.

#### FOLIAR TREATMENT:

##### CRATER ROT (*Rhizoctonia solani*): Apply as a basal spray after each cultivation.

##### \* Azoxystrobin. See label.

- *Amistar*, 0.125 to 0.25 oz per 1000 row feet. (0 days)
- *Quadris*, 0.4 to 0.8 fl oz per 1000 row feet. (0 days)

##### \* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 2.4 - 3.7 pts every 7-14 days. (7 days)

##### \* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb every 7 days.
- *Bravo Weather Stik*, *Equus 720 SST*, 2 to 3 pt every 7 days. (7 days)
- *Echo 720*, 2 to 3 pt every 7 days. (7 days)
- *Echo 720*, 1 to 1 1/2 pt every 3-5 days. (7 days)
- *Echo 90 DF*, 7/8 to 1 1/4 lb every 3 - 5 days. (7 days)
- *Echo 90 DF*, 1 5/8 to 2 1/2 lb every 7 days. (7 days)
- *Echo Zn*, 1 1/2 to 2 1/8 pt every 3 - 5 days. (7 days)
- *Echo Zn*, 3 to 4 1/4 pt every 7 days. (7 days)

##### \* Potassium phosphite/chlorothalonil

- *Catamaran*, 4 pt. (0 days)

##### PINK ROT (*Sclerotinia sclerotiorum*):

##### Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 2.7 lb every 7 days (pink rot suppression). (7 days)
- *Bravo Weather Stik*, *Equus 720 SST*, 3 pt every 7 days (pink rot suppression). (7 days)
- *Echo 90 DF*, 1.7 to 2.4 lb. (7 days)
- *Equus DF*, 1.8 to 2.7 lb. (7 days)

##### \* Cyprodinil/Fludioxonil

- *Switch 62.5 WG*, 11 to 14 oz. (0 days)

##### \* DCNA

- *Botran 75 W* (5 1/3 lb (single application)) or *Botran 75 W* (2 lb every 7 - 14 days) (7 days)

##### EARLY BLIGHT (*Cercospora apii*), LATE BLIGHT (*Septoria apicola*): Treat every 7 to 10 days beginning after transplanting.

##### \* Azoxystrobin

- *Amistar*, 3 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 9.2 to 15.4 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

##### \* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 2.4 - 3.7 pt every 7-14 days. (7 days)

or

##### \* Azoxystrobin/Propiconazole

- *Quilt*, *Quilt Xcel*, 14 fl oz. (14 days)

or

##### \* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb every 7 days. (7 days)
- *Bravo Weather Stik*, *Equus 720 SST*, 2 to 3 pt every 7 days. (7 days)

- *Echo 720*, 2 to 3 pt every 7 days. (7 days)

- *Echo 720*, 1 to 1 1/2 pt every 3-5 days. (7 days)

- *Echo 90 DF*, 7/8 to 1 1/4 lb every 3 - 5 days. (7 days)

- *Echo 90 DF*, 1 5/8 to 2 1/2 lb every 7 days. (7 days)

- *Echo Zn*, 1 1/2 to 2 1/8 pt every 3 - 5 days. (7 days)

- *Echo Zn*, 3 to 4 1/4 pt every 7 days. (7 days)

or

##### \* Propiconazole

- *Propimax EC*, *Tilt*, 4 fl oz. (14 days) Maximum of four applications per season.

or

##### \* Trifloxystrobin

- *Flint* (2 to 3 oz) or *Gem 500* (1.9 to 2.9 fl oz) (7 days) Do not apply more than three sequential foliar application of strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

##### Copper Ammonium Carbonate

- *Copper Count N*, 2 to 3 qt. (0 days)

or

##### Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)

- *Champ Formula 2 F*, 1 1/3 pt. (0 days)

- *Champion WP*, 2 lb. (0 days)

- *Kocide 2000*, 1 1/2 lb. (0 days)

- *Kocide 3000*, 0.75-1.5 lb. (0 day)

- *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt. (0 days)

- *Nu-Cop 50 DF*, 1 to 2 lb, 5- to 7-day intervals. (0 days)

or

##### Copper Oxychloride / Copper Sulfate

- *C-O-C-S WDG*, 2 to 4 lb, 7 days. (0 days)

or

##### Copper Resinate

- *Tenn-Cop 5 E*, 3 pt (*Cercospora apii*). (0 days) (*Cercospora apii*)

or

##### Copper Sulfate

- *Basic Copper 53*, *Basicop*, 3 to 4 lb. (0 days)

- *Cuprofix Ultra*, 1.25 lb. (0 days)

or

##### Fenamidone

- *Reason 500 SC*, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating.

or

##### Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

##### Potassium phosphite/chlorothalonil

- *Catamaran*, 4 pt. (7 days)

##### BACTERIAL LEAF SPOT (*Pseudomonas syringae* pv. *apii*): Treat every 7 to 10 days, beginning after transplanting.

##### Copper Ammonium Carbonate

- *Copper Count N*, 2 to 3 qt. (0 days)

or

## Corn, Sweet

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 2 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
- Nu-Cop 50 DF, 1 to 2 lb, 5- to 7-day intervals. (0 days)  
or

### Copper Oxychloride / Copper Sulfate

- C-O-C-S WDG, 2 to 4 lb, 7 days. (0 days)  
or

### Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)  
or

### Copper Sulfate

- Cuprofix Ultra, 1.25 lb. (0 days)

### LATE BLIGHT (*Septoria apicola*):

- \* Azoxystrobin/Propiconazole
- Quilt, Quilt Xcel, 14 fl oz. (14 days)  
or
- \* Trifloxystrobin
- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) 12 hr REI.  
or

### Fenamidone

- Reason 500 SC, 5.5 - 8.2 fl oz. (2 days) Suppression. 12 hr REI.

### RUST:

#### Trifloxystrobin

- Gem 500, 1.9 to 2.9 fl oz. (7 days)

### CERCOSPORA LEAF SPOT (*Cercospora beticola*):

#### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

### SEPTORIA LEAF SPOT (*Septoria lycopersici*):

#### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

### ANTHRACNOSE (*Colletotrichum spp.*):

#### Pyraclostrobin

- Cabrio, 12-16 oz. (0 days)

## Corn, Sweet

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Root-lesion, stunt, stubby-root, lance and dagger nematodes can reduce sweet corn yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the above plant-parasitic nematodes are present in population densities above the economic threshold for sweet corn, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-lesion, lance, stunt, dagger and stubby-root nematodes in sweet corn production.

### FALL SOIL FUMIGATION:

#### 1,3-D

- Telone II (3 gal in-row for mineral soil) or Telone II (9-12 gal/A broadcast for mineral soil) Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In

some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### SOIL TREATMENT:

### PREPLANT TREATMENT:

Mocap 15 G, band. Add 3/4 to 1 lb per 1,000 row ft in a band 12-15 inches on the row 3 days before planting to at-planting. Mix with the top 2-4 inches of soil. Rate per acre is dependent on row spacing.

Rate would be 10-13.3 lb/A at 40-inch row spacings. (RUP)

Mocap 15 G, broadcast. Apply 40 lb/A 3 days before planting to at-planting. Mix with the top 2-4 inches of soil. (RUP)

## INSECTS

### SEED TREATMENT:

Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions.

### CORN FLEA BEETLE, WIRE WORM, SEED CORN MAGGOT, CUTWORM, CORN LEAF APHIDS:

Avicta, . See label for rates and application methods. (RUP)

or  
Cruiser 5 FS, Purchase seed treated at 1.28 to 5.1 fl oz / 100 lb seed.

### CORN ROOTWORM, FLEA BEETLE, SEEDCORN MAGGOT, WIREWORM:

Poncho 600, purchase seed treated commercially at 1.13 to 5.64 fl oz/80,000.

### SOIL TREATMENT:

Apply at cultivation.

### CORN ROOTWORM:

Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. (30 days) (RUP)

### ARMYWORM, CUTWORM:

Capture LFR, 3.4 fl oz (Pre-emergence) or 4 to 5.3 fl oz (Pre-plant incorporated). (RUP)

### CUTWORM:

10% Sevin Granules, 20 lb. (2 days)

### PLANTING TREATMENT:

**WIREWORM:** Broadcast evenly on soil surface and incorporate to 4 to 6 inches or band over the row at planting at reduced rate. Note: Consult the labels for other uses of these materials.

Aztec 2.1 G, 6.7 oz/1000 row ft. (RUP)

or  
Lorsban 15 G, 8 oz/1000 row ft, banded. (RUP)

or  
Mocap 15 G, 10.5 oz/1,000 row ft, banded. (RUP)

or  
Pounce 1.5 G, 8 oz/1000 row ft. (RUP)

or

#### Terbufos

- Counter 15-G Lock'n Load, or Counter 15G Smartbox (6 to 8 oz/1000 row ft.) or Counter 20G Smartbox (4.5 to 6 oz/1000 row ft.) (RUP)
- or

*Thimet* 20 G, 4.5 to 6.0 oz/1000 row ft. (RUP)

**SEED CORN MAGGOT:**

*Aztec* 2.1 G, 6.7 oz/1,000 ft of row. (RUP)

or

*Lambda-cyhalothrin*

- *Lambda-Cy*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Proaxis*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Warrior II* with Zeon Technology (0.33 fl oz/1000 row ft.) or *Warrior* with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)

or

*Lorsban* 15 G, 8 oz/1000 row ft, banded. (RUP)

or

*Pounce* 1.5 G, 8 oz/1000 row ft. (RUP)

or

*Terbufos*

- *Counter* 15-G Lock'n Load, or *Counter* 15G Smartbox (6 to 8 oz/1000 row ft.) or *Counter* 20G Smartbox (4.5 to 6 oz/1000 row ft.) (RUP)

or

*Thimet* 20 G, 4.5 to 6.0 oz/1000 row ft. Do not apply in-furrow. (RUP)

**CORN ROOTWORM: Corn rootworms are a problem only when rotation of crops is not practiced.**

*Aztec* 2.1 G, 6.7 oz/1,000 row ft. (RUP)

or

*Bifenthrin*

- *Bifenthrin* 2EC AG, 0.3 fl oz/1000 row ft. (RUP)
- *Bifenture* EC, 0.3 fl oz/1000 row ft. (RUP)
- *Brigade* 2EC, 0.3 fl oz/1000 row ft. (RUP)
- *Capture* 1.15 G (6.4 to 8 oz/1000 row ft.) or *Capture* 2 EC (0.3 fl oz/1000 row ft.) or *Capture LFR* (6.8 to 8.5 fl oz.) (RUP)
- *Discipline* 2EC, 0.3 fl oz/1000 row ft. (RUP)
- *Empower*, 6.4 to 8.0 oz/1000 row ft. (RUP)
- *Fanfare* 2EC, 0.3 fl oz/1000 row ft. (RUP)
- *Sniper*, 0.3 fl oz/1000 row ft. (RUP)
- *Tundra* EC, 0.3 fl oz/1000 row ft. (RUP)

or

*Force* 3G, 4 to 5 oz/1000 row ft. (RUP)

or

*Lambda-cyhalothrin*

- *Lambda-Cy*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Proaxis*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Warrior II* with Zeon Technology (0.33 fl oz/1000 row ft.) or *Warrior* with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)

or

*Lorsban* 15 G, 8 oz/1000 row ft, banded. (RUP)

or

*Mocap* 15 G, 10.5 oz/1,000 row ft. (RUP)

or

*Terbufos*

- *Counter* 15-G Lock'n Load, or *Counter* 15G Smartbox (6 to 8 oz/1000 row ft.) or *Counter* 20G Smartbox (4.5 to 6 oz/1000 row ft.) (RUP)

or

*Thimet* 20 G, 4.5 to 6.0 oz/1000 row ft. Do not apply in-furrow. (RUP)

**CUTWORM, SEED CORN MAGGOT, WIREWORM:***Bifenthrin*

- *Bifenthrin* 2EC AG, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Bifenture* EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Brigade* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Capture* 1.15 G (3.2 to 8.0 oz/1000 row ft.) or *Capture* 2 EC (0.15 to 0.3 fl oz/1000 row ft.) or *Capture LFR* (3.4 to 6.8 fl oz.) (RUP)
- *Discipline* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Empower*, 3.2 to 8.0 oz/1000 row ft. (RUP)
- *Fanfare* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)

- *Sniper*, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Tundra* EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)

See label for application methods.

or

*Diazinon* AG 500, 2 to 4 qt.; 3-4 qt. for wireworms. Broadcast just before planting and immediately incorporate into soil. See label for specific directions. (RUP)

or

*Force* 3G, 4 to 5 oz/1000 row ft. (RUP)

**ARMYWORM:***Bifenthrin*

- *Bifenthrin* 2EC AG, 0.15 to 0.3 fl oz/1000 row ft.. (30 days) (RUP)
- *Bifenture* EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Brigade* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Capture LFR*, 0.2 to 0.39 fl oz/1000 row ft. (RUP)
- *Discipline* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Fanfare* 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Sniper*, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Tundra* EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)

See labels for application methods.

**FLEA BEETLE:**

*Thimet* 20 G, 4.5 to 6.0 oz/1000 row ft. (RUP)

**CUTWORM:***Lambda-cyhalothrin*

- *Lambda-Cy*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Proaxis*, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Warrior II* with Zeon Technology (0.33 fl oz/1000 row ft.) or *Warrior* with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)

**FOLIAR TREATMENT:**

**CUTWORM, ARMYWORM: Apply when they appear. Repeat as needed.**

\* *Bifenthrin*

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Brigade* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz.. (1 day) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

or

\* *Mustang Max*, 2.8 to 4.0 oz. (3 days) (RUP)

or

\* *Permethrin*

- *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1 day) (RUP)
- *Pounce* 1.5 G (6.7 to 13.3 lb.) or *Pounce* 25 WP (6.4 to 12.8 oz.) (1 day) (RUP)

or

*Belt* SC, 2 to 3 fl oz. (1 day) Do not apply more than 3 oz/acre per 3-day interval; do not apply more than 12 oz/acre per crop season.

or

*Chlorpyrifos*

- *Lorsban* 4 E / *Lorsban Advanced* (1 to 2 pt.) or *Lorsban* 7 WG (0.67 to 1.33 lb.) (21 days) (RUP)

or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)

or

*Lambda-cyhalothrin*

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

## Corn, Sweet

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or  
*Larvin* 3.2 EC, 20 to 30 oz. (0 days)

or  
*Penncap-M* 2 F, 4 pt. (3 days) Do not apply during pollination. (RUP)  
or  
*Radiant SC*, 3 to 6 fl oz. (1 day; 3 days for forage or  
fodder) Minimum of 2 days between applications for corn earworm at  
silking; 4 days for all other applications. Do not apply more than 36 fl  
oz. per year.

or  
*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

or  
*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**CORN FLEA BEETLE:** Apply when damage is first seen, especially if  
Stewart's disease has been a problem. Plant a variety low in  
susceptibility to Stewart's wilt for best disease control. Some corn  
rootworm insecticides may give some early-season flea beetle  
control (see corn rootworm section).

*Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or  
Bifenthrin

• *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz.. (1 day) (RUP)

• *Bifenture* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Brigade* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Capture* 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Discipline* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Fanfare* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Tundra* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

or  
Carbaryl

• *Carbaryl* 4L, 1 to 2 qt. (2 days)

• *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* XLR  
Plus (1 to 2 qt.) (2 days) See label for pre-harvest intervals for  
forage and fodder.

or  
Chlorpyrifos

• *Lorsban* 4 E / *Lorsban Advanced* (1 to 2 pt.) or *Lorsban* 75  
WG (1.33 lb.) (21 days) (RUP)

or  
Diazinon AG 500, 1 pt. (0 days) (RUP)

or  
Esfenvalerate

• *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)

• *Asana* XL, 5.8 to 9.6 fl oz. (1 day) (RUP)

• *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)

or  
Hero, 4 to 10.3 oz. (3 days) (RUP)

or  
Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior*  
with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or  
Methomyl

• *Lannate* LV (0.75 to 1.5 pt.) or *Lannate* SP (0.25 to 0.5 lb.) (0  
days; 3 days for forage; 21 days for fodder) (RUP)

• *Nudrin* LV (0.75 to 1.5 pt.) or *Nudrin* SP (0.25 to 0.5 lb.) (0 days; 3  
days for forage; 21 days for fodder) (RUP)

or  
Mustang Max, 2.4 to 4.3 oz. (3 days) (RUP)

or  
Permethrin

• *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)

• *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1  
day) (RUP)

• *Pounce* 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)

or  
*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

or  
*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**EUROPEAN CORN BORER:** For early season control, prior to  
tasseling. Treat if >15% of plants are infested. Direct granules into  
corn whorls.

*Avaunt*, 2.5 to 3.5 oz. (3 days) Whorl application only.

or  
*Lorsban* 15 G, 6 to 8 oz/1,000 row ft. (35 days) (RUP)

or  
*Pounce* 1.5 G, 6.7 to 13.5 lb. (1 day) (RUP)

**EUROPEAN CORN BORER:** If pheromone trap catch is >5 moths per  
week. Apply every 5-7 days, beginning at tassel stage.

*Avaunt*, 2.5 to 3.5 oz. (3 days)

or  
*Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or  
*Belt* SC, 2 to 3 fl oz. (1 day) Do not apply more than 3 oz/acre per 3-  
day interval; do not apply more than 12 oz/acre per crop season.

or  
Bifenthrin

• *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Bifenture* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Brigade* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Capture* 1.15 G (3.5 to 8.7 lb.) or *Capture* 2 EC (2.1 to 6.4 fl oz.) (1  
day) (RUP)

• *Discipline* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Empower*, 3.5 to 8.7 lb. (1 day) (RUP)

• *Fanfare* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)

• *Tundra* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

or  
Carbaryl

• *Carbaryl* 4L, 1.5 to 2 qt. (2 days)

• *Sevin* 4 F (1.5 to 2 qt.) or *Sevin* 80 S (1.88 to 2.5 lb.) or *Sevin*  
XLR Plus (1.5 to 2 qt.) (2 days) See label for pre-harvest intervals  
for forage and fodder.

or  
Chlorpyrifos

• *Lorsban* 4 E / *Lorsban Advanced* (1 to 2 pt.) or *Lorsban* 75

WG (0.67 to 1.33 lb.) (21 days) (RUP)

or  
*Coragen*, 3.5 to 5 fl oz. (1 day)

or  
*Entrust*, 0.5 to 2 oz. (1 day)

or  
Esfenvalerate

• *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)

• *Asana* XL, 5.8 to 9.6 fl oz. (1 day) (RUP)

• *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)

or  
*Hero*, 4 to 10.3 oz. (3 days) (RUP)

or  
Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

• *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior*  
with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or  
*Larvin* 3.2 EC, 20 to 30 oz. (0 days)

or  
Methomyl

• *Lannate* LV (0.75 to 1.5 pt.) or *Lannate* SP (0.25 to 0.5 lb.) (0  
days; 3 days for forage; 21 days for fodder) (RUP)

- *Nudrin* LV (0.75 to 1.5 pt.) or *Nudrin* SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
  - or
  - Mustang Max*, 2.8 to 4.0 oz. (3 days) (RUP)
  - or
  - PennCap-M* 2 F, 2 to 4 pt. (3 days) Do not apply during pollination.
  - (RUP)
  - or
- Permethrin**
  - *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - *Pounce* 1.5 G (6.7 to 13.3 lb.) or *Pounce* 25 WP (6.4 to 12.8 oz.) (1 day) (RUP)
    - or
  - Radiant* SC, 3 to 6 fl oz. (1 day; 3 days for forage or fodder) Minimum of 2 days between applications for corn earworm at silking; 4 days for all other applications. Do not apply more than 36 fl oz. per year.
  - or
  - Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - or
  - Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**CORN EARWORM:** Apply to silks when moths are active to prevent ear damage. Treat every 5 days if 2-6 moths per week are caught in pheromone traps, every 4 to 5 days if catch is 7 to 90 moths per week, and every 3 to 4 days if catch is >90 moths per week. Use the shorter intervals listed above if temperatures are >85.

- \* *Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
  - or
- \* **Bifenthrin**
  - *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Bifenture* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Brigade* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Capture* 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Discipline* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Fanfare* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Tundra* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
    - or
- \* **Esfenvalerate**
  - *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - *Asana* XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)
    - or
  - \* *Larvin* 3.2 EC, 20 to 30 oz. (0 days)
    - or
- \* *Mustang Max*, 2.8 to 4 oz. (3 days) (RUP)
  - or
- \* **Permethrin**
  - *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - *Pounce* 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
    - or
  - \* *Warrior* with Zeon Technology, 2.6 to 3.8 fl oz. (1 day) (RUP)
    - or
  - Belt* SC, 2 to 3 fl oz. (1 day) Do not apply more than 3 oz/acre per 3-day interval; do not apply more than 12 oz/acre per crop season.
    - or
- Carbaryl**
  - *Carbaryl* 4L, 1 to 2 qt. (2 days)
  - *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (2 days) See label for pre-harvest intervals for forage and fodder.
    - or

#### Chlorpyrifos

- *Lorsban* 4 E / *Lorsban* Advanced (1.5 to 2 pt.) or *Lorsban* 75 WG (1 to 1.33 lb.) (21 days) (RUP)
  - or
- Coragen*, 3.5 to 5 fl oz. (1 day)
- or
- Diazinon* AG 500, 1 to 1.25 qt. (7 days) (RUP)
- or

#### Endosulfan

- *Endosulfan* 3 EC, 2 qt. (1 day) Maximum of 3 applications. Note: Do not use for processing corn. Do not feed forage to livestock.
- (RUP)
- *Thionex* 3EC, 2 qt. (17 days) (RUP)
  - or

#### Entrust, 1 to 2 oz. (1 day)

- or
- Hero*, 4 to 10.3 oz. (3 days) (RUP)
- or

#### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - or

#### Methomyl

- *Lannate* LV (0.75 to 1.5 pt.) or *Lannate* SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- *Nudrin* LV (0.75 to 1.5 pt.) or *Nudrin* SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
  - or

*Radiant* SC, 3 to 6 fl oz. (3 days) Minimum of 2 days between applications for corn earworm at silking; 4 days for all other applications. Do not apply more than 36 fl oz. per year.

or  
*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**CORN ROOTWORM ADULTS:** Apply as needed to protect silks, when beetle are active and feeding on silks.

- Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
  - or

#### Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Brigade* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - or

#### Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (2 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (2 days) See label for pre-harvest intervals for forage and fodder.
  - or

#### Chlorpyrifos

- *Lorsban* 4 E / *Lorsban* Advanced (1 to 2 pt.) or *Lorsban* 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
  - or

*Diazinon* AG 500, 0.5 to 1 pt. (0 days) (RUP)
 

- or

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)
 

- or

## Corn, Sweet

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### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

### Methomyl

- *Lannate LV* (0.75 to 1.5 pt.) or *Lannate SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- *Nudrin LV* (0.75 to 1.5 pt.) or *Nudrin SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)  
or

*Mustang Max*, 2.2 to 4 oz. (3 days) (RUP)  
or

*PennCap-M 2 F*, 1 to 2 pt. (3 days) (RUP)  
or

### Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)  
or

*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)  
or

*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**CORN LEAF APHIDS:** Apply when populations start to build, prevents sooty mold on ears at harvest.

### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Brigade 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)  
or

### Chlorpyrifos

- *Lorsban 4 E / Lorsban Advanced* (1 to 2 pt.) or *Lorsban 75 WG* (0.67 to 1.33 lb.) (21 days) (RUP)  
or

*Diazinon AG 500*, 1 to 2 pt. (0 days) (RUP)  
or

### Endosulfan

- *Endosulfan 3 EC*, 1.33 qt. (1 day) Maximum of 3 applications.  
Note: Do not use for processing corn. Do not feed forage to livestock. (RUP)
- *Thionex 3EC*, 1.33 qt. (17 days) (RUP)  
or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)  
or

*PennCap-M 2 F*, 2 pt. (15 days) Do not apply during pollination. (RUP)  
or

*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)  
or

*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**SAP BEETLE:** These usually come in following damage by other insects or birds. Controlling damage will be the most effective solution. For short-term control, apply as needed.

### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)

- *Brigade 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)  
or

### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (2 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (2 days) See label for pre-harvest intervals for forage and fodder.  
or

*Diazinon AG 500*, 2 to 2.5 pt. (RUP)  
or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)  
or

*Hero*, 4 to 10.3 oz. (3 days) (RUP)  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

*Malathion 57 EC*, 1.5 pt. (5 days) Begin treatment when 10% of ears show silk; repeat at 3 to 5 day intervals until 4 to 5 applications are made.  
or

*Mustang Max*, 2.2 to 4 oz. (3 days) (RUP)  
or

*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)  
or

*Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**ARMYWORM:** Apply when they appear. Repeat as needed.

*Avaunt*, 2.5 to 3.5 oz. (3 days)  
or

*Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or

### Bifenthrin

- *Capture 1.15 G*, 3.5 to 8.7 lb. (1 day) (RUP)
- *Empower*, 3.5 to 8.7 lb. (1 day) (RUP)  
or

### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (2 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (2 days)  
or

*Coragen*, 3.5 to 5 fl oz. (1 day)  
or

*Entrust*, 0.5 to 2 oz. (1 day)  
or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)  
or

### Methomyl

- *Lannate LV* (0.75 to 1.5 pt.) or *Lannate SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- *Nudrin LV* (0.75 to 1.5 pt.) or *Nudrin SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)

**CUTWORM: Apply when they appear. Repeat as needed.**Carbaryl

- Sevin 4 F, Sevin XLR Plus, 2 qt. (2 days; 14 days for forage; 48 days for fodder)  
or

Entrust, 1 to 2 oz. (1 day)

or

Esfenvalerate

- Adjourn, 2.9 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 2.9 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaloStar, 2.9 to 9.6 fl oz. (1 day) (RUP)

or

Methomyl

- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)

**MITES**Bifenthrin

- Bifenture EC, Brigade 2EC, Capture 2 EC, 5.1 to 6.4 oz. (1 day) (RUP)

or

Hero, 10.3 oz. (3 days) (RUP)

or

Phorate

- Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. At planting treatment.  
(RUP)

**DISEASES****SEED TREATMENT:**

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):** Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions.

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

Captan

- Captan 30-DD, 3 1/4 oz/100 lb seed.
- Captan 400, 2 to 4 oz/100 lb seed.

or

Fludioxinil

- Maxim 4 FS, 0.08 fl oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.

or

Mefenoxam

- Apron XL LS, 0.32 to 0.64 oz/100 lb seed (*Pythium*).

or

Metalaxyll

- Allegiance-FL (0.75 fl oz/100 lb seed (*Pythium*)) or Apron 50 W (1/2 to 1 oz/100 lb seed (*Pythium*)) or Apron FS (3/4 to 1 1/2 oz/100 lb seed (*Pythium*))

or

Thiram

- 42-S Thiram, 5 oz/100 lb seed.
- Thiram 50 WP Dyed, 3 oz/100 lb seed. Use as a slurry treatment.

**SYSTEMIC DOWNTY MILDEW:**Mefenoxam

- Apron XL LS, 1.28 oz/100 lb seed.  
or

Metalaxyll

- Apron 50 W (2 oz/100 lb seed) or Apron FS (3 oz/100 lb seed)

**FOLIAR TREATMENT:**

**CORN RUST (*Puccinia sorghi*):** Apply when conditions favor disease. Note: Do not feed treated forage to livestock.

Azoxystrobin

- Amistar, 2 to 3 oz. (7 days)
- Quadris, 6.2 to 9.2 fl oz. (7 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Propiconazole

- Quilt (10.5 - 14 fl oz every 14 days) or Quilt Xcel (10.5 - 14 fl oz) (14 days)

or

Chlorothalonil

- Bravo Ultrex, 0.7 to 1.8 lb. (14 days) Note: Do not apply to sweet corn to be processed.

- Bravo Weather Stik, Equus 720 SST, 3/4 to 2 pt. (14 days) Sweet corn and seed corn only, not field corn. Do not apply to sweet corn to be processed.

- Echo 720, 1.5 to 2 pt. (14 days)  
or

Mancozeb

- Dithane DF Rainshield, Dithane M-45, Dithane WSP, 1 1/2 lb. (7 days)

- Dithane F-45 Rainshield, 1 1/5 qt. (7 days)

- Manzate Pro-Stick, 1 1/2 lb. (7 days)

- Penncozeb 4 F, 1.6 qt. (7 days)

- Penncozeb 75 DF, Penncozeb 80 WP, 1 1/2 lb. (7 days)

or

Maneb

- Maneb 75 DF, Maneb 80 WP, 1 1/2 lb, 3- to 10-day intervals. (7 days)

- Manex, 1 1/5 qt, 3- to 10-day intervals. (7 days)

or

Propiconazole

- Tilt, 4 fl oz. (14 days) Apply at 7 to 14 day intervals. Maximum 16 fl oz per season.

or

Tebuconazole

- Folicur 3.6F, 4-6 fl oz. (7 days) 19 days REI.

**BLIGHTS:**Azoxystrobin/Propiconazole

- Quilt Xcel, 10.5 - 14 fl oz. (14 days)

**Cucumber**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Root-knot and root-lesion nematodes can reduce cucumber yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for cucumber, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot and root-lesion nematodes in cucumber production. Recent observations indicate that cucumber planted the year following a chemigated (metham) potato crop may provide benefits to the cucumber crop.

## Cucumber

### FALL SOIL FUMIGATION (BROADCAST):

#### 1.3-D

- Telone II, 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.**

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### PREPLANT NEMATICIDE TREATMENT (IN-ROW):

Mocap 15 G, at 13 lb/A (7-foot row spacing) or 2.1 lb/1000 row feet in a band 12 to 15 inches wide on top of the row at or just before planting. Mix with top 2 to 4 inches of soil immediately after application. Do not use as a seed furrow treatment or allow granules to contact seed. (RUP)

or

Vydate L, apply 2 gal (broadcast) or 1 gal (band) per acre. Apply before planting, incorporate 2-4 in into the soil. (RUP)

## INSECTS

### SEED TREATMENT:

#### CUCUMBER BEETLE:

Cruiser 5 FS, . See label for rates and application methods.

### SOIL TREATMENT:

#### APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:

Durivo, 10 to 13 fl oz. (30 days)

or

#### Thiamethoxam

- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

#### THRIPS, LEAFHOPPERS, SQUASH BUG:

Venom, 5 to 6 oz. (21 days) See label for application methods.

#### CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS, SQUASH BUG, THRIPS:

Scorpion 35SL, 9 to 10.5 fl oz. (21 days) See label for application methods.

#### APHIDS, LEAFHOPPERS, THRIPS:

Venom 20 SG, 1.13 to 1.34 lb. (21 days) See label for application methods.

### SEED CORN MAGGOT:

Athena, 8.5 to 17 fl oz. (RUP)

or

#### Bifenthrin

- Brigade WSB, 8 to 16 oz. (RUP)
- Capture LFR, 3.4 to 6.8 fl oz. (RUP)

Apply infurrow with seed or transplant.

#### CUTWORM, FLEA BEETLE LARVAE:

Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

#### CUTWORM:

10% Sevin Granules, 10 lb. (3 days)

#### APHIDS, CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS:

Belay, 9 to 12 fl oz. See label for application methods.

#### APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THRIPS:

#### Imidacloprid

- Admire Pro, 7.0 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 16 to 24 fl oz. (21 days)

### FOLIAR TREATMENT:

Cucumber plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat cucumbers during bloom. If treatment is necessary, see the Insecticide Effectiveness for bee toxicity.

#### CUTWORM: Apply if needed to prevent >1-5% stand loss.

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

#### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

#### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)

• Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)

• S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

#### Lambda-cyhalothrin

• Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)

• Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

Malathion 8, 1.75 pt. (1 day) Do not apply unless plants are dry.

or

#### Methomyl

- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

or

#### Permethrin

• Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)

• Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)

• Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

or

Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

or

Synapse WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.

or

Vetica, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**STRIPED and SPOTTED CUCUMBER BEETLE:** Apply as soon as possible if numbers exceed 0.1 to 1 per plant. Repeat as needed. Use preplant Furadan treatment (above) in fields with severe problems.

*Assail* 30 SG, 2.5 to 5.3 oz. (0 days)  
or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or  
*Baythroid XL*, 2.4 to 2.8 fl oz. (0 days) (RUP)

or  
*Belay*, 3 to 4 fl oz. (21 days)

or  
**Bifenthrin**

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or  
**Carbaryl**

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)

or  
**Dinotefuran**

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom*, 3 to 4 oz. (1 day)

or  
**Endosulfan**

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (16 days) (RUP)

or  
**Esfenvalerate**

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or  
**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or  
**Malathion**

- *Malathion* 5 (3 pt.) or *Malathion* 5 EC (2 pt.) or *Malathion* 8 (1.75 pt.) (1 day) Do not apply unless plants are dry.

or  
**Methomyl**

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

or  
**Permethrin**

- *Ambush* 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

or  
*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

**FLEA BEETLE:** Apply when damage is present.

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.  
or

*Belay*, 3 to 4 fl oz. (21 days)

or  
**Carbaryl**

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)

or  
**Dinotefuran**

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom*, 3 to 4 oz. (1 day)

or  
**Endosulfan**

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (16 days) (RUP)

or  
**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or  
**Methomyl**

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

or  
*Voliam Flexi*, 4 to 7 oz. (1 day)

**APHIDS:** Apply if needed.

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.

or  
*Assail* 30 SG, 2.5 to 4 oz. (0 days)

or  
*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or  
*Belay*, 3 to 4 fl oz. (21 days)

or  
*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)

or  
**Bifenthrin**

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or  
**Endosulfan**

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (16 days) (RUP)

or  
*Fulfill*, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.

or  
**Lambda-cyhalothrin**

- *Lambda-Cy*, 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.92 fl oz.) or *Warrior* with Zeon Technology (3.84 fl oz.) (1 day) (RUP)

## Cucumber

### Malathion

- *Malathion* 5 (1.5 pt.) or *Malathion* 5 EC (1.5 to 2 pt.) or *Malathion* 57 EC (1.5 pt.) or *Malathion* 8 (1.75 pt.) (1 day)  
or

### Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

### Permethrin

- *Perm-UP* 25DF (12.8 oz.) or *Perm-UP* 3.2 EC (8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 12.8 oz. (0 days) (RUP)  
or
- *Venom* 20 SG, 0.44 to 0.895 lb.. (1 day)  
or
- *Voliam* Flexi, 4 to 7 oz. (1 day)

### **THRIPS: Apply when damage is seen. Repeat as needed.**

*Athena*, 13.5 to 17 fl oz. (7 days) (RUP)  
or

### Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom* 20 SG (0.44 to 0.895 lb.) (1 day)  
or

*Entrust*, 2 to 2.5 oz. (1 day)  
or

*Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)  
or

*Malathion* 8, 1.75 pt. (1 day) Do not apply unless plants are dry.  
or

*Radiant* SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

### **SQUASH BUG:**

*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or

*Belay*, 3 to 4 fl oz. (21 days)  
or

### Bifenthrin

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade* WSB (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)  
or

### Carbaryl

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin* XLR Plus (1 qt.) (3 days)  
or

### Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom*, 3 to 4 oz. (1 day)  
or

### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (16 days) (RUP)  
or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *Asana* XL, 5.8 to 9.6 fl oz. (3 days) (RUP)

• *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

### Permethrin

- *Ambush* 25 W, 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (12.8 oz.) or *Perm-UP* 3.2 EC (8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 12.8 oz. (0 days) (RUP)  
or
- *Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

### **SEED CORN MAGGOT:**

*Empower*, 3.5 to 8.7 lb. (3 days) (RUP)

### **LEAFHOPPERS:**

#### Bifenthrin

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade* WSB (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)  
or

#### Carbaryl

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin* XLR Plus (1 qt.) (3 days)  
or

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

### **MITES**

Apply when needed. Usually a problem only in hot, dry weather.

*Agri-Mek* 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)  
or

#### Bifenthrin

- *Bifenture* EC, *Brigade* 2EC, *Capture* 2 EC, 5.1 to 6.4 oz. (3 days) (RUP)  
or

*Danitol* 2.4 EC, 10 2/3 fl oz. (7 days) (RUP)  
or

*Kelthane* 35 (1 2/3 lb) or *Kelthane* 50 WSP (1 1/4 lb) (2 days)  
or

*Oberon* 2 SC, 7 to 8.5 fl oz. (7 days)  
or

*Zeal*, 2 to 3 oz. (7 days)

### **DISEASES**

#### **SEED TREATMENT:**

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*): Use only as directed; over-treatment may cause injury.**

#### Bacillus subtilis GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

#### Captan

- *Captan* 30-DD, 2 1/3 fl oz/100 lb seed.

- Captan 400, 2 1/2 to 3 fl oz/100 lb seed.  
or  
Fludioxinil
- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.  
or  
Metalaxyl
- Allegiance-FL, 0.75 fl oz/100 lb seed.  
or  
Thiram  
• 42-S Thiram, *Thiram* 50 WP Dyed, 4 1/2 oz/100 lb seed.

## SEEDBED PREPARATION:

**ROOT ROTS (*Fusarium solani*, *Fusarium cucurbitae*, *Pythium* spp., *Rhizoctonia solani*):** Grow transplants in disease free soil (sterilized) and fumigate fields before planting. To sterilize soil, use steam or fumigate with Chemicals suggested for seedbed sterilization in Appendix A. Follow manufacturer's recommendations for use with particular crops. Avoid planting until the soil is free of fumigant.

## PREPLANT SOIL FUMIGATION:

**DAMPING OFF, ROOT ROTS (*Phytophthora* spp., *Pythium* spp., *Rhizoctonia solani*):** This method protects plants grown from seed or transplanted in the field.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

- 1,3 Dichloropropene/chloropicrin
  - Telone C35, 13-35 gal. (RUP)  
or  
Metam Sodium
  - Sectagon 42, *Vapam* HL, 37.5-75 gal.  
or  
Potassium N-methylidithiocarbamate
  - Sectagon-K54, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## PREPLANT TREATMENT:

**PYTHIUM DAMPING OFF and COTTONY LEAK (*Pythium* spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold SL, 1-2 pt.
- Ultra Flourish, 2 to 4 pt.

## DRIP APPLICATION:

**PHYTOPHTHORA BLIGHT (*Phytophthora capsici*), DOWNTY MILDEW (*Pseudoperonospora cubensis*):**

- \* Fluopicolide
- Presidio, 3-4 fl oz. (2 days)

## FOLIAR TREATMENT:

**POWDERY MILDEW (*Sphaerotheca fuliginea* or *Erysiphe cichoracearum*):**

- \* Azoxystrobin/Difenoconazole
- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or

## \*Kresoxim-methyl

- Sovran, 3.2 to 4.8 oz. (0 days)  
or

## \*Myclobutanil

- Rally 40 WSP, 2.5 to 5 oz. (0 days) Do not apply more than 1.5 lb per acre per crop.  
or

## \*Pyraclostrobin

- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

## \*Pyraclostrobin/Boscalid

- Pristine, 12.5 to 18.5 oz. (0 days)  
or

## \*Thiophanate-Methyl

- Topsin 4.5 FL, 10 fl oz. (1 day)
- Topsin M 70 WP, *Topsin* M WSB, 1/4 to 1/2 lb. (0 days) Apply at 7 to 14-day intervals.  
or

## \*Trifloxystrobin

- Flint, 1 1/2 to 2 oz. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. 12 hr REI.  
or

## Azoxystrobin

- Amistar, 3.5 to 5 oz every 7 - 14 days. (1 day)
- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

## Azoxystrobin/Chlorothalonil

- Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)  
or

## Bacillus subtilis

- Serenade, 6 to 8 lb every 7 days. (0 days)
- Serenade Max, 1 - 3 lb every 7 to 10 days. (0 days)

Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

## Boscalid

- Endura, 6.5 oz. (0 days)  
or

## Chlorothalonil

- Bravo Ultrex, *Equus* DF, 1.8 to 2.7 lb. (0 days) *Sphaerotheca* only.
- Bravo Weather Stik, *Echo* 720, *Equus* 720 SST, 2 to 3 pt. (0 days) *Sphaerotheca* only.
- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)  
or

## Copper Ammonium Carbonate

- Copper Count N, 1 to 2 qt. (0 days)  
or

## Copper Hydroxide

- Champ DP, 1 1/3 lb, 5- to 7-day intervals. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)

## Champion WP

- Kocide 2000, 1 1/2 lb. (0 days)

## Kocide 3000

- Nu-Cop 3 L, 0.5-1.25 lb. (0 day)

## Nu-Cop 3 L

- 1 to 4 pt, 5- to 10-day intervals. (0 days)  
or

## Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)  
or

## Copper Sulfate

- Cuprofix Ultra, 1.25 lb. (0 days)  
or

## Difenoconazole/Cyprodinil

- Inspire Super, 16 to 20 fl oz. (7 days) Suppression.

## Cucumber

### Neem Oil

- Trilogy, 2 pt. (0 days)

or

### Potassium Bicarbonate

- Armicarb 100, 2.5 to 5 lb. (0 days)

or

### Sulfur

- Kumulus DF, 2 to 6 lb. (0 days)

- Micro Sulf, 3 to 10 lb. (0 days)

- Microthiol Disperss, 2 to 4 lb. (0 days)

- Thiolux Jet, 4 to 6 lb. (0 days)

or

### Tebuconazole

- Folicur 3.6F, 4-6 fl oz. (7 days) 12 hr REI.

or

### Triflumizole

- Procure 480 SC, 4 to 8 fl oz every 7-14 days. (0 days)

**SCAB (*Cladosporium cucumerinum*): Treat every 7 days after plants are 2 to 3 inches tall.**

### \* Chlorothalonil

- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)

- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)

or

### \* Mancozeb

- Dithane DF Rainshield, Dithane M-45, 2 to 3 lb. (5 days)

- Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt. (5 days)

- Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals. (5 days) Maximum 24 ln/year.

- Penncozeb 4 F, 1.2 to 2.4 qt. (5 days)

or

### Copper Ammonium Carbonate

- Copper Count N, 2 to 3 qt. (0 days)

or

### Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)

or

### Mancozeb/Copper Hydroxide

- ManKocide, 2-3 lb. (5 days)

or

### Neem Oil

- Trilogy, 2 pt. (0 days)

**ALTERNARIA LEAF BLIGHT (*Alternaria cucumerin*): Treat plants after vine tip when conditions favor disease and continue at 7 to 10 day intervals.**

### \* Azoxystrobin

- Amistar, 3.5 to 5 oz every 7-14 days. (1 day)

- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

### \* Azoxystrobin/Chlorothalonil

- Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)

or

### \* Azoxystrobin/Difenoconazole

- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.

or

### \* Chlorothalonil

- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb every 7 days. (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)

- Echo 90 DF, 1.6 to 2.4 lb. (0 days)

or

### \* Difenoconazole/Cyprodnil

- Inspire Super, 16 to 20 fl oz. (7 days)

or

### \* Mancozeb

- Penncozeb 4 F, 1.2 to 2.4 qt. (5 days)

- Penncozeb 75 DF, Penncozeb 80 WP, 1 1/2 to 3 lb. (5 days)

or

### \* Maneb

- Maneb 75 DF, Maneb 80 WP, 1 1/2 to 2 lb. (5 days)

- Manex, 1 1/5 to 1 3/5 qt. (5 days)

or

### \* Pyraclostrobin

- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

### \* Pyraclostrobin/Boscalid

- Pristine, 12.5 to 18.5 oz. (0 days)

or

### Boscalid

- Endura, 6.5 oz. (0 days)

or

### Copper Ammonium Carbonate

- Copper Count N, 1 to 2 qt. (0 days)

or

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)

- Champ Formula 2 F, 1 1/3 pt. (0 days)

- Champion WP, 1.5 to 3 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.5-1.25 lb. (0 day)

- Nu-Cop 3 L, 1 to 4 pt. (0 days)

or

### Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)

or

### Copper Sulfate

- Cuprofix Ultra, 1.25 lb. (0 days)

or

### Famoxadone/Cymoxanil

- Tanos, 8 oz. (3 days)

or

### Mancozeb/Copper Hydroxide

- ManKocide, 2-3 lb. (5 days)

or

### Mancozeb/Copper Sulfate

- Cuprofix MZ Disperss, 4-7.25 lb. (5 days)

or

### Mancozeb/Zoxamide

- Gavel 75 DF, 1.5 - 2.0 lb. (5 days)

or

### Neem Oil

- Trilogy, 2 pt. (0 days)

or

### Potassium Bicarbonate

- Armicarb 100, 2.5 to 5 lb. (0 days)

or

### Potassium phosphite/chlorothalonil

- Catamaran, 6 pt. (1 day)

**ANTHRACNOSE (*Colletotrichum lagenarium*): Treat after flowering when conditions are favorable for disease development.**

### \* Azoxystrobin

- Amistar, 3.5 to 5 oz every 7 - 14 days. (1 day)

- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

- \* Azoxystrobin/Chlorothalonil
  - *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day) or
- \* Azoxystrobin/Difenoconazole
  - *Quadris Top*, 10 to 14 fl oz. (1 day) One application before alternating with another chemical. or
- \* Chlorothalonil
  - *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb. (0 days)
  - *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (0 days)
  - *Echo 90 DF*, 1.3 to 1.6 lb every 7 days. (0 days) or
- \* Mancozeb
  - *Dithane DF Rainshield*, *Dithane M-45*, 2 to 3 lb, 7- to 10-day intervals. (5 days)
  - *Dithane F-45 Rainshield*, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals. (5 days)
  - *Manzate Pro-Stick*, 2 to 3 lb, 7- to 10-day intervals. (5 days)
  - *Penncozeb 4 F*, 1.2 to 2.4 qt. (5 days)
  - *Penncozeb 75 DF*, *Penncozeb 80 WP*, 1 1/2 to 3 lb, 7- to 10-day intervals. (5 days) or
- \* Maneb
  - *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 2 lb, 7- to 10-day intervals. (5 days)
  - *Manex*, 1 1/5 to 1 3/5 qt, 7- to 10-day intervals. (5 days) or
- \* Pyraclostrobin
  - *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical. or
- \* Pyraclostrobin/Boscalid
  - *Pristine*, 18.5 oz. (0 days) or
- \* Thiophanate-Methyl
  - *Topsin 4.5 FL*, 10 fl oz. (1 day)
  - *Topsin M 70 WP*, *Topsin M WSB*, 1/4 to 1/2 lb, 7- to 14-day intervals. (1 day) or
- Copper Ammonium Carbonate
  - *Copper Count N*, 1 to 2 qt. (0 days) or
- Copper Hydroxide
  - *Champ DP*, 1 1/3 lb. (0 days)
  - *Champ Formula 2 F*, 1 1/3 pt. (0 days)
  - *Champion WP*, 1.5 to 3 lb. (0 days)
  - *Kocide 2000*, 1 1/2 lb. (0 days)
  - *Kocide 3000*, 0.5-1.25 lb. (0 day)
  - *Nu-Cop 3 L*, 1 to 4 pt, 5- to 10-day intervals. (0 days) or
- Copper Oxychloride / Copper Sulfate
  - *C-O-C-S WDG*, 2 to 4 lb every 7 days. (0 days) or
- Copper Sulfate
  - *Basic Copper 53*, *Basicop*, 2 lb. (0 days)
  - *Cuprofix Ultra*, 1.25 lb. (0 days) or
- Difenoconazole/Cyprodil
  - *Inspire Super*, 16 to 20 fl oz. (7 days) or
- Famoxadone/Cymoxanil
  - *Tanos*, 8 oz. (3 days) or
- Mancozeb/Copper Hydroxide
  - *ManKocide*, 2-3 lb. (5 days) or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss*, 4-7.25 lb. (5 days) or

Neem Oil

- *Trilogy*, 2 pt. (0 days) or

Potassium phosphite/chlorothalonil

- *Catamaran*, 4 pt. (1 day)

**ANGULAR LEAF SPOT (*Pseudomonas lachrymans*):** Spray every 7 days, starting before the first fruit form. The disease is likely to be more serious in high-population plantings (40,000 plants/A or more). Under these conditions spray every 3 or 4 days to protect fruit at all stages of development.

Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days) or

Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP* (1 1/2 to 3 lb) or *Nu-Cop 50 DF* (1 1/2 to 2 lb) (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day) or

Copper Resinate

- *Tenn-Cop 5 E*, 3 pt. (0 days) or

Copper Sulfate

- *Basic Copper 53*, *Basicop*, 2 lb. (0 days)
- *Cuprofix Ultra*, 1.25 lb. (0 days) or

Mancozeb/Copper Hydroxide

- *ManKocide*, 2 to 2.5 lb. (5 days) or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

**BELLY ROT (*Rhizoctonia solani*):**\* Thiophanate-Methyl

- *Topsin 4.5 FL*, 10 fl oz. (1 day)
- *Topsin M 70 WP*, *Topsin M WSB*, 1/2 lb. (0 days) or

Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)
- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt see label for interval. (1 day)

**DOWNTY MILDEW (*Pseudoperonospora cubensis*):** Treat plants at first sign of disease and repeat at 14-day intervals.\* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb. (0 days)
- *Bravo Weather Stik*, or *Echo 720* (2 to 3 pt, 7-day intervals) or *Equus 720 SST* (2 to 3 pt every 7 days) (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days) or

\* Cyazofamid

- *Ranman*, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days) or

\* Cymoxanil

- *Curzate 60 DF*, 3. 2 oz every 5 - 7 days. (3 days) or

\* Famoxadone/Cymoxanil

- *Tanos*, 8 oz. (3 days)

## Cucumber

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or

\* Mancozeb

- *Dithane DF Rainshield, Dithane M-45, 2 to 3 lb, 7- to 10-day intervals.* (5 days)
- *Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals.* (5 days)
- *Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals.* (5 days) Maximum 24 lb/season.
- *Penncozeb 4 F, 1.2 to 2.4 qt.* (5 days)
- *Penncozeb 75 DF, 1.2 to 2.4 qt.* (5 days)

or

\* Mancozeb/Zoxamide

- *Gavel 75 DF, 2.0 lb.* (5 days)

or

\* Propamocarb

- *Previcur Flex, 1.2 pt every 7 - 14 days.* (2 days)

or

Azoxystrobin

- *Amistar, 3.5 to 5 oz.* (1 day)
- *Quadris, 11.0 to 15.4 fl oz.* (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Chlorothalonil

- *Quadris Opti, 3.2 pt every 7 - 14 days.* (1 day)

or

Dimethomorph

- *Forum, 6 fl oz.* (0 days)

or

Fenamidone

- *Reason 500 SC, 5.5 fl oz every 5 to 10 days.* (14 days)

or

Fluopicolide

- *Presidio, 3-4 fl oz.* (2 days)

or

Fosetyl-Aluminum

- *Aliette WDG, 2 to 5 lb, 7 to 14 day intervals.* (0 days) Do not tank mix with copper fungicides.

or

Mancozeb/Copper Hydroxide

- *ManKocide, 2-3 lb.* (5 days)

or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss, 4-7.25 lb.* (5 days)

or

Mandipropamid

- *Revus, 8 fl oz.* (0 day)

or

Mefenoxam/Chlorothalonil

- *Flouronil, Ridomil Gold Bravo, 2 lb.* (7 days) Maximum 4 applications. Do not apply to mature or senescent plants.

or

Mefenoxam/Copper Hydroxide

- *Ridomil Gold Copper, 2 lb.* (5 days) Maximum 4 applications.

or

Mefenoxam/Mancozeb

- *Ridomil Gold MZ, 2 1/2 lb.* (5 days) Maximum 4 applications.

or

Mono-, dibasic sodium salts of phosphorous acid

- *Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.* (0 days)

or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Phostrol, 2.5 to 5 pt every 7 - 14 days.* (0 days)

- *Prophyt, 2 to 4 pt.* (0 days)

or

Neem Oil

- *Trilogy, 2 pt.* (0 days)

or

Potassium Bicarbonate

- *Armicarb 100, 2.5 to 5 lb.* (0 days)

or

Potassium phosphite/chlorothalonil

- *Catamaran, 4 pt.* (1 day)

or

Pyraclostrobin

- *Cabrio, 8-12 oz.* (0 days) Do not apply more than one application before alternating with another chemical.

or

Pyraclostrobin/Boscalid

- *Pristine, 12.5 to 18.5 oz.* (0 days)

or

Trifloxystrobin

- *Flint, 4 oz.* (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo. 12 hr REI.

**Note:** Most fungicides that protect against Alternaria and gummy stem blight may also provide limited downy mildew protection.

**GUMMY STEM BLIGHT or BLACK ROT (*Didymella bryoniae* also called *Mycosphaerella melonis*): Begin treatment at the 2-leaf stage.**

\* Azoxystrobin

- *Amistar, 3.5 to 5 oz every 7 - 14 days.* (1 day)

- *Quadris, 11.0 to 15.4 fl oz.* (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti, 3.2 pt every 7 - 14 days.* (1 day)

or

\* Azoxystrobin/Difenoconazole

- *Quadris Top, 10 to 14 fl oz.* (1 day)

or

Chlorothalonil

- *Bravo Ultrex, Equus DF, 1.8 to 2.7 lb.* (0 days)

- *Bravo Weather Stik, or Echo 720 (2 to 3 pt, 7-day intervals) or Equus 720 SST (2 to 3 pt every 7 days)* (0 days)

- *Echo 90 DF, 1.6 to 2.4 lb every 7 days.* (0 days)

or

\* Mancozeb

- *Dithane DF Rainshield, Dithane M-45, 2 to 3 lb, 7- to 10-day intervals.* (5 days)

- *Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals.* (5 days)

- *Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals.* (5 days) Maximum 24 lb/season.

- *Penncozeb 4 F, 1.2 to 2.4 qt.* (5 days)

- *Penncozeb 75 DF, 1.2 to 2.4 qt.* (5 days)

or

\* Pyraclostrobin

- *Cabrio, 12-16 oz.* (0 days) Do not apply more than one application before alternating with another chemical.

or

\* Pyraclostrobin/Boscalid

- *Pristine, 12.5 to 18.5 oz.* (0 days)

or

\* Thiophanate-Methyl

- *Topsin 4.5 FL, 10 fl oz.* (1 day)

- *Topsin M 70 WP, Topsin M WSB, 1/4 to 1/2 lb, 7- to 14-day intervals.* (1 day)

or

**Boscalid**

- *Endura*, 6.5 oz. (0 days)  
or

**Copper Ammonium Carbonate**

- *Copper Count N*, 1 to 2 qt. (0 days)  
or

**Copper Hydroxide**

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP*, 1.5 to 3 lb. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L*, 1 to 4 pt, 5- to 10-day intervals. (0 days)  
or

**Copper Sulfate**

- *Cuprofix Ultra*, 1.25 lb. (0 days)  
or

**Difenoconazole/Cyprodinil**

- *Inspire Super*, 16 to 20 fl oz. (7 days)  
or

**Fenamidone**

- *Reason 500 SC*, 5.5 fl oz every 5 to 10 days. (14 days)  
or

**Kresoxim-methyl**

- *Sovran*, 4.8 oz. (0 days)  
or

**Mancozeb/Copper Hydroxide**

- *ManKocide*, 2-3 lb. (5 days)  
or

**Mancozeb/Copper Sulfate**

- *Cuprofix MZ Disperss*, 4-7.25 lb. (5 days)  
or

**Potassium phosphite/chlorothalonil**

- *Catamaran*, 6 pt. (1 day)  
or

**Tebuconazole**

- *Folicur 3.6F*, 8 fl oz. (7 days) Approved for gummy stem blight.  
Suppression only.

**FRUIT ROT (*Phytophthora* spp., *Pythium* spp.):** Initiate treatment at flowering. If possible, tank-mix products with a labeled copper product.

**\* Dimethomorph**

- *Forum*, 6 fl oz. (0 days)  
or

**\* Famoxadone/Cymoxanil**

- *Tanos*, 8 - 10 oz every 5 - 7 days. (3 days)  
or

**\* Mancozeb/Zoxamide**

- *Gavel 75 DF*, 1.5 - 2.0 lb. (5 days)  
or

**Cyazofamid**

- *Ranman*, 2.75 fl oz every 7 to 10 days. (0 days)  
or

**Fosetyl-Aluminum**

- *Aliette WDG*, 2 to 5 lb, 7- to 14-day intervals (*Phytophthora*). (0 days) Do not tank mix with copper fungicides.  
or

**Mancozeb**

- *Penncozeb 4 F*, 1.2 to 2.4 qt. (5 days)
- *Penncozeb 75 DF* (1 1/2 to 3 lb, 7- to 10-intervals (*Pythium*))  
or *Penncozeb 80 WP* (1 1/2 to 3 lb, 7- to 10-day intervals  
(*Pythium*)) (5 days)  
or

**Mandipropamid**

- *Revus*, 8 fl oz. (0 day)  
or

**Maneb**

- *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 2 lb, 7- to 10-day intervals  
(*Pythium*). (5 days)

- *Manex*, 1.2 to 1.6 qt (*Pythium*). (5 days) Maximum 12.8 qt/season.  
or

**Mono-, dibasic sodium salts of phosphorous acid**

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.  
(0 days)  
or

**Mono-, dibasic sodium, potassium and ammonium phosphites**

- *Phostrol*, 2.5 to 5 pt every 7 - 14 days. (0 days)
- *Prophyt*, 6 pt. (0 days)

**Note:** Fungicides applied to control downy mildew may have limited efficacy against Phytophthora crown and fruit rot.

**PHYTOPHTHORA CROWN and FRUIT ROT (*Phytophthora* spp.):****Fluopicolide**

- *Presidio*, 3-4 fl oz. (2 days)

**Eggplant**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES****SOIL TREATMENT AT PLANTING:**

*Vydate L*, . Apply 1 gal/A in a band 2 to 3 weeks after transplanting and again 4 weeks later. Make 2 foliar treatments of 2 qt 2-4 weeks after the soil treatments at 1 to 2 week intervals. (RUP)

**INSECTS****SOIL TREATMENT:**

**COLORADO POTATO BEETLE, APHIDS, FLEA BEETLE:** Apply where high potato beetle, aphid, or flea beetle numbers are expected. Apply in a band prior to transplanting or in a drench at transplanting.

\* Imidacloprid. Additional generic brands available.

- *Admire Pro*, 7 to 10.5 fl oz. (21 days) Consult label for rotation restrictions and application methods.

- *Nuprid 2 F*, 16 to 24 fl oz.  
or

**\* Thiamethoxam**

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) Apply as in-furrow spray or narrow surface band, as a post seeding, transplant or hill drench,in trickle or drip irrigation, or shanked into root zone after establishment or transplanting.  
or

- *Belay*, 9 to 12 fl oz. See label for application methods.  
or

- *Durivo*, 10 to 13 fl oz. (30 days)  
or

- *Venom 20 SG*, 1.13 to 1.34 lb. (21 days) See label for application methods.

**COLORADO POTATO BEETLE, FLEA BEETLE:****Dimetofuran**

- *Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)
- *Venom*, 5 to 6 oz. (21 days)

**CUTWORM:**

- 10% *Sevin Granules*, 20 lb. (3 days)  
or

- Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods.  
(RUP)

## Eggplant

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### FOLIAR TREATMENT:

**CUTWORM:** Apply when damage is first seen, usually soon after transplanting.

- \* *Baythroid* XL, 2.1 to 2.8 fl oz. (7 days) (RUP)  
or
- \* *Perm-UP* 3.2 EC, 4 to 8 oz. (3 days) (RUP)  
or
- \* *Warrior* with Zeon Technology, 2.6 to 3.8 fl oz. (5 days) (RUP)  
or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or

#### Bifenthrin

- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (7 days) (RUP)
- *Empower*, 3.5 to 8.7 lb. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

#### Bifenthrin + Imidacloprid

- *Brigadier*, 5.1 to 9.85 fl oz. (7 days) (RUP)
- *Swagger*, 10.2 to 19.7 fl oz. (7 days) (RUP)  
or

#### Carbaryl

- *Carbaryl* 4L, 2 qt. (3 days)
- *Sevin* 4 F (2 qt.) or *Sevin* 80 S (2.5 lb.) or *Sevin* 80 WSP (2.5 lb.) or *Sevin* XLR Plus (2 qt.) (3 days)  
or

*Confirm* 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or

#### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)  
or

*Leverage* 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

or

*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or

*Synapse* WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.  
or

*Vetica*, 12 to 17 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

### COLORADO POTATO BEETLE:

\* *Actara*, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or

\* *Assail* 30 SG, 1.4 to 2.5 oz. (7 days) Do not use if neonicotinoids were used at planting.

or

#### Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom* 20 SG (0.44 to 0.895 lb.) (1 day)  
Do not use if neonicitinoids were used at planting.  
or

\* Imidacloprid. Additional generic brands available.

- *Admire Pro*, 1.3 to 2.2 fl oz. (0 days)

- *Nuprid* 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicitinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or

*Baythroid* XL, 1.6 to 2.8 fl oz. (7 days) (RUP)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

#### Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

#### Bifenthrin + Imidacloprid

- *Brigadier*, 5.1 to 9.85 fl oz. (7 days) (RUP)
- *Swagger*, 10.2 to 19.7 fl oz. (7 days) (RUP)  
or

#### Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (3 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (3 days)  
or

*Coragen*, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

or

*Endosulfan* 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)

or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 21 days.

or

#### Esfenvvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)  
or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

#### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)  
or

*Leverage* 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

or

*Novodor*, . (0 days) Small larvae only.

or

#### Permethrin

- *Ambush* 25 W, 12.8 oz. (3 days) (RUP)
- *Perm-UP* 25DF (9.6 oz.) or *Perm-UP* 3.2 EC (8 oz.) (3 days) (RUP)
- *Pounce* 25 WP, 9.6 oz. (3 days) (RUP)  
or

*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or

<p><i>Voliam Flexi</i>, 4 to 7 oz. (1 day) or <i>Vydate L</i>, 1 to 2 qt. (1 day) Repeat in 1 to 3 weeks if needed. (RUP)</p> <p><b>FLEA BEETLE: Apply when damage is first seen.</b></p> <p><i>Actara</i>, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season. or <i>Athena</i>, 7 to 17 fl oz. (7 days) (RUP) or <i>Baythroid XL</i>, 2.8 fl oz. (7 days) (RUP) or <i>Belay</i>, 3 to 4 fl oz. (21 days) or <b>Bifenthrin</b></p> <ul style="list-style-type: none"> <li>• <i>Bifenthrin</i> 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Bifenture EC</i>, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Brigade</i> 2EC (2.1 to 6.4 fl oz.) or <i>Brigade WSB</i> (5.3 to 12.8 oz.) (7 days) (RUP)</li> <li>• <i>Capture</i> 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Discipline</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Fanfare</i> 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Sniper</i>, 2.1 to 6.4 fl oz. (7 days) (RUP)</li> <li>• <i>Tundra</i> EC, 2.1 to 6.4 fl oz. (7 days) (RUP) or</li> </ul> <p><b>Bifenthrin + Imidacloprid</b></p> <ul style="list-style-type: none"> <li>• <i>Brigadier</i>, 5.1 to 9.85 fl oz. (7 days) (RUP)</li> <li>• <i>Swagger</i>, 10.2 to 19.7 fl oz. (7 days) (RUP) or</li> </ul> <p><b>Carbaryl</b></p> <ul style="list-style-type: none"> <li>• <i>Carbaryl</i> 4L, 0.5 to 1 qt. (3 days)</li> <li>• <i>Sevin</i> 4 F (0.5 to 1 qt.) or <i>Sevin</i> 80 S (0.63 to 1.25 lb.) or <i>Sevin</i> 80 WSP (0.67 to 1.25 lb.) or <i>Sevin XLR Plus</i> (0.5 to 1 qt.) (3 days) or <i>Dibrom</i> 8 Emulsive, 1 pt. (1 day) (RUP) or</li> </ul> <p><b>Dinotefuran</b></p> <ul style="list-style-type: none"> <li>• <i>Scorpion</i> 35SL, 2 to 7 fl oz. (1 day)</li> <li>• <i>Venom</i> (1 to 4 oz.) or <i>Venom</i> 20 SG (0.44 to 0.895 lb.) (1 day) Do not use if neonicitinoids were used at planting. or <i>Endosulfan</i> 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)</li> </ul> <p>Consult label for rotation limitations. or</p> <p><b>Esfenvalerate</b></p> <ul style="list-style-type: none"> <li>• <i>Adjourn</i>, 5.8 to 9.6 fl oz. (7 days) (RUP)</li> <li>• <i>Asana</i> XL, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>• <i>S-FenvatoStar</i>, 5.8 to 9.6 fl oz. (1 day) (RUP) or</li> </ul> <p><i>Hero</i>, 4 to 10.3 oz. (7 days) (RUP) or</p> <p><b>Lambda-cyhalothrin</b></p> <ul style="list-style-type: none"> <li>• <i>Lambda-Cy</i>, 2.56 to 3.84 fl oz. (5 days) (RUP)</li> <li>• <i>Proaxis</i>, 2.56 to 3.84 fl oz. (5 days) (RUP)</li> <li>• <i>Warrior II</i> with Zeon Technology (1.28 to 1.92 fl oz.) or <i>Warrior</i> with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP) or <i>Leverage</i> 360, 4.1 fl oz. (7 days) (RUP) or</li> </ul> <p><i>Mustang Max</i>, 2.2 to 4 oz. (1 day) (RUP) or</p> <p><b>Permethrin</b></p> <ul style="list-style-type: none"> <li>• <i>Ambush</i> 25 W, 6.4 to 12.8 oz. (3 days) (RUP)</li> <li>• <i>Perm-UP</i> 25DF (9.6 oz.) or <i>Perm-UP</i> 3.2 EC (4 to 8 oz.) (3 days) (RUP)</li> <li>• <i>Pounce</i> 25 WP, 6.4 to 9.6 oz. (3 days) (RUP) or <i>Steed</i>, 3.5 to 4.7 fl oz. (7 days) (RUP) or <i>Voliam Flexi</i>, 4 to 7 oz. (1 day)</li> </ul>	<p><b>APHIDS: Apply when needed.</b></p> <ul style="list-style-type: none"> <li>* <i>Actara</i>, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season. or * <i>Assail</i> 30 SG, 1.9 to 2.8 oz. (7 days) or * <b>Imidacloprid</b>. Additional generic brands available.</li> <li>• <i>Admire Pro</i>, 1.3 to 2.2 fl oz. (0 days)</li> <li>• <i>Nuprid</i> 1.6 F, 3.8 to 6.2 fl oz. (0 days)</li> </ul> <p>Do not use if neonicitinoids were used at planting. Do not apply more than 19.2 oz/acre per season. or <i>Athena</i>, 7 to 17 fl oz. (7 days) (RUP) or <i>Belay</i>, 3 to 4 fl oz. (21 days) or <i>Beleaf</i> 50 SG, 2 to 2.8 oz. (0 days) or <b>Bifenthrin + Imidacloprid</b></p> <ul style="list-style-type: none"> <li>• <i>Brigadier</i>, 3.8 to 9.8 fl oz. (7 days) (RUP)</li> <li>• <i>Swagger</i>, 7.6 to 19.7 fl oz. (7 days) (RUP) or <i>Dibrom</i> 8 Emulsive, 1 pt. (1 day) (RUP) or</li> </ul> <p>Consult label for rotation limitations.</p> <p><i>Endosulfan</i> 3 EC, 0.66 to 1.33 qt. (1 day) (RUP) or <i>Fulfill</i>, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality or <i>Leverage</i> 360, 3.8 to 4.1 fl oz. (7 days) (RUP) or <b>Malathion</b></p> <ul style="list-style-type: none"> <li>• <i>Malathion</i> 5, or <i>Malathion</i> 5 EC (1 pt.) or <i>Malathion</i> 57 EC (1 to 1.5 pt.) or <i>Malathion</i> 8 (0.75 to 3.5 pt.) (3 days) or</li> </ul> <p><b>Methomyl</b></p> <ul style="list-style-type: none"> <li>• <i>Lannate</i> LV (0.75 to 3 pt.) or <i>Lannate</i> SP (0.25 to 1 lb.) (5 days) (RUP)</li> <li>• <i>Nudrin</i> LV (0.75 to 3 pt.) or <i>Nudrin</i> SP (0.25 to 1 lb.) (5 days) (RUP) or</li> </ul> <p><i>Movento</i>, 4 to 5 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties. or <i>Venom</i> 20 SG, 0.44 to 0.895 lb.. (1 day) or <i>Voliam Flexi</i>, 4 to 7 oz. (1 day)</p> <p><b>MITES</b></p> <p>Apply if needed to avoid foliar injury.</p> <p><i>Agri-Mek</i> 0.15 EC, 8 to 16 fl oz. (7 days) (RUP) or</p> <p><b>Bifenthrin</b></p> <ul style="list-style-type: none"> <li>• <i>Bifenture EC</i>, <i>Brigade</i> 2EC, <i>Capture</i> 2 EC, 5.1 to 6.4 oz. (7 days) (RUP) or</li> </ul> <p><b>Fenpyroximate</b></p> <ul style="list-style-type: none"> <li>• <i>Portal</i>, 2.0 pt. (1 day) Do not make more than 2 applications per season; do not apply more than 4 pt. per season. or <i>Hero</i>, 10.3 oz. (7 days) (RUP) or <i>Oberon</i> 2 SC, 7 to 8.5 fl oz. (7 days) or <i>Trithion</i> 8 EC, 1/2 to 1 pt. (7 days) or <i>Vydate</i> L, 1 to 2 qt. (1 day) Repeat in 1 to 3 weeks if needed. (RUP) or</li> </ul>
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## Eggplant

Zeal, 2 to 3 oz. (7 days)

## DISEASES

### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Phytophthora* spp., *Rhizoctonia solani*):** Apply to seed as slurry or dust. Use only as directed; overtreatment may cause injury.

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).

or

Thiram

- Thiram 50 WP Dyed, 6 oz/100 lb seed.

or

Thiram

- 42-S Thiram, 6 1/2 oz/100 lb seed.

- Thiram 50 WP Dyed, 6 oz/100 lb seed.

### SEEDBED TREATMENT:

**DAMPING OFF (*Pythium* spp.), CROWN ROT (*Phytophthora capsici*):**

Ridomil must be applied to the soil before the plants are infected with *Phytophthora* to obtain satisfactory disease control.

Mefenoxam

- Ridomil Gold SL, 1 pt. (7 days)
- Ridomil Gold WSP, 1 lb. (7 days)
- Ultra Flourish, 2 pt. (7 days)

Incorporate mechanically before planting or move into root zone after planting with 1/2 to 1 inch sprinkler water. For banded applications, use 12 to 16 inch band.

After initial application, 2 supplemental post-directed applications at 1 lb (Ridomil Gold WSP) or 1 pt (Ridomil Gold EC) should be made at 30-day intervals. Spray should be directed at the base of the plants and cover 6 to 8 inches of soil on either side of the plants. Ridomil Gold must be moved into the root zone mechanically or by sprinkler irrigation. Spray may be applied with liquid fertilizer shanked in as a band treatment to either side of the plant. The foliar blight phase of *Phytophthora* cannot be controlled with foliar applications of Ridomil Gold.

Note: Observe limit of active ingredient/crop on label.

### PREPLANT SOIL FUMIGATION:

**FUSARIUM, VERTICILLIUM WILT, PHYTOPHTHORA spp:** Preplant treatment (production fields). Most fumigants applied to the soil to control disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

1,3 Dichloropropene/chloropicrin

- Telone C35, 13-35 gal. (RUP)  
or

Metam Sodium

- Sectagon 42, Vapam HL, 37.5-75 gal.  
or

Potassium N-methylidithiocarbamate

- Sectagon-K54, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at

epa.gov/fumiganttoolbox. Michigan soil fumigant distributors can provide e-templates for the management plans.

### DRIP APPLICATION:

**PHYTOPHTHORA CROWN ROT (*Phytophthora* spp.):**

\* Fluopicolide

- Presidio, 3-4 fl oz. (2 days)

### FOLIAR TREATMENT:

**ALTERNARIA BLIGHT (*Alternaria melongenae*), ANTHRACNOSE (*Colletotrichum melongenae*):** Treat every 7 to 10 days after disease first appears.

\* Azoxystrobin. Anthracnose only.

- Amistar, 2 to 5 oz every 7 - 14 days. (0 days)

- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Boscalid

- Endura, 2.5 to 3.5 oz (alternaria blight only). (0 days)

or

\* Maneb

- Maneb 75 DF, Maneb 80 WP, 1 1/2 to 2 lb. (5 days)

- Manex, 1 1/5 to 1 3/5 qt. (5 days)

or

\* Trifloxystrobin

- Flint, 2 to 3 oz. (3 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

or

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days)

or

Copper Hydroxide

- Champ Formula 2 F, Nu-Cop 3 L, 1 1/3 pt. (0 days)

- Champion WP, Nu-Cop 50 DF, 2 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.75-1.5 lb. (0 day)

or

Copper Sulfate

- Basicop 53 WP, 3 to 4 lb. (0 days)

- Cuprofix Ultra, 1.25 lb. (0 days)

or

Pyraclostrobin

- Cabrio, 8 to 12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

**PHOMOPSIS BLIGHT (*Phomopsis vexans*):** Treat every 7 to 10 days after disease first appears.

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days)

or

Copper Hydroxide

- Champ Formula 2 F, Nu-Cop 3 L, 1 1/3 pt. (0 days)

- Champion WP, Nu-Cop 50 DF, 2 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.75-1.5 lb. (0 day)

or

Copper Sulfate

- Basicop 53 WP, 3 to 4 lb. (0 days)

- Cuprofix Ultra, 1.25 lb. (0 days)

### PHYTOPHTHORA CROWN ROT:

\* Dimethomorph

- Forum, 6 fl oz. (0 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## Garden Greens

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### INSECTS

#### PLANTING TREATMENT:

##### APHIDS:

- Imidacloprid. See label for application methods.
- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 oz. (21 days)  
or  
*Platinum*, 5 to 11 fl oz. (30 days) See label for application methods.

##### CABBAGE MAGGOT:

###### Chlorpyrifos

- *Lorsban 15 G* (4.6 to 9.2 oz per 1,000 ft of row) or *Lorsban 4 E / Lorsban Advanced* (1.6 to 2.75 fl oz / 1,000 ft of row) Apply in a 4-inch band over row at time of seeding. Use only as directed.  
Brassica greens only. (RUP)

##### FLEA BEETLE, THRIPS:

- Platinum*, 5 to 11 fl oz. (30 days)

##### APHIDS, FLEA BEETLES, and THRIPS:

- Belay*, 9 to 12 fl oz. (21 days)

##### APHIDS, CABBAGE "WORM", FLEA BEETLE, LOOPERS:

- Durivo*, 10 to 13 fl oz. (30 days)

#### FOLIAR TREATMENT:

**FLEA BEETLE:** Apply when damage is first seen on young plants. Repeat as needed.

- Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.  
or  
*Asana XL*, 5.8 to 9.6 oz. (7 days) Collards only. (RUP)  
or  
*Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) Mustard greens only. (RUP)  
or  
*Belay*, 3 to 4 fl oz. (21 days)  
or  
*Bifenture EC*, 2.1 to 6.4 oz. (7 days) Brassica greens only. (RUP)  
or  
Carbaryl
  - *Sevin 80 S* (1 1/4 lb) or *Sevin XLR Plus* (1 qt) (14 days)  
or
- Cypermethrin
  - *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) (RUP)  
or
- Imidacloprid
  - *Admire Pro*, 1.3 fl oz. (7 days)
  - *Nuprid 1.6 F*, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.  
or  
*Leverage 360*, 3 fl oz. (7 days) (RUP)  
or  
*Lorsban 50 W*, 2 lb. (21 days) Collards, kale and kohlrabi only. (RUP)  
or  
*Mustang Max*, 2.2 to 4.0 oz. (1 day) (RUP)  
or  
*Pyrellin EC*, 1 to 2 pt. (0 days)  
or  
*Pyrenone*, 2 to 12 oz. (0 days)

##### CUTWORM, LOOPERS: Apply as needed.

- \* *Asana XL*, 9.6 oz. (7 days) Collards and mustard greens only. (RUP)  
or  
\* *Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) Mustard greens only. (RUP)  
or

##### \* Cypermethrin

- *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) Brassica greens only. (RUP)  
or

##### \* Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) Non-Brassica greens only. (RUP)
- *Perm-UP 3.2 EC* (4 to 8 oz) or *Pounce 25 WP* (6.4 to 12.8 oz) (1 day) Chard and non-Brassica greens only. (RUP)  
or

##### *Avaunt*, 2.5 to 3.5 oz. (3 days)

- or  
*Brigadier*, 4.2 to 6.1 fl oz. (7 days) Brassica greens only. (RUP)  
or  
*Endosulfan 3 EC*, 1 qt. (21 days) Collards, kale and mustard greens only. (RUP)  
or

##### *Entrust*, 1 to 2 oz. (1 day)

- or  
*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or  
*Larvin 3.2 EC*, 16 to 30 oz. (14 days) Cress, dandelion, endive, parsley and Swiss chard (consult label for a complete list).

##### *Lorsban 50 W*, 2 lb. (21 days) Collards, kale and kohlrabi only. (RUP) or

##### *Mustang Max*, 3.2 to 4.0 oz. (1 day) (RUP) or

##### *Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season. or

##### *Vetica*, 12.0 to 17.0 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

##### **CABBAGE "WORM":** Apply when feeding damage is seen. Repeat as needed.

##### *Asana XL*, 9.6 oz. (7 days) Collards and mustard greens only. (RUP) or

##### *Avaunt*, 2.5 to 3.5 oz. (3 days)

##### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)  
or

##### *Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) Mustard greens only. (RUP) or

##### *Brigadier*, 4.2 to 6.1 fl oz. (7 days) Brassica greens only. (RUP) or

##### Carbaryl

- *Sevin 80 S* (1 1/4 lb) or *Sevin XLR Plus* (1 to 2 qt) (14 days)  
or

##### *Confirm 2F*, 6 to 8 fl oz. (7 days)

##### Cypermethrin

- *Ammo 2.5 EC*, *UP-Cyde 2.5 EC*, 2.5 to 5 oz. (1 day) Brassica greens only. (RUP)  
or  
*Dibrom 8 Emulsive*, 1 pt. (1 day) Collards and kale only. (RUP)  
or

##### *Endosulfan 3 EC*, 1 qt. (21 days) Collards, kale and mustard greens only. (RUP) or

##### *Entrust*, 1 to 2 oz. (1 day)

- or  
*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or  
*Larvin 3.2 EC*, 16 to 30 oz. (14 days) Cress, dandelion, endive, parsley and swiss chard (consult label for a complete list).

##### *Leverage 360*, 3 fl oz. (7 days) (RUP) or

## Garden Greens

Lorsban 50 W, 2 lb. (21 days) Collards, kale and kohlrabi only.  
(RUP)  
or  
Malathion 57 EC, 1 qt. (7 days)  
or  
Methomyl  
• Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (10 days) (RUP)  
• Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (10 days) (RUP)  
or  
Mustang Max, 2.2 to 4.0 oz. (1 day) (RUP)  
or  
Permethrin  
• Ambush 25 W, 6.4 to 12.8 oz. (1 day) Non-Brassica greens only.  
(RUP)  
• Perm-UP 3.2 EC (4 to 8 oz) or Pounce 25 WP (6.4 to 12.8 oz) (1 day) Chard and non-Brassica greens only. (RUP)  
or  
Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or  
Vetica, 12.0 to 17.0 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

**APHIDS: Apply as needed to avoid infestations on leaves at harvest.**

- \* Assail 30 SG, 1.9 to 2.8 oz. (7 days) Do not use if Imidacloprid was used at planting.  
or  
\* Fulfill, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.
- \* Imidacloprid
  - Admire Pro, 1.3 fl oz. (7 days)
  - Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.  
or
- Actara, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.  
or  
Belay, 3 to 4 fl oz. (21 days)  
or  
Beleaf 50 SG, 2 to 2.8 oz. (0 days)  
or  
Brigadier, 4.2 to 6.1 fl oz. (7 days) Brassica greens only. (RUP)  
or  
Dibrom 8 Emulsive, 1 pt. (1 day) Collards and kale only. (RUP)  
or  
Dimethoate 2.67 EC, 0.75 pt. (14 days)  
or  
Endosulfan 3 EC, 1 qt. (21 days) Collards, kale and mustard greens only. (RUP)  
or  
Malathion 57 EC, 1 qt. (7 days) Collards, kale and mustard greens only.  
or  
Movento, 4.0 to 5.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.  
or  
Pyrellin EC, 1 to 2 pt. (0 days)  
or  
Pyrenone, 2 to 12 oz. (0 days)

### CUTWORM, EUROPEAN CORN BORER:

Bifenture EC, 2.1 to 6.4 oz. (7 days) Brassica greens only. (RUP)  
or  
Vetica, 12.0 to 17.0 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

### CATERPILLARS:

Confirm 2F, 6 to 8 fl oz. (7 days)  
or  
Leverage 360, 3 fl oz. (7 days) (RUP)  
or

### Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (10 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (10 days) (RUP)  
or  
Synapse WG, 2 to 3 oz. (1 day)

## MITES

May be a problem in hot, dry weather.

### Bifenthrin

- Bifenture EC, 5.1 to 6.4 oz. (7 days) Brassica greens only. (RUP)  
or  
Naled
  - Dibrom 8 Emulsive, 1 pt. (1 day) Collards and kale. (RUP)

## SLUGS

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF (*Rhizoctonia* spp., *Pythium* spp.):

##### Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or  
Captan

- Captan 30-DD, 9 1/2 oz/100 lb seed. Swiss chard.
- Captan 30-DD, 1 1/4 oz/100 lb seed. Collards, kale, mustard.
- Captan 400, 10 to 12 oz/100 lb seed. Swiss chard.
- Captan 400, 1 to 2 oz/100 lb seed. Mustard.  
or  
Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only. Collards, endive, kale, swiss chard.  
or  
Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

### SEEDBED TREATMENT:

#### CLUBROOT (*Plasmodiophora brassicae*):

##### Fluazinam

- Omega 500 F, 2.6 pt. (50 days)

### PREPLANT INCORPORATED:

#### DAMPING OFF (*Pythium* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into seed zone after planting with 1/2 to 1 in. of sprinkler irrigation. Endive and Swiss chard only).

- Ridomil Gold GR, 20 to 40 lb.
- Ridomil Gold WSP, 1 to 2 lb.

### TRANSPLANT DRENCH:

#### CLUBROOT (*Plasmodiophora brassicae*):

##### Fluazinam

- Omega 500 F, 6.45 fl oz. (50 days)

**FOLIAR TREATMENT:**

**BOTRYTIS GRAY MOLD (*Botrytis spp.*): Apply 7 days following transplanting. Repeat applications when plants are half, mature. Do not apply to wilted plants or seedlings.**

**\* DCNA**

- Botran 75 W, 2 2/3 lb (endive, escarole). (14 days)

**DOWNTY MILDEW (*Peronospora parasitica*): Apply as needed to maintain control.**

**\* Fosetyl-Aluminum**

- Alette WDG, 2 to 5 lb at 7- to 21-day intervals. (3 days) Collards, kale, mustard greens, endive, escarole, Swiss chard. Note: Do not tank mix with copper fungicides.  
or

**Acibenzolar-S-methyl**

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.  
or

**Dimethomorph**

- Forum, 6 fl oz. (7 days)  
or

**Mandipropamid**

- Revus, 8 fl oz. (1 day)  
or

**Mono-, dibasic sodium salts of phosphorous acid**

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.  
(0 days)  
or

**Mono-, dibasic sodium, potassium and ammonium phosphites**

- Phostrol, 2.5 to 5 pt every 7 - 21 days. (0 days)

**Note:** Fungicides that protect against Alternaria also provide limited downy mildew protection.

**CERCOSPORA LEAF SPOT (*Cercospora beticola*):****\* Azoxystrobin**

- Amistar, 2 to 5 oz. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

**\* Difenoconazole/Cyprodinil**

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

**\* Trifloxystrobin**

- Flint, 2 to 3 oz. (7 days) Swiss chard only.

Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.  
or

**Pyraclostrobin**

- Cabrio, 12-16 oz. (3 days) Do not apply more than one application before alternating with another chemical.  
or

**Tebuconazole**

- Folicur 3.6F, 3-4 fl oz. (7 days) Maximum 16 fl oz/acre/season. 12 hr REI.

**ALTERNARIA LEAF SPOT (*Alternaria cucumerina*):****\* Azoxystrobin**

- Amistar, 2 to 5 oz. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

**\* Azoxystrobin/Difenconazole**

- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.  
or

**\* Difenconazole/Cyprodinil**

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

**\* Maneb**

- Maneb 75 DF, Maneb 80 WP, 1 1/2 to 2 lb. (10 days) Kale only.
- Manex, 1.2 to 1.6 qt. (10 days) Kale only.  
or

**Copper Hydroxide**

- Kocide 2000, 3/4 to 1 1/2 lb. (0 days) Mustard greens and Collards only.
- Kocide 3000, 0.5-0.75 lb. (0 day)  
or

**Cyprodinil/Fludioxonil**

- Switch 62.5 WG, 11 to 14 oz. (7 days)  
or

**Pyraclostrobin**

- Cabrio, 12-16 oz. (3 days) Do not apply more than one application before alternating with another chemical.  
or

**Tebuconazole**

- Folicur 3.6F, 3-4 fl oz. (7 days) Maximum 16 fl oz/acre/season. 12 hr REI.

## Garlic

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

**SOIL TREATMENT:**

**BULB and STEM NEMATODE:** Garlic is an excellent host for the bulb and stem nematode but there are no labeled chemical options for its control on this crop. If garlic plantings exhibit symptoms, submit leaves and bulbs for nematode analyses. If bulb and stem nematodes are detected, a management plan will be provided. These nematodes can be difficult to detect in the soil, so it is always best plant tissue samples are submitted for proper diagnoses.

## INSECTS

**FOLIAR TREATMENT:****LOOPERS, ARMYWORM: Apply as needed.****\* Cypermethrin**

- Ammo 2.5 EC, UP-Cyde 2.5 EC, 2 to 5 oz. (7 days) (RUP)  
or

**\* Mustang Max, 2.2 to 4.0 oz. (7 days) (RUP)****\* Permethrin**

- Ambush 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
- Perm-UP 3.2 EC (6 to 12 oz) or Pounce 25 WP (9.6 to 19.2 oz) (1 day) (RUP)  
or

**Bacillus thuringiensis**

- Agree, Biobit, Dipel, Javelin, Xentari, . (0 days)  
or

Entrust, 1 to 2 oz. (1 day) Do not apply more than 9 oz per acre per crop. Do not make more than 5 applications per year.  
or

Radiant SC, 5 to 10 fl oz. (1 day) Do not make more than 5 applications or exceed 30 fl oz/acre per season.

**APHIDS: Apply as needed.**

- Malathion 57 EC, 1 1/2 to 2 pt. (3 days)

## **Garlic**

### **THRIPS: Apply as needed.**

- \* Cypermethrin
- *Ammo* 2.5 EC, *UP-Cyde* 2.5 EC, 4 to 5 oz. (7 days) (RUP)  
or  
• *Mustang Max*, 2.9 to 4.0 oz. (7 days) (RUP)  
or  
*Entrust*, 1.25 to 2.5 oz. (1 day)  
or  
*Malathion* 57 EC, 1 1/2 to 2 pt. (3 days)  
or  
Permethrin
  - *Ambush* 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
  - *Perm-UP* 3.2 EC (6 to 12 oz) or *Pounce* 25 WP (9.6 to 19.2 oz) (1 day) (RUP)  
or  
*Pyrellin* EC, 1 to 2 pt. (0 days)  
or  
*Pyrenone*, 2 to 12 oz. (0 days)  
or  
*Radiant* SC, 6 to 10 fl oz. (1 day) Do not make more than 5 applications or exceed 30 fl oz/acre per season.

### **ARMYWORM:**

- Methomyl
- *Lannate* LV (1.5 pt.) or *Lannate* SP (0.5 lb.) (7 days) (RUP)
- *Nudrin* LV (1.5 pt.) or *Nudrin* SP (0.5 lb.) (7 days) (RUP)

## **DISEASES**

### **SEED TREATMENT:**

**WHITE ROT (*Sclerotium cepivorum*):** Apply a uniform mist spray.  
For best results use a commercial sticker to the spray solution.

- PCNB
  - *Terraclor* 75 WP, 13 1/2 lb/1000 lb of "seed" cloves.
  - *Terraclor* F, 2.5 gal/1000 lb of "seed" cloves.

### **PLANTING TREATMENT:**

#### **DAMPING OFF (*Pythium* spp.):**

- Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. or sprinkler irrigation.
- *Ridomil* Gold SL, 0.5-1 pt.
- *Ultra Flourish*, 1 to 2 pt.

**WHITE ROT (*Sclerotium cepivorum*):** Apply as an in-furrow spray at planting.

- DCNA
  - *Botran* 75 W, 2 2/3 to 5 1/3 lb. The use of a spreader/sticker is not recommended. Do not make more than one application per season.  
or  
*Iprodione*
  - *Iprodione* 4L AG, *Rovral* 4 F, 4 pt. Note: See label for permissible crop rotation.  
or

- PCNB
  - *Blocker* 4 F, 29 oz/1000 row feet.
  - *Terraclor* 2 E, 10 gal.
  - *Terraclor* 75 WP, 27.5 lb.
  - *Terraclor* F, 5 gal.  
or

- Thiophanate-Methyl
  - *Topsin* 4.5 FL, 40 fl oz.

### **FOLIAR TREATMENT:**

**BOTRYTIS LEAF BLIGHT (*Botrytis* spp.), PURPLE BLOTCH (*Alternaria porri*):**

- \* Azoxystrobin
  - *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)
  - *Quadris*, 6.2 to 15.4 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

  - \* Azoxystrobin/Propiconazole
    - *Quilt*, 14 to 27.5 fl oz. (14 days)  
or
  - \* Boscalid
    - *Endura*, 6.8 oz. (7 days)  
or
  - \* Chlorothalonil
    - *Bravo Ultrex*, 0.9 to 2.7 lb. (7 days)
    - *Bravo Weather Stik*, *Bravo Weather Stik Zn*, *Echo* 720, *Equus* 720 SST, 1 to 3 pt. (7 days)
    - *Echo* 90 DF, 1.2 to 2.4 lb every 7 days. (7 days)
    - *Equus* DF, 0.9 to 2.7 lb. (7 days)  
or
  - \* Mancozeb
    - *Dithane* DF Rainshield, *Dithane* M-45, 3 lb. (7 days)
    - *Dithane* F-45 Rainshield, 2.4 qt. (7 days)
    - *Manzate* Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs.
    - *Penncozeb* 4 F, 1.6 to 2.4 qt. (7 days)
    - *Penncozeb* 75 DF, *Penncozeb* 80 WP, 2 to 3 lb. (7 days)  
or
  - \* Maneb
    - *Maneb* 75 DF, *Maneb* 80 WP, 2 to 3 lb. (7 days)
    - *Manex*, 3.2 to 4.8 pt. (7 days)  
or
  - \* Pyraclostrobin
    - *Cabrio*, 8-12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.  
or
  - \* Pyraclostrobin/Boscalid
    - *Pristine*, 14.5 to 18.5 oz for *Botrytis*, 10.5 to 18.5 oz for *Alternaria*. (7 days)  
or
  - DCNA
    - *Botran* 75 W, 2 2/3 to 5 1/3 lb. (14 days) The use of a spreader/sticker is not recommended. Do not make more than one application per season.  
or
  - Difenoconazole/Cyprodinil
    - *Inspire Super*, 16 to 20 fl oz. (7 days)  
or
  - Fenamidone
    - *Reason* 500 SC, 5.5 fl oz every 5 to 10 days. (7 days) Purple blotch only.  
or
  - Neem Oil
    - *Trilogy*, 2 pt. (0 days)  
or
  - Propiconazole
    - *Propimax* EC, 4 fl oz. (14 days)
    - *Tilt*, 4-8 fl oz. (14 days)  
or
  - Pyrimethanil
    - *Scala*, 18 fl oz. (7 days) 12 hr REI.

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**BACTERIAL BLIGHT (*Erwinia carotovora* subsp. *carotovora*, *Pseudomonas* spp.):** Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foliar phytotoxicity.

Copper Hydroxide

- Champ DP, 2/3 to 1 lb. (0 days)
- Champ Formula 2 F, 2/3 to 1 pt. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)  
or

Copper Sulfate

- Cuprofix Ultra, 1.25 to 3 lb. (0 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

**DOWNTY MILDEW (*Peronospora destructor*):** Apply after the 4-leaf stage.

\* Dimethomorph

- Forum, 6 fl oz. (0 days)  
or

\* Mancozeb

- Dithane DF Rainshield, Dithane M-45, 3 lb. (7 days)
- Dithane F-45 Rainshield, 2.4 qt. (7 days)
- Manzate Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs.
- Penncozeb 4 F, 1.6 to 2.4 qt. (7 days)
- Penncozeb 75 DF, Penncozeb 80 WP, 2 to 3 lb. (7 days)  
or

\* Maneb

- Manex, 3.2 to 4.8 pt. (7 days)  
or

\* Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 2 lb. (7 days) Maximum 4 applications.  
or

\* Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 lb. (10 days) Maximum 4 applications.  
or

\* Mefenoxam/Mancozeb

- Ridomil Gold MZ, 2 1/2 lb. (7 days) Maximum 4 applications.  
or

Azoxystrobin

- Amistar, 3 to 5 oz every 5 - 7 days. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Chlorothalonil

- Quadris Opti, 2.4 to 3.6 pt. (7 days)  
or

Chlorothalonil. Downy mildew suppression.

- Bravo Ultrex, 0.9 - 2.7 lb every 7 to 10 days. (7 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1 to 3 pt. (7 days) Downy mildew suppression.
- Bravo Weather Stik Zn, 1.5 to 3 pt every 7 to 10 days. (7 days)
- Echo 90 DF, 1.2 to 2.4 lb every 7 days. (7 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or

Fenamidone

- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)  
or

Mandipropamid

- Revus, 8 fl oz. (7 day)  
or

Mono-, dibasic sodium, potassium and ammonium phosphites

- Prophyt, 4 pt. (0 days)  
or

Neem Oil

- Trilogy, 2 pt. (0 days)  
or

Potassium phosphite/chlorothalonil

- Catamaran, 4-7 pt. (7 days)  
or

Pyraclostrobin

- Cabrio, 12 oz. (7 days) Do not apply more than one application before alternating with another chemical.  
or

Pyraclostrobin/Boscalid

- Pristine, 18.5 oz (suppression). (7 days)

**Note:** Most fungicides that protect against purple blotch or Botrytis leaf blight may also provide limited downy mildew protection.

**WHITE ROT (*Sclerotium cepivorum*):**

\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 to 3.2 pt. (7 days)  
or

Tebuconazole

- Folicur 3.6F, 20.5 fl oz in 4-6 inch band. 12 hr REI.

**PURPLE BLOTCH (*Alternaria porri*):**

\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 to 3.2 pt. (7 days)  
or

\* Azoxystrobin/Propiconazole

- Quilt (14 to 27.5 fl oz) or Quilt Xcel (14 to 21 fl oz) (14 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or

Potassium phosphite/chlorothalonil

- Catamaran, 4-7 pt. (7 days)  
or

Tebuconazole

- Folicur 3.6F, 4-6 fl oz. (7 days) Maximum 12 fl oz/acre/season. 12 hr REI.

**ALTERNARIA BLIGHT (*Alternaria* spp.), BOTRYTIS LEAF BLIGHT (*Botrytis* spp.):**

\* Azoxystrobin/Difenoconazole

- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.

**BOTRYTIS LEAF BLIGHT (*Botrytis* spp.):**

\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 to 3.2 pt. (7 days)  
or

\* Azoxystrobin/Propiconazole

- Quilt Xcel, 17.5 to 26 fl oz. (14 days)

## Leeks

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Leeks are hosts for root-knot nematodes. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). Management of root-knot nematodes can be accomplished by using crop rotation. The benefits of utilizing nematicides for leeks grown in Michigan are undetermined at this time.

## INSECTS

### SEED TREATMENT:

None presently registered.

## Leeks

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### SOIL TREATMENT:

ONION MAGGOT: No insecticides are registered for this use.

Onion maggots are not as serious in leeks as they are in onions. Avoid planting leeks near onions that had onion maggot problems the previous year. Plant as late as is practical to reduce early-season problems.

### FOLIAR TREATMENT:

CUTWORM, ARMYWORM: Apply banded over the row.

Bacillus thuringiensis

- Agree, Biobit, Dipel, Javelin, Mattch, MVP II, Xentari, . (0 days)

or

Entrust, 1 to 2 oz. (1 day) Do not apply more than 9 oz per acre per crop. Do not make more than 5 applications per year.

or

Mustang Max, 2.2 to 4.0 oz. (7 days) (RUP)

or

Pyrellin EC, 1 to 2 pt. (0 days)

or

Pyrenone, 2 to 12 oz. (0 days)

or

Radiant SC, 5 to 10 fl oz. (1 day) Do not make more than 5 applications or exceed 30 fl oz/acre per season.

### THRIPS:

Entrust, 1 to 2 oz. (1 day) Suppression only. Do not apply more than 9 oz per acre per crop. Do not make more than 5 applications per year.

or

Mustang Max, 1.9 to 4.0 oz. (7 days) (RUP)

or

Pyrellin EC, 1 to 2 pt. (0 days)

or

Pyrenone, 2 to 12 oz. (0 days)

or

Radiant SC, 6 to 10 fl oz. (1 day) Do not make more than 5 applications or exceed 30 fl oz/acre per season.

## DISEASES

### SOIL TREATMENT:

#### DAMPING OFF (*Pythium* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold SL, 0.5-1 pt.
- Ultra Flourish, 1 to 2 pt.

### GREENHOUSE PREPLANT INCORPORATION:

#### DAMPING OFF (*Pythium* spp.), ROOT ROT (*Rhizoctonia* spp.):

Gliocladium virens GL-21

- SoilGard 12 G, 1 to 1.5 lb per cubic yard.

Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

### FOLIAR TREATMENT:

BACTERIAL BLIGHT (*Erwinia carotovora* subsp. *carotovora*, *Pseudomonas* spp.): Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foliar phytotoxicity.

Copper Hydroxide

- Champ DP, 2/3 to 1 lb. (0 days)
- Champ Formula 2 F, 2/3 to 1 pt. (0 days)

or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

#### BOTRYTIS LEAF BLIGHT (*Botrytis squamosa*), PURPLE BLOTCH (*Alternaria porri*): Apply every 7 to 10 days after the 4 leaf stage.

\* Azoxystrobin

- Amistar, 2 to 5 oz every 7 - 14 days. (0 days)
- Quadris, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Propiconazole

- Quilt, 14 to 27.5 fl oz. (14 days)

or

\* Chlorothalonil

- Bravo Ultrex, 1.4 to 2.7 lb every 7 - 10 days. (14 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 3 pt every 7 to 10 days. (14 days)
- Bravo Weather Stik Zn, 1.5 to 3 pt. (14 days)
- Echo 90 DF, 1.2 to 2.4 lb. (14 days)

or

\* Difenoconazole/Cyproconazole

- Inspire Super, 16 to 20 fl oz. (7 days)

or

\* Pyraclostrobin

- Cabrio, 8-12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.

or

\* Pyraclostrobin/Boscalid

- Pristine, 14.5 to 18.5 oz for *Botrytis*, 10.5 to 18.5 oz for *Alternaria*. (7 days)

or

Boscalid

- Endura, 6.8 oz. (7 days)

or

Fenamidone

- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (7 days)

or

Neem Oil

- Trilogy, 2 pt. (0 days)

or

Propiconazole

- Propimax EC, 4 fl oz. (14 days)

- Tilt, 4-8 fl oz. (14 days)

or

Pyrimethanil

- Scala, 9 to 18 fl oz. (7 days)

#### DOWNTY MILDEW (*Peronospora destructor*): Apply every 7 to 10 days after the 4 leaf stage.

\* Dimethomorph

- Forum, 6 fl oz. (0 days)

or

\* Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 2 lb. (21 days) Maximum 3 applications.

or

\* Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 lb. (7 days) Maximum 3 applications.

or

Azoxystrobin

- Amistar, 3 to 5 oz every 5 - 7 days. (0 days)

- Quadris, 9.2 to 15.4 fl oz every 5 to 7 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Chlorothalonil

- Quadris Opti, 2.4 - 3.7 pt. (14 days)  
or  
Chlorothalonil. Downy mildew suppression.
- Bravo Ultrex, 1.4 to 2.7 lb every 7 - 10 days. (14 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 3 pt every 7 days. (14 days)
- Bravo Weather Stik Zn, 1.5 to 3 pt every 7 to 10 days. (14 days)
- Echo 90 DF, 1.2 to 2.4 lb every 7 days. (14 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or

Fenamidone

- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (7 days)  
or

Mandipropamid

- Revus, 8 fl oz. (7 day)  
or

Neem Oil

- Trilogy, 2 pt. (0 days)  
or

Potassium phosphite/chlorothalonil

- Catamaran, 4-7 pt. (7 days)  
or

Pyraclostrobin

- Cabrio, 12 oz. (7 days) Do not apply more than application before alternating with another chemical.  
or
- Pristine, 18.5 oz. (7 days)

**Note:** Most fungicides that protect against purple blotch or Botrytis leaf blight may also provide limited downy mildew protection.

**PURPLE BLOTCH (*Alternaria porri*):**

- \* Azoxystrobin/Chlorothalonil
- Quadris Opti, 1.6 to 3.2 pt. (7 days)  
or
- \* Azoxystrobin/Propiconazole
- Quilt Xcel, 14 to 21 fl oz. (14 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or
- Potassium phosphite/chlorothalonil
- Catamaran, 4-7 pt. (7 days)

**ALTERNARIA BLIGHT (*Alternaria spp.*):**

- \* Azoxystrobin/Difenoconazole
- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.

**BOTRYTIS LEAF BLIGHT (*Botrytis squamosa*):**

- \* Azoxystrobin/Chlorothalonil
- Quadris Opti, 1.6 to 3.2 pt. (7 days)  
or
- \* Azoxystrobin/Difenoconazole
- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.  
or
- \* Azoxystrobin/Propiconazole
- Quilt Xcel, 17.5 to 26 fl oz. (14 days)

## Lettuce

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Root-knot and root-lesion can reduce lettuce yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for lettuce, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot and root-lesion nematodes in lettuce production.

**FALL SOIL FUMIGATION (BROADCAST):**

Fumigate in the fall when soil temperatures at a 6 inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

1,3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).  
or

Metam Sodium

- Vapam HL, 37.5 to 75 gal/A. Use higher rate for muck soil injected with shanks spaced 5 inches apart or to a depth of 4 to 10 inches in well prepared soil. Follow immediately with a roller to smooth and compact surface. Light watering to the treated surface helps to prevent escape of gas.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

**INSECTS****SOIL TREATMENT:****CUTWORM:**

- 10% Sevin Granules, 20 lb. (14 days)

Diazinon

- Diazinon 50 W (4 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 fl oz.) Use only as directed. (RUP)

**FLEA BEETLE:**

Scorpion 35SL, 9 to 10.5 fl oz. (21 days) See label for application methods.

**APHIDS:**Imidacloprid

- Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 fl oz. (21 days)  
or

Venom 20 SG, 1.13 to 1.34 lb. (21 days) See label for application methods.

**LEAFHOPPERS, LEAF MINERS:**

Dinotefuran. See label for application methods.

- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)
- Venom (5 to 6 oz.) or Venom 20 SG (1.13 to 1.34 lb.) (21 days)

## Lettuce

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### LEAFHOPPERS:

#### Imidacloprid

- *Admire Pro*, 4.4 to 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 fl oz. (21 days)

### PLANTING TREATMENT:

#### APHIDS, LEAFHOPPER, FLEA BEETLE:

*Belay*, 9 to 12 fl oz. See label for application methods.  
or

#### Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) See label for application methods.

#### APHIDS, ARMYWORM, CABBAGE LOOPERS, FLEA BEETLE, LEAFHOPPERS:

*Durivo*, 10 to 13 fl oz. (30 days)

#### ARMYWORM, CABBAGE LOOPERS:

*Coragen*, 3.5 to 5 fl oz. (1 day) See label for application methods.

#### ARMYWORM, CUTWORM:

*Capture LFR*, 3.4 to 6.8 fl oz. Head lettuce only. See label for application methods. (RUP)

### FOLIAR TREATMENT:

#### CUTWORM, ARMYWORM: Apply when damage is first seen and repeat as needed.

- \* *Mustang Max*, 3.2 to 4 oz. (5 days) (RUP)

or

#### Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)

or

*Athena*, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)

or

#### Bifenthrin. Head lettuce only.

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)

- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

#### Bifenthrin + Imidacloprid. Head lettuce only.

- *Brigadier*, 5.1 to 6.1 fl oz. (7 days) (RUP)

- *Swagger*, 10.2 to 12.2 fl oz. (7 days) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) Head lettuce only. (RUP)

or

*Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.

#### ASTER LEAFHOPPERS:

- \* *Cypermethrin*. Head lettuce only.

- *Ammo 2.5 EC*, 2.5 to 5 fl oz.. (5 days) (RUP)

- *Cypermethrin*, 2.5 to 5 fl oz. (5 days) (RUP)

- *Holster*, 2.5 to 5 fl oz. (5 days) (RUP)

- *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (5 days) (RUP)

or

#### \* Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

- \* *Mustang Max*, 2.2 to 4 oz. (5 days) Head lettuce only. (RUP)  
or

#### \* Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP 25DF* (3.2 to 12.8 oz.) or *Perm-UP 3.2 EC* (2 to 8 oz.) (1 day) (RUP)

- *Pounce 25 WP*, 3.2 to 12.8 oz. (1 day) (RUP)  
or

#### Acephate. Crisphead type only.

- *Acephate 90 WDG*, or *Acephate 90 WSP* (8 to 17.6 oz.) or *Acephate 97* (8 to 16 oz.) or *Acephate 97 UP* (8 to 16 oz.) (21 days)

- *Bracket 97*, 8 to 16 oz. (21 days)

- *Orthene 97*, 8 to 16 oz. (21 days)

Do not apply more than 2.13 lb per season.

or  
*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11 oz/Acre per season

or  
*Athena*, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)

or  
*Baythroid XL*, 2.4 to 3.2 fl oz. (0 days) (RUP)  
or

#### Bifenthrin. Head lettuce only.

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)

- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)

- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

#### Bifenthrin + Imidacloprid. Head lettuce only.

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

- *Swagger*, 7.6 to 12.2 fl oz. (7 days) (RUP)  
or

#### Carbaryl

- *Carbaryl 4L*, 0.5 to 2 qt. (14 days)

- *Sevin 4 F* (0.5 to 2 qt.) or *Sevin 80 S* (0.63 to 2.5 lb.) or *Sevin 80 WSP* (0.67 to 2.5 lb.) or *Sevin XLR Plus* (0.5 to 2 qt.) (14 days)  
or

#### Dimethoate

- *Dimethoate 4 EC*, *Dimethoate 400*, *Dimethoate 4E*, 0.5 pt.. (14 days)  
Leaf lettuce only.

or

#### Dinotefuran

- *Scorpion 35SL*, 2 to 5.25 fl oz. (7 days)

- *Venom* (1 to 3 oz.) or *Venom 20 SG* (0.44 to 0.67 lb.) (7 days)  
or

#### Endosulfan. Consult label for number of applications and other limitations.

- *Endosulfan 3 EC*, 1 to 1.33 qt. (14 days) (RUP)

- *Thionex 3EC* (1 to 1.33 qt.) or *Thionex 50W* (1.5 to 2 lb.) (14 days)  
or

*Hero*, 4 to 10.3 oz. (7 days) Head lettuce only. (RUP)  
or

#### Imidacloprid

- *Admire Pro*, 1.3 fl oz. (7 days)

- *Nuprid 1.6 F*, 3.8 fl oz. (7 days)  
or

- *Leverage 360*, 3 fl oz. (7 days) (RUP)  
or

Malathion

- *Malathion* 5, *Malathion* 5 EC, *Malathion* 57 EC, *Malathion* 8, 2 pt. (7 days for head lettuce; 14 days for leaf lettuce)  
or

Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or  
*Steed*, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)  
or  
*Voliam Flexi*, 4 to 7 oz. (7 days)

**APHIDS:**

- \* *Assail* 30 SG, 1.9 to 2.8 oz. (7 days)

or

- \* *Fulfill*, 2.75 oz. (7 days) Do not exceed 5.5 oz/acre per season.  
May require 5 to 7 days for aphid mortality.

or

- \* Imidacloprid. Additional generic brands available.

- *Admire* Pro, 1.3 fl oz. (7 days)

- *Nuprid* 1.6 F, 3.8 fl oz. (7 days)

Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.  
or

Acephate. Chrishead only.

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz.) or *Acephate* 97 (8 to 16 oz.) or *Acephate* 97 UP (8 to 16 oz.) (21 days)

- *Bracket* 97, 8 to 16 oz. (21 days)

- *Orthene* 97, 8 to 16 oz. (21 days)

Do not apply more than 2.13 lb per season.  
or

- Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11 oz/acre per season.  
or

- Athena*, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)  
or

- Belay*, 3 to 4 fl oz. (21 days)  
or

- Beleaf* 50 SG, 2 to 2.8 oz. (0 days)  
or

Bifenthrin. Head lettuce only.

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

Bifenthrin + Imidacloprid. Head lettuce only.

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 7.6 to 12.2 fl oz. (7 days) (RUP)  
or

Diazinon

- *Diazinon* AG 500 (0.5 to 1 pt) or *Diazinon* AG600 (6.5 to 12.75 fl oz.) (14 days) (RUP)  
or

Dimethoate

- *Dimethoate* 4 EC, *Dimethoate* 400, *Dimethoate* 4E, 0.5 pt.. (14 days) Leaf lettuce only.  
or

Endosulfan. Consult label for number of applications and other limitations.

- *Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) (RUP)

- *Thionex* 3EC (1 to 1.33 qt.) or *Thionex* 50W (1.5 to 2 lb.) (14 days) (RUP)  
or

- Leverage* 360, 3 fl oz. (7 days) (RUP)  
or

Malathion

- *Malathion* 5, *Malathion* 5 EC, *Malathion* 57 EC, *Malathion* 8, 2 pt. (7 days for head lettuce; 14 days for leaf lettuce)  
or

Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

*Movento*, 4 to 5 fl oz. (3 days) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.  
or

- Pyrenone*, 2 to 12 oz. (0 days)  
or

- Venom* 20 SG, 0.44 to 0.67 lb. (7 days)  
or

- Voliam Flexi*, 4 to 7 oz. (7 days)

**TARNISHED PLANT BUG: Head lettuce only.**

- \* *Baythroid* XL, 2.4 to 3.2 fl oz. (0 days) (RUP)  
or

- \* Cypermethrin. Head lettuce only.

- *Ammo* 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)

- *Cypermethrin*, 2.5 to 5 fl oz. (5 days) (RUP)

- *Holster*, 2.5 to 5 fl oz. (5 days) (RUP)

- *UP-Cyde* 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)  
or

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)

- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or

- \* *Mustang Max*, 3.2 to 4 oz. (5 days) (RUP)  
or

- Athena*, 13.5 to 17 fl oz. (7 days) Head lettuce only. (RUP)  
or

- Beleaf* 50 SG, 2 to 2.8 oz. (0 days)  
or

Bifenthrin

- *Bifenthrin* 2EC AG, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Bifenture* EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Brigade* 2EC (5.12 to 6.4 fl oz.) or *Brigade* WSB (12.8 to 16 oz.) (7 days) (RUP)

- *Capture* 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Discipline* 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Fanfare* 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Sniper*, 5.12 to 6.4 fl oz. (7 days) (RUP)

- *Tundra* EC, 5.12 to 6.4 fl oz. (7 days) (RUP)  
or

Bifenthrin + Imidacloprid. Head lettuce only.

- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

- *Swagger*, 7.6 to 12.2 fl oz. (7 days) (RUP)  
or

Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (14 days)

## Lettuce

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- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (14 days) or  
*Hero*, 10.3 oz. (7 days) Head lettuce only. (RUP)

**CATERPILLARS:** Caterpillars (mainly cabbage loopers), are usually controlled with aster leafhopper program, but damage potential may require additional treatments.

- \* *Baythroid* XL, 1.6 to 2.4 fl oz. (0 days) (RUP)  
or
- \* Cypermethrin. Head lettuce only.
- *Ammo* 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
- *Cypermethrin*, 3.75 to 5 fl oz. (5 days) (RUP)
- *Holster*, 3.75 to 5 fl oz. (5 days) (RUP)
- *UP-Cyde* 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)  
or
- \* Permethrin
- *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)  
or

Acephate. Crisphead type only.

- *Acephate* 90 WDG, or *Acephate* 90 WSP (17.6 oz.) or *Acephate* 97 (16 oz.) or *Acephate* 97 UP (16 oz.) (21 days)
- *Bracket* 97, 16 oz. (21 days)
- *Orthene* 97, 16 oz. (21 days)  
or

*Athena*, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)

or  
*Avaunt*, 2.5 to 3.5 oz. (3 days)  
or

Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, . (0 days)  
or

Bifenthrin. Head lettuce only.

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

Bifenthrin + Imidacloprid. Head lettuce only.

- *Brigadier*, 5.1 to 6.1 fl oz. (7 days) (RUP)
- *Swagger*, 10.2 to 12.2 fl oz. (7 days) (RUP)  
or

Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (14 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (14 days)  
or

*Confirm* 2F, 6 to 8 fl oz. (7 days)  
or

*Coragen*, 3.5 to 5 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.  
or

Endosulfan. Consult label for numbers of applications and other restrictions.

- *Endosulfan* 3 EC, 1 to 1.33 qt. (14 days) (RUP)
- *Thionex* 3EC (1 to 1.33 qt.) or *Thionex* 50W (1.5 to 2 lb.) (14 days)  
(RUP)  
or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 21 days.  
or

Esfenvalerate

- *Adjourn*, 4.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 4.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 4.8 to 9.6 fl oz. (7 days) (RUP)  
or
- Hero*, 4 to 10.3 oz. (7 days) Head lettuce only. (RUP)  
or
- Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or
- Larvin* 3.2 EC, 16 to 30 oz. (14 days)  
or
- Leverage* 360, 3 fl oz. (7 days) (RUP)  
or

Malathion

- *Malathion* 5, or *Malathion* 5 EC (3 pt.) or *Malathion* 57 EC (2.5 to 3 pt.) or *Malathion* 8 (2 pt.) (7 days for head lettuce; 14 days for leaf lettuce)  
or

Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

*Proclaim*, 3.2 to 4.8 oz. (7 days) Head Lettuce only. (RUP)  
or

*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or

*Synapse* WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.  
or

*Voliam* Flexi, 4 to 7 oz. (7 days)

**VEGETABLE LEAFMINER:** Apply as soon as visible mines appear and repeat every 7 days as needed.

*Agri-Mek* 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

or  
*Athena*, 13.5 to 17 fl oz. (7 days) Head lettuce only. (RUP)  
or

*Coragen*, 5 to 7.5 fl oz. (1 day)  
or

Dimethoate

- *Dimethoate* 4 EC, *Dimethoate* 400, *Dimethoate* 4E, 0.5 pt.. (14 days) Leaf lettuce only.  
or

Dinotefuran

- *Scorpion* 35SL, 2 to 5.25 fl oz. (7 days)
- *Venom* (1 to 3 oz.) or *Venom* 20 SG (0.44 to 0.67 lb.) (7 days)  
or

*Entrust*, 2 to 3 oz. (1 day) Do not apply more than 3 times in 21 days.  
or

Permethrin

- *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)  
or

*Radiant* SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or

*Steed*, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)

- or  
Swagger, 10.2 to 12.2 fl oz. (7 days) Head lettuce only. (RUP)
- or  
Trigard, 2.66 oz. (7 days)

**CUTWORM:****\* Cypermethrin**

- Ammo 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
- Holster, 2.5 to 5 fl oz. (5 days) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- or

**\* Lambda-cyhalothrin**

- Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- or
- Empower, 3.5 to 8.7 lb. (7 days) Head lettuce only. (RUP)
- or

**Methomyl**

- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (7 days) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (7 days) (RUP)
- or
- Steed, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)

**FLEA BEETLE:****Actara**, 1.5 to 3 oz. (7 days)

or

**Athena**, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)

or

**Baythroid XL**, 2.4 to 3.2 fl oz. (0 days) (RUP)

or

**Belay**, 3 to 4 fl oz. (21 days)

or

**Bifenthrin**. Head lettuce only.

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade 2EC (2.1 to 6.4 fl oz) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- or

**Bifenthrin + Imidacloprid**. Head lettuce only.

- Brigadier, 5.1 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 12.2 fl oz. (7 days) (RUP)
- or

**Carbaryl**

- Carbaryl 4L, 0.5 to 1 qt. (14 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (14 days)
- or

**Cypermethrin**

- Ammo 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
- Holster, 2.5 to 5 fl oz. (5 days) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- or

**Imidacloprid**

- Admire Pro, 1.3 fl oz. (7 days)
- Nuprid 1.6 F, 3.8 fl oz. (7 days)
- or

**Lambda-cyhalothrin**

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)

- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- or
- Leverage 360, 3 fl oz. (7 days) (RUP)
- or
- Scorpion 35SL, 2 to 5.25 fl oz. (7 days)
- or
- Steed, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)
- or
- Voliam Flexi, 4 to 7 oz. (7 days)

**ARMYWORM:**

- \* Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- or

**\* Cypermethrin**

- Ammo 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 3.75 to 5 fl oz. (5 days) (RUP)
- Holster, 3.75 to 5 fl oz. (5 days) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
- or

**\* Lambda-cyhalothrin**

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- or

**Acephate**

- Acephate 90 WDG, or Acephate 90 WSP (17.6 oz.) or Acephate 97 (16 oz.) or Acephate 97 UP (16 oz.) (21 days)
- Bracket 97, 16 oz. (21 days)
- Orthene 97, 16 oz. (21 days)
- or

**Confirm 2F**, 6 to 8 fl oz. (7 days)

or

**Endosulfan**

- Endosulfan 3 EC, 1.33 qt. (14 days) (RUP)
- Thionex 3EC (1.33 qt.) or Thionex 50W (2 lb.) (14 days) (RUP)
- or

**Methomyl**

- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- or

Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

**Voliam Flexi**, 4 to 7 oz. (7 days)**SLUGS**

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

**DISEASES****SEED TREATMENT:****DAMPING OFF (*Rhizoctonia* spp., *Pythium* spp. *Botrytis* spp.):*****Bacillus subtilis* GB03**

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).
- or

**Fludioxinil**

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.
- or

**Thiram**

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

## Melons

### SEEDBED TREATMENT:

DAMPING OFF SEED and CROWN ROTS (*Rhizoctonia* spp., *Pythium* spp., *Botrytis* spp., *Sclerotinia sclerotiorum*):

Note: For seedbed protection programs, sterilize seedbed with steam or Chemicals (see Appendix A). Follow recommended procedures carefully.

### PLANTING TREATMENT:

#### PYTHIUM DAMPING OFF:

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold GR, 20 to 40 lb.
- *Ridomil* Gold WSP, 1 to 2 lb.
- *Ultra Flourish*, 2-4 pt.

### DRIP APPLICATION:

DOWNTY MILDEW (*Peronospora effusa*):

- \* Fluopicolide
- *Presidio*, 3-4 fl oz. (2 days)

### FOLIAR TREATMENT:

DROP (*Sclerotinia sclerotiorum* or *Sclerotinia minor*):

Boscalid

- *Endura*, 8 to 11 oz. (14 days)  
or

DCNA

- *Botran 75 W*, 2 to 3 1/3 lb. (14 days) Apply at 2 lb preemergence in a 4- to 6-inch band over the transplanted or seeded row. Make a second application of 3 1/3 lb immediately after thinning. Do not use more than 5 1/3 lb per acre per season. For a single application, apply 5 1/3 lb immediately after thinning.  
or

Iprodione

- *Rovral 4 F*, 1 1/2 to 2 pt. (14 days) Apply at 3-leaf stage to just after thinning and again in 10 days. Make a third application 10 days later if conditions for disease remain favorable.

Note: See label for permissible crop rotations.

BOTTOM ROT (*Rhizoctonia solani*):

Boscalid

- *Endura*, 8 to 11 oz (bottom rot suppression). (14 days)  
or

Iprodione

- *Rovral 4 F*, 1 1/2 to 2 pt. (14 days) Apply at 3-leaf stage to just after thinning and again in 10 days. Make a third application 10 days later if conditions for disease remain favorable.

Note: See label for permissible crop rotations.

DOWNTY MILDEW (*Bremia lactucae*):

\* Dimethomorph

- *Forum*, 6 fl oz. (0 days)  
or

\* Famoxadone/Cymoxanil

- *Tanos*, 8 oz. (3 days) Head Lettuce only.  
or

\* Fosetyl-Aluminum

- *Aliette WDG*, 2 to 5 lb at 7- to 21-day intervals. (3 days) Do not make more than 7 applications per season. Do not tank mix with copper fungicides.  
or

Azoxystrobin

- *Amistar*, 4 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 12.3 to 15.4 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Copper Hydroxide

- *Champ Formula* 2 F, 2/3 to 1 1/3 pt. (0 days)
- *Champion WP*, *Nu-Cop 50 DF*, 1 to 2 lb. (0 days)
- *Nu-Cop 3 L*, 2/3 to 2 2/3 pt. (0 days)

or

Cymoxanil

- *Curzate 60 DF*, 3.2 to 5 oz. (30 days) Do not apply more than 30 oz/acre/season.

or

Fenamidone

- *Reason 500 SC*, 5.5 to 8.2 fl oz every 5 to 10 days. (2 days)

or

Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

or

Mandipropamid

- *Revus*, 8 fl oz. (1 day)

or

Maneb

- *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 2 lb. (10 days) Do not apply more than 9.6 qt per season

- *Manex 4 F*, 1 1/5 to 1 3/5 qt. (10 days)

or

Mefenoxam

- *Ridomil Gold SL*, 0.125-0.25 pt. (7 days)

or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Phostrol*, 2.5 to 5 pt every 7 - 21 days. (0 days)

- *Prophyt*, 2 to 4 pt. (0 days)

or

Propamocarb

- *Previcur Flex*, 2 fl oz. (2 days)

or

Pyraclostrobin

- *Cabrio*, 16 oz. (0 days)

### SEEDLING DISEASES:

Propamocarb

- *Previcur Flex*, 2 fl oz. (2 days) Directed spray at lower portion of plant and surrounding soil, or via drip irrigation, transplant water or sprinklers.

## Melons

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Muskmelons and watermelons are hosts for root-knot and lesion nematodes. These nematodes can reduce melon yields but yield losses in Michigan have not been documented. If you suspect nematodes are reducing melon yields collect root and soil samples for analyses as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds; control options will be suggested. Vydate 2L is labeled for use in melons.

### INSECTS

#### SEED TREATMENT:

#### CUCUMBER BEETLE:

*Cruiser 5 FS*, . See label for rates and application methods.

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**SOIL TREATMENT:****APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:**

*Durivo*, 10 to 13 fl oz. (30 days)  
or

Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz) (30 days) See label for application methods.

**THRIPS, LEAFHOPPERS, SQUASH BUG:**

*Venom*, 5 to 6 oz. (21 days) See label for application methods.

**CUTWORM:**

10% *Sevin* Granules, 10 lb. (3 days)

or

*Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

or

Diazinon

- *Diazinon 50 W* (4 lb.) or *Diazinon AG 500* (2 to 4 qt.) or *Diazinon AG600* (51 to 102 fl oz.) Use only as directed. (RUP)

**CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS, SQUASH BUG, THRIPS:**

*Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)

**APHIDS, LEAFHOPPERS, THRIPS:**

*Venom 20 SG*, 1.13 to 1.34 lb. (21 days)

**SEED CORN MAGGOT:**

*Athena*, 8.5 to 17 fl oz. (RUP)

or

Bifenthrin. See label for application methods.

- *Brigade WSB*, 8 to 16 oz. (RUP)
- *Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

**FLEA BEETLE LARVAE:**

*Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods.  
(RUP)

**APHIDS, CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS:**

*Belay*, 9 to 12 fl oz. See label for application methods.

**APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THRIPS:**Imidacloprid

- *Admire Pro*, 7.0 to 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 16 to 24 fl oz. (21 days)

**FOLIAR TREATMENT:**

Melon plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat melons during bloom.

**CUTWORM: Apply if >1% of plants are injured.**

\* *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

Bifenthrin

- *Bifenthrin 2EC AG*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Empower*, 3.5 to 8.7 lb. (3 days) (RUP)
- *Fanfare 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- or  
\* Esfenvalerate
- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- or

\* Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (0 days) (RUP)
- or  
*Athena*, 7 to 17 fl oz. (7 days) (RUP)

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP)
- or  
*Methomyl*

- *Lannate LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

- *Nudrin LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- or  
*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

- or  
*Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.
- or  
*Vetica*, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

**STRIPED and SPOTTED CUCUMBER BEETLE:** Apply if numbers exceed 0.1 to 1/plant. Repeat as needed. Use preplant Furadan treatment in fields with severe problems.

*Assail 30 SG*, 2.5 to 5.3 oz. (0 days)

or  
*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or  
*Baythroid XL*, 2.4 to 2.8 fl oz. (0 days) (RUP)

or  
*Belay*, 3 to 4 fl oz. (21 days)

or  
Bifenthrin

- *Bifenthrin 2EC AG*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- or  
*Carbaryl*

- *Carbaryl 4L*, 1 qt. (3 days)
- *Sevin 4 F* (1 qt.) or *Sevin 80 S* (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)
- or  
*Danitol 2.4 EC*, 10.66 to 16 fl oz. (7 days) (RUP)

or  
Diazinon

- *Diazinon 50 W* (0.5 to 1.5 lb.) or *Diazinon AG 500* (0.5 to 1.5 pt.) (3 days) *Diazinon 50 W* for honeydew melons only. (RUP)
- or  
*Dinotefuran*

- *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- *Venom*, 3 to 4 oz. (1 day)
- or  
*Endosulfan*

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (2 days) (RUP)

## Melons

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- *Thionex* 3EC (0.66 to 1.33 qt.) or *Thionex* 50W (1 to 2 lb.) (4 days) (RUP)

or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

### Malathion 5, 2 pt. (1 day)

or

### Methomyl

- *Lannate LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

or

### Permethrin

- *Ambush* 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

or

### Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

### FLEA BEETLE: Apply if needed.

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.

or

### Belay, 3 to 4 fl oz. (21 days)

or

### Carbaryl

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)

or

### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC (0.66 to 1.33 qt.) or *Thionex* 50W (1 to 2 lb.) (4 days) (RUP)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

### Methomyl

- *Lannate LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

or

### Venom, 3 to 4 oz. (1 day)

or

### Voliam Flexi, 4 to 7 oz. (1 day)

### LEAFHOPPERS: Apply if insects and damage are present.

#### \* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 oz. (3 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

### Athena, 7 to 17 fl oz. (7 days) (RUP)

or

### Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

### Belay, 3 to 4 fl oz. (21 days)

or

### Bifenthrin

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

### Carbaryl

- *Carbaryl* 4L, 1 qt. (3 days)
- *Sevin* 4 F (1 qt.) or *Sevin* 80 S (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)

or

### Diazinon

- *Diazinon* 50 W (0.5 to 1.5 lb.) or *Diazinon* AG 500 (0.5 to 1.5 pt.) (3 days) *Diazinon* 50 W for honeydew melons only. (RUP)

or

### Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)

or

### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) or *Dimethoate* 4E (0.5 to 1 pt.) (3 days)

or

### Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom* 20 SG (0.44 to 0.895 lb.) (1 day)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

### Malathion 5, 2.5 to 2.75 pt. (1 day)

or

### Permethrin

- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

or

### Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

### APHIDS:

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.

or

### Assail 30 SG, 2.5 to 4 oz. (0 days)

or

### Athena, 7 to 17 fl oz. (7 days) (RUP)

or

### Belay, 3 to 4 fl oz. (21 days)

or

### Beleaf 50 SG, 2 to 2.8 oz. (0 days)

or

### Bifenthrin

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or
- Diazinon
  - Diazinon 50 W (0.5 to 1.5 lb.) or Diazinon AG 500 (0.5 to 1.5 pt.) (3 days) Diazinon 50 W for honeydew melons only. (RUP)
    - or
- Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)
  - or
- Dimethoate
  - Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) or Dimethoate 4E (0.5 to 1 pt.) (3 days)
    - or
- Endosulfan
  - Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
  - Thionex 3EC (0.66 to 1.33 qt.) or Thionex 50W (1 to 2 lb.) (4 days) (RUP)
    - or
- Fulfill, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.
  - or
- Lambda-cyhalothrin
  - Lambda-Cy, 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.92 fl oz.) or Warrior with Zeon Technology (3.84 fl oz.) (1 day) (RUP)
    - or
- Malathion
  - Malathion 5 (1.5 to 2 pt.) or Malathion 57 EC (1.5 pt.) (1 day)
    - or
- Methomyl
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
    - or
  - Venom 20 SG, 0.44 to 0.895 lb.. (1 day)
    - or
  - Voliam Flexi, 4 to 7 oz. (1 day)

**THrips: Apply when damage is seen. Repeat as needed.**

Athena, 13.5 to 17 fl oz. (7 days) (RUP)

orDiazinon

- Diazinon 50 W (0.5 to 1.5 lb.) or Diazinon AG 500 (0.5 to 1.5 pt.) (3 days) Diazinon 50 W for honeydew melons only. (RUP)
  - or

Dimethoate

- Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (1 pt.) or Dimethoate 4E (1 pt.) (3 days) Dimethoate 4E and 400 are not for thrips control on watermelons.
  - or

Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom (1 to 4 oz.) or Venom 20 SG (0.44 to 0.895 lb.) (1 day)
  - or

Entrust, 2 to 2.5 oz. (3 days)orLambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)or

Radiant SC, 6 to 10 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

**SQUASH BUG:**

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Belay, 3 to 4 fl oz. (21 days)

orBifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or

Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
  - or

Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)
  - or

Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC (0.66 to 1.33 qt.) or Thionex 50W (1 to 2 lb.) (4 days) (RUP)
  - or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - or

Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - or

Permethrin

- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
  - or
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**SQUASH VINE BORER:**

Athena, 7 to 17 fl oz. (7 days) (RUP)

orBifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or

Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC (0.66 to 1.33 qt.) or Thionex 50W (1 to 2 lb.) (4 days) (RUP)
  - or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

## Melons

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or  
Permethrin
- *Ambush 25 W*, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (0 days) (RUP)  
or  
Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)  
or  
Synapse WG, 2 to 3 oz. (1 day)  
or  
Vetica, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

### **SEED CORN MAGGOT:**

- *Empower*, 3.5 to 8.7 lb. (3 days) (RUP)

## MITES

Apply when needed. Watermelons are particularly susceptible. Usually a problem only in hot, dry weather.

- *Agri-Mek 0.15 EC*, 8 to 16 fl oz. (7 days) (RUP)  
or  
Bifenthrin

- *Bifenthrin EC*, *Brigade 2EC*, *Capture 2 EC*, 5.1 to 6.4 oz. (3 days) (RUP)  
or  
Danitol 2.4 EC, 10 2/3 fl oz. (7 days) (RUP)  
or  
Diazinon

- *Diazinon 50 W* (1 lb) or *Diazinon AG 500* (1 pt) (3 days) (RUP)  
or  
Fenpyroximate

- *Portal*, 2.0 pt. (1 day) Do not make more than 2 applications per season; do not apply more than 4 pt. per season.  
or  
Kelthane 35, 1 to 1 1/2 lb. (2 days)  
or  
Naled

- *Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)  
or  
Oberon 2 SC, 7 to 8.5 fl oz. (7 days)  
or  
Zeal, 2 to 3 oz. (7 days)

## SLUGS

*Deadline M-Ps 4%* (20 to 40 lb) or *Metaldehyde 3.5 G* (30 to 40 lb) Apply between rows. Avoid contact with edible product.

## DISEASES

### **SEED TREATMENT:**

**DAMPING OFF (*Pythium spp.*, *Rhizoctonia solani*): If possible, buy treated seed. Use only as directed; over-treatment may cause injury.**

#### *Bacillus subtilis* GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or  
Captan

- *Captan 300*, *Captan 30-DD*, 1 2/3 fl oz/100 lb seed.
- *Captan 400*, 1 1/2 to 2 fl oz/100 lb seed.  
or  
Fludioxinil

- *Maxim 4 FS*, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.  
or

### Thiram

- 42-S *Thiram*, *Thiram 50 WP Dyed*, 4 1/2 oz/100 lb seed.

### **SEEDBED PREPARATION:**

**DAMPING OFF, ROOT ROT (*Pythium spp.*, *Rhizoctonia solani*):** Grow transplants in disease-free soil (sterilized) and fumigate fields before planting. To sterilize soil use steam or fumigate with Chemicals suggested for seedbed sterilization in Appendix A. Follow manufacturer's recommendations for use with particular crops. Avoid planting until soil is free of fumigant.

### **SOIL INJECTION:**

#### **DAMPING OFF, VINE DECLINE:**

##### Fludioxinil

- *Cannonball*, 0.25 to 0.5 lb. (14 days)

### **PREPLANT SOIL FUMIGATION:**

**DAMPING OFF, ROOT ROTS (*Phytophthora spp.*, *Pythium spp.*, *Rhizoctonia solani*), FUSARIUM WILT or ROOT ROT (*Fusarium oxysporum*):** This protects plants grown from seed or transplanted in the field.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

#### 1,3 Dichloropropene/chloropicrin

- *Telone C35*, 13-136 gal. (RUP)  
or  
Metam Sodium

- *Sectagon 42*, *Vapam HL*, 37.5-75 gal.  
or  
Potassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### **GREENHOUSE PREPLANT INCORPORATION:**

#### **DAMPING OFF (*Pythium spp.*), ROOT ROT (*Rhizoctonia spp.*):**

##### *Gliocladium virens* GL-21

- *SoilGard 12 G*, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

### **PREPLANT TREATMENT:**

#### **DAMPING OFF and COTTONY LEAK (*Pythium spp.*):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil Gold SL*, 1-2 pt.
- *Ultra Flourish*, 2 to 4 pt.

### **DRIP APPLICATION:**

#### **DOWNY MILDEW (*Pseudoperonospora cubensis*), PHYTOPHTHORA BLIGHT (*Phytophthora capsici*):**

##### \* Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

**DAMPING OFF, VINE DECLINE:**Fludioxinil

- *Cannonball*, 0.25 to 0.5 lb. (14 days)

**FOLIAR TREATMENT:****POWDERY MILDEW (*Sphaerotheca fuliginea, Erysiphe cichoracearum*):**\* Azoxystrobin/Difenoconazole

- *Quadris Top*, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or

\* Kresoxim-methyl

- *Sovran*, 3.2 to 4.8 oz. (0 days)  
or

\* Myclobutanil

- *Rally 40 WSP*, 2.5 to 5 oz, 7 to 10 day schedule.. (0 days) Do not apply more than 1.5 lbs per acre per crop.  
or

\* Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

\* Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days) To avoid crop injury, do not add adjuvants.  
or

\* Quinoxystrobin

- *Quintec*, 4 to 6 fl oz, 10- to 14-day intervals. (3 days)  
or

\* Thiophanate-Methyl

- *Topsin M 70 WP, Topsin M WSB*, 1/4 to 1/2 lb. (0 days) Apply at 7 to 14 day intervals after disease appears.  
or

\* Trifloxystrobin

- *Flint*, 1 1/2 to 2 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season.  
or

Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)
- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or

Bacillus subtilis

- *Serenade*, 6 to 8 lb every 7 days. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.
- *Serenade Max*, 1 - 3 lb every 7 to 10 days. (0 days)  
or

Boscalid

- *Endura*, 6.5 oz. (0 days)  
or

Chlorothalonil

- *Bravo Ultrex, Equus DF*, 1.8 to 2.7 lb. (0 days)
- *Bravo Weather Stik*, or *Echo 720* (2 to 3 pt, 7-day intervals) or *Equus 720 SST* (2 to 3 pt every 7 days) (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or

Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)  
or

Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)

\* Champion WP, 1.5 to 3 lb. (0 days)\* Kocide 2000, 1 1/2 lb. (0 days)\* Kocide 3000, 0.5-1.25 lb. (0 day)\* Nu-Cop 3 L, 1 to 4 pt, 5- to 10-day intervals. (0 days)  
orCopper Resinate\* Tenn-Cop 5 E, 3 pt. (0 days)  
orCopper Sulfate\* Cuprofix Ultra, 1.25 lb. (0 days)  
orDifenoconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days) Suppression.  
or

Neem Oil

- *Trilogy*, 2 pt. (0 days)  
or

Sulfur

- *Kumulus DF*, 20 to 25 lb. Do not use on sulfur-sensitive varieties.  
(0 days)

\* Microthiol Disperss, 5 to 10 lb. (0 days)\* Thiolux Jet, 6 to 15 lb. (0 days)  
orTebuconazole

- *Folicur 3.6F*, 4-6 fl oz. (7 days) 12 hr REI.  
or

Triflumizole

- *Procure 480 SC*, 4 to 8fl oz every 7-14 days. (0 days)

**ALTERNARIA LEAF BLIGHT (*Alternaria cucumerin*):**\* Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)

\* Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or

\* Azoxystrobin/Difenoconazole

- *Quadris Top*, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or

\* Chlorothalonil

- *Bravo Ultrex, Equus DF*, 1.8 to 2.7 lb. (0 days)

- *Bravo Weather Stik, Echo 720, Equus 720 SST*, 2 to 3 pt. (0 days)

- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or

\* Difenoconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days)  
or

\* Mancozeb

- *Dithane DF Rainshield, Dithane M-45, Dithane WSP*, 2 to 3 lb. (5 days)

\* Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt. (5 days)\* Manzate Pro-Stick, 2 to 3 lb. (5 days)\* Penncozeb 4 F, 1.2 to 2.4 qt. (5 days)\* Penncozeb 75 DF, Penncozeb 80 WP, 2 to 3 lb. (5 days)  
or\* Maneb

- *Maneb 75 DF, Maneb 80 WP*, 1 to 2 lb. (5 days)

\* Manex, 1 1/5 to 1 3/5 qt. (5 days)  
or\* Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

## Melons

- or  
\* Pyraclostrobin/Boscalid  
• *Pristine*, 12.5 to 18.5 oz. (0 days) To avoid crop injury, do not add adjuvants.  
or  
Boscalid  
• *Endura*, 6.5 oz. (0 days)  
or  
Copper Ammonium Carbonate  
• *Copper Count N*, 1 to 2 qt. (0 days)  
or  
Copper Hydroxide  
• *Champ DP*, 1 1/3 lb. (0 days)  
• *Champ Formula 2 F*, 1 1/3 pt. (0 days)  
• *Champion WP*, 1.5 to 3 lb. (0 days)  
• *Kocide 2000*, 1 1/2 lb. (0 days)  
• *Kocide 3000*, 0.5-1.25 lb. (0 day)  
• *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or  
Copper Resinate  
• *Tenn-Cop 5 E*, 3 pt. (0 days)  
or  
Copper Sulfate  
• *Cuprofix Ultra*, 1.25 lb. (0 days)  
or  
Fenamidone  
• *Reason 500 SC*, 5.5 fl oz. (14 days) 12 hr REI.  
or  
Mancozeb/Copper Hydroxide  
• *ManKocide*, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.  
or  
Mancozeb/Copper Sulfate  
• *Cuprofix MZ Disperss*, 5 - 7.25 lb. (5 days)  
or  
Mancozeb/Zoxamide  
• *Gavel 75 DF*, 1.5 - 2.0 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.  
or  
Neem Oil  
• *Trilogy*, 2 pt. (0 days)
- SCAB (*Cladosporium cucumerinum*): Treat every 7 days beginning after the plants have flowered.**
- \* Chlorothalonil  
• *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb. (0 days)  
• *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 3 pt. (0 days)  
• *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or  
\* Mancozeb  
• *Dithane DF Rainshield* (2 to 3 lb (watermelon)) or *Dithane M-45* (2 to 3 lb (watermelon)) or *Dithane WSP* (2 to 3 lb (watermelon)) (5 days)  
• *Dithane F-45 Rainshield*, 1.6 to 2.4 qt (watermelon). (5 days)  
• *Manex II*, 1.6 to 2.4 qt every 7 to 10 days. (5 days)  
or  
Copper Ammonium Carbonate  
• *Copper Count N*, 2 to 3 qt. (0 days)  
or  
Copper Resinate  
• *Tenn-Cop 5 E*, 3 pt. (0 days)  
or  
Mancozeb/Copper Hydroxide  
• *ManKocide*, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.  
or
- Neem Oil  
• *Trilogy*, 2 pt. (0 days)
- ANTHRACNOSE (*Colletotrichum lagenarium*): Treat every 7 to 14 days after flowering.**
- \* Azoxystrobin  
• *Amistar*, 3.5 to 5 oz. (1 day)  
• *Quadris*, 11.0 to 15.4 fl oz. (1 day)  
Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or  
\* Azoxystrobin/Chlorothalonil  
• *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or  
\* Azoxystrobin/Difenoconazole  
• *Quadris Top*, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or  
\* Chlorothalonil  
• *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb. (0 days)  
• *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (0 days)  
• *Echo 90 DF*, 1.3 to 1.6 lb every 7 days. (0 days)  
or  
\* Mancozeb  
• *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 2 to 3 lb. (5 days)  
• *Dithane F-45 Rainshield*, 1 3/5 to 2 2/5 qt. (5 days)  
• *Manzate Pro-Stick*, 2 to 3 lb. (5 days)  
• *Penncozeb 4 F*, 1.2 to 2.4 qt. (5 days)  
• *Penncozeb 75 DF*, *Penncozeb 80 WP*, 2 to 3 lb. (5 days)  
or  
\* Maneb  
• *Maneb 75 DF*, *Maneb 80 WP*, 1 to 2 lb. (5 days)  
• *Manex*, 1 1/5 to 1 3/5 qt. (5 days)  
or  
\* Pyraclostrobin  
• *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or  
\* Pyraclostrobin/Boscalid  
• *Pristine*, 18.5 oz. (0 days) To avoid crop injury, do not adjuvants.  
or  
\* Thiophanate-Methyl  
• *Topsin M 70 WP*, *Topsin M WSB*, 4 to 8 oz. (0 days)  
or  
Copper Ammonium Carbonate  
• *Copper Count N*, 1 to 2 qt. (0 days)  
or  
Copper Hydroxide  
• *Champ DP*, 1 1/3 lb. (0 days)  
• *Champ Formula 2 F*, 1 1/3 pt. (0 days)  
• *Champion WP*, 1.5 to 3 lb. (0 days) Watermelon.  
• *Kocide 2000*, 1 1/2 lb. (0 days)  
• *Kocide 3000*, 0.5-1.25 lb. (0 day)  
• *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or  
Copper Oxychloride / Copper Sulfate  
• *C-O-C-S WDG*, 2 to 4 lb every 7 days. (0 days)  
or  
Copper Sulfate  
• *Basic Copper 53*, *Basicop*, 2 lb. (0 days)  
• *Cuprofix Ultra*, 1.25 lb. (0 days)  
or  
Difenoconazole/Cyprodinil  
• *Inspire Super*, 16 to 20 fl oz. (7 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

Mancozeb/Copper Hydroxide

- *ManKocide*, 2.5 lb. (5 days)  
or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss*, 5 - 7.25 lb. (5 days)  
or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

**ANGULAR LEAF SPOT (*Pseudomonas lachrymans*):** Copper may be used for control of this bacterial disease. Spray every 7 days, starting before the first fruit form and continue to protect fruit at all stages of development.

Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)  
or

Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP*, 1.5 to 3 lb. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or

Copper Resinate

- *Tenn-Cop 5 E*, 3 pt. (0 days)  
or

Copper Sulfate

- *Basic Copper 53*, *Basicop*, 2 lb. (0 days)
- *Cuprofix Ultra*, 1.25 lb. (0 days)  
or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

**DOWNTY MILDEW (*Pseudoperonospora cubensis*):** Treat plants when in the 2-leaf stage and continue at 7-14 day intervals.

\* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb. (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 3 pt. (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or

\* Cyazofamid

- *Ranman*, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)  
or

\* Cymoxanil

- *Curzate 60 DF*, 3.2 oz every 5 - 7 days. (3 days)  
or

\* Famoxadone/Cymoxanil

- *Tanos*, 8 oz. (3 days)  
or

\* Mancozeb

- *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 2 to 3 lb. (5 days)
- *Dithane F-45 Rainshield*, 1 3/5 to 2 2/5 qt. (5 days)
- *Manzate Pro-Stick*, 2 to 3 lb. (5 days)
- *Penncozeb 4 F*, 1.2 to 2.4 qt. (5 days)
- *Penncozeb 75 DF*, *Penncozeb 80 WP*, 2 to 3 lb. (5 days)  
or

\* Mancozeb/Zoxamide

- *Gavel 75 DF*, 1.5-2.0 lb. (5 days)  
or

\* Propamocarb

- *Previcur Flex*, 1.2 pt every 7 - 14 days. (2 days)  
or

\* Propamocarb

- *Previcur Flex*, 1.2 pt every 7 - 14 days. (2 days)  
or

Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)
- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or

Copper Resinate

- *Tenn-Cop 5 E*, 3 pt. (0 days)  
or

Dimethomorph

- *Forum*, 6 fl oz. (0 days)  
or

Fenamidone

- *Reason 500 SC*, 5.5 fl oz. (14 days) 12 hr REI.  
or

Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)  
or

Fosetyl-Aluminum

- *Alette WDG*, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.  
or

Mancozeb/Copper Hydroxide

- *ManKocide*, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.  
or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss*, 5 - 7.25 lb. (5 days)  
or

Mandipropamid

- *Revus*, 8 fl oz. (0 day)  
or

Maneb

- *Maneb 75 DF*, *Maneb 80 WP*, 1 to 2 lb. (5 days)
- *Manex*, 1 1/5 to 1 3/5 qt. (5 days)  
or

Mefenoxam/Chlorothalonil

- *Ridomil Gold Bravo*, 2 lb. (0 days) Maximum 4 applications.  
or

Mefenoxam/Copper Hydroxide

- *Ridomil Gold Copper*, 2 lb. (7 days) Maximum 4 applications.  
or

Mefenoxam/Mancozeb

- *Ridomil Gold MZ*, 2 1/2 lb. (5 days) Maximum 4 applications.  
or

Mono-, dibasic sodium salts of phosphorous acid

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.  
(0 days)  
or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Phostrol*, 2.5 to 5 pt every 7 - 14 days. (0 days)
- *Prophyt*, 2 to 4 pt. (0 days)  
or

Neem Oil

- *Trilogy*, 2 pt. (0 days)  
or

Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days) To avoid crop injury, avoid adding adjuvants.  
or

Trifloxystrobin

- *Flint*, 4 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo.

## Mint

**Note:** Most fungicides that protect against Alternaria may also provide limited downy mildew protection.

**GUMMY STEM BLIGHT or BLACK ROT (*Didymella bryonae* also called *Mycosphaerella melonis*):** Begin at the 2-leaf stage and apply every 7 days.

\* Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)
- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (0 days)

or

\* Azoxystrobin/Difenoconazole

- *Quadris Top*, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.

or

\* Chlorothalonil

- *Bravo Ultrex* (1.8 to 2.6 lb) or *Equus DF* (1.8 to 2.7 lb) (0 days)
- *Bravo Weather Stik, Echo 720, Equus 720 SST*, 2 to 3 pt. (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)

or

\* Mancozeb

- *Dithane DF Rainshield, Dithane M-45, Dithane WSP*, 2 to 3 lb. (5 days)
- *Dithane F-45 Rainshield*, 1 3/5 to 2 2/5 qt. (5 days)
- *Manzate Pro-Stick*, 2 to 3 lb. (5 days)
- *Penncozeb 4 F*, 1.2 to 2.4 qt. (5 days)
- *Penncozeb 75 DF, Penncozeb 80 WP*, 2 to 3 lb. (5 days)

or

\* Maneb

- *Maneb 75 DF, Maneb 80 WP*, 1 to 2 lb. (5 days)
- *Manex*, 1 1/5 to 1 3/5 qt. (5 days)

or

\* Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

\* Thiophanate-Methyl

- *Topsin M 70 WP, Topsin M WSB*, 1/4 to 1/2 lb. (0 days)

or

Boscalid

- *Endura*, 6.5 oz. (0 days)

or

Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)

or

Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP*, 1.5 to 3 lb. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L*, 1 to 4 pt. (0 days)

or

Copper Sulfate

- *Cuprofix Ultra*, 1.25 lb. (0 days)

or

Difenoconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days)

or

Kresoxim-methyl

- *Sovran*, 4.8 oz. (0 days)

or  
Mancozeb/Copper Hydroxide

- *ManKocide*, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.

or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss*, 5 - 7.25 lb. (7 days)

or

Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days) To avoid crop injury, avoid adding adjuvants.

or

Tebuconazole

- *Folicur 3.6F*, 8 fl oz. (7 days) Approved for gummy stem blight. Suppression only.

**PHYTOPHTHORA CROWN and FRUIT ROT (*Phytophthora* spp.):**

\* Dimethomorph

- *Forum*, 6 fl oz. (0 days)

or

\* Famoxadone/Cymoxanil

- *Tanos*, 8 - 10 oz every 5 - 7 days. (3 days)

or

\* Mancozeb/Zoxamide

- *Gavel 75 DF*, 1.5-2.0 lb. (5 days)

or

Cyazofamid

- *Ranman*, 2.75 fl oz every 7 to 10 days. (0 days)

or

Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

or

Fosetyl-Aluminum

- *Aliette WDG*, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.

or

Mandipropamid

- *Revus*, 8 fl oz. (0 day)

or

Mono-, dibasic sodium salts of phosphorous acid

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)

or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Phostrol*, 2.5 to 5 pt every 7 - 14 days. (0 days)

- *Prophyt*, 4 pt. (0 days)

**Note:** Most fungicides applied to control downy mildew may have limited efficacy against Phytophthora crown and fruit rot.

## Mint

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Root-lesion, false root-lesion and needle nematodes can cause reduction in yields, especially in the presence of the Verticillium wilt fungus. Fields should be tested for nematodes prior to planting. If any of these nematodes exceed damage threshold estimates, soil fumigation in the fall may be recommended.

## FALL SOIL FUMIGATION (BROADCAST):

1,3-D

- *Telone II*, 25 gal/A (muck soil). Fumigate in the fall when soil temperatures at an 8-inch depth are above 50F. Inject the fumigant to a depth of 6 inches and seal the soil with a drag immediately after application. Use soil fumigants only as directed on the label.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

or

#### Metam Sodium

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with shanks spaced 5 inches apart or to a depth of 4 to 10 inches in well prepared soil. Follow immediately with a roller to smooth and compact surface. Light watering to the treated surface helps to prevent escape of gas.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

#### **PREPLANT TREATMENT:**

*Mocap 6 EC*, . Broadcast. Apply 4 quarts in 20-30 gallons of water per acre over the entire field using ground equipment. Incorporate during or immediately following application to a depth of 2-4 inches by mechanical means OR immediately irrigate with 1-2 inches of water. Repeat irrigation before the soil dries. For establishment of new mint. Do not harvest within 225 days of application. Only 1 application per year. (RUP)

#### **POST-PLANT TREATMENT:**

*Mocap 6 EC*, . Broadcast. Apply 4 quarts in 20-30 gallons of water per acre over the entire field using ground equipment. Incorporate during or immediately following application to a depth of 2-4 inches by mechanical means OR immediately irrigate with 1-2 inches of water. Repeat irrigation before the soil dries. Apply after the last harvest of the growing season. Do not harvest within 225 days of application. Only 1 application per year. (RUP)

## **INSECTS**

#### **SOIL TREATMENT:**

##### **MINT ROOT BORER:**

*Mocap 6 EC*, 2 qt. (225 days) Apply after last harvest of the growing season or preplant incorporated; 1 application per season. REI = 7 days, 11 days when annual rainfall is <25 inches. (RUP)

#### **FOLIAR TREATMENT:**

##### **MINT ROOT BORER:**

*Lorsban 4 E / Lorsban Advanced*, 2 to 4 pt. (90 days) Apply post-harvest when larvae are present. Follow with at least 1 inch of irrigation. (RUP)

**MINT FLEA BEETLE:** Apply prior to egg-laying activity (July 20 to August 10) if needed to control adult stage, which will reduce root-damaging populations of larvae the following year. Three applications, 7 to 10 days apart, may be needed to control severe infestations (common only in older fields). Timing is critical.

*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 12.0 oz/Acre per season.

or

*Malathion 57 EC*, 1 1/2 pt. (7 days)

or

**Methomyl**

- *Lannate LV* (2.25 to 3 pt.) or *Lannate SP* (0.75 to 1 lb.) (14 days) (RUP)
- *Nudrin LV* (2.25 to 3 pt.) or *Nudrin SP* (0.75 to 1 lb.) (14 days) (RUP)

**CUTWORM, LOOPERS:** Apply before worms are 3/4 inch long for best results.

##### Acephate

- *Acephate 97 UP*, *Orthene 97*, 1 lb. (14 days) Do not apply more than 2-1/8 lb per season.

or

*Avaunt*, 3.5 oz. (7 days) Do not exceed 14 oz/acre per crop.

or

##### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)

or

*Lorsban 4 E / Lorsban Advanced*, 2 to 4 pt. (90 days) One application only. (RUP)

or

##### Methomyl

- *Lannate LV* (3 pt.) or *Lannate SP* (1 lb.) (14 days) (RUP)

- *Nudrin LV* (3 pt.) or *Nudrin SP* (1 lb.) (14 days) (RUP)

or

*Radiant SC*, 4 to 12 fl oz. (7 days) Do not make more than 4 applications or exceed 60.5 fl oz/acre per season.

**APHIDS:** Apply when damage is first seen or when insects are noticeable.

##### Acephate

- *Acephate 97 UP*, *Orthene 97*, 1 lb. (14 days) Do not apply more than 2-1/8 lb per season.

or

*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 12.0 oz/Acre per season.

or

*Malathion 57 EC*, 1 1/2 pt. (7 days)

#### **LOOPERS:**

*Confirm 2F*, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)

## **MITES**

Apply if needed.

*Agri-Mek 0.15 EC*, 8 to 12 fl oz. (28 days) (RUP)

or

*Kelthane MF*, 1 3/4 to 2 1/2 pt. (30 days) Limited to one application per season.

## **DISEASES**

#### **PREPLANT SOIL FUMIGATION:**

**VERTICILLIUM WILT (*Verticillium dahliae*):** Apply as a broadcast or row treatment, placing the fumigant at least 12 to 14 inches below the final soil surface.

**Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.**

##### 1,3 Dichloropropene/chloropicrin

- *Telone C35*, 13-35 gal. (RUP)

or

##### Metam Sodium

- *Sectagon 42*, *Vapam HL*, 37.5-75 gal.

or

##### Potassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## Onions

### FOLIAR TREATMENT:

**MINT RUST (*Puccinia menthae*):** Apply to plants 4 to 8 inches tall at 7 to 10 day intervals. Do not apply more than 3 times. Do not feed hay to livestock.

\* Azoxystrobin/Propiconazole

- *Quilt* (14 fl oz) or *Quilt Xcel* (10.5 - 14 fl oz) (30 days)  
or

Azoxystrobin

- *Amistar*, 2 to 5 oz. (0 days fresh; 7 days processed)
  - *Quadris*, 6.2 to 15.4 fl oz. (0 days fresh; 7 days processed)
- Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

Chlorothalonil

- *Bravo Ultrex*, 1 lb. (80 days)
- *Bravo Weather Stik, Echo 720, Equus 720 SST*, 1 3/8 pt. (80 days)  
or

Myclobutanil

- *Rally 40 WSP*, 4 to 5 oz. (30 days)  
or

Pyraclostrobin

- *Headline EC* (9 to 12 fl oz) or *Headline SC* (9-12 fl oz) (14 days)

### POWDERY MILDEW (*ERYSYPHE CICHORACEARUM*):

Azoxystrobin

- *Amistar*, 2 to 5 oz. (0 days fresh; 7 days processed)
- *Quadris*, 6.2 to 15.4 fl oz. (0 days fresh; 7 days processed)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

Myclobutanil

- *Rally 40 WSP*, 4 to 5 oz. (30 days)  
or

Pyraclostrobin

- *Headline EC* (9 to 12 fl oz) or *Headline SC* (9-12 fl oz) (14 days)  
or

Sulfur

- *Kumulus DF*, 4 lb, 21-day intervals. (28 days) Do not apply unless buyer of oil has authorized use.
- *Microthiol Special, Thiolux Jet*, 4 to 6 lb, 30-day intervals. (30 days) Maximum 3 applications.

## Onions

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Northern root-knot, root-lesion, onion bloat, common needle and stubby-root nematodes can reduce onion yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for onions, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of northern root-knot, root-lesion, onion bloat and stubby-root nematodes in onion production.

### FALL SOIL FUMIGATION (BROADCAST):

1,3-D

- *Telone II*, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F.

Inject the fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.  
or

Metam Sodium

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with shanks spaced 5 inches apart to a depth of 4 to 10 inches in well-prepared soil. Material should be applied with adequate water and the soil surface sealed (light watering) after the application.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### AT-PLANTING TREATMENT:

*Vydate L*, 3/4 to 1 gal per acre. Apply at planting as an in-furrow drench using 100-150 gallons of water per acre or 1-1/2 to 2 gal per acre as an in-furrow band using 20-50 gallons of water per acre or 1/2 to 1 gal/A as an in-furrow spray followed by 1 to 2 postemergence band treatments at 1/2 to 1 gal/A in a minimum of 20 gal water per acre. Do not apply within 14 days of harvest. Do not apply more than 2 1/4 gal of Vydate L/acre/season. Do not use on green onions. (RUP)

## INSECTS

### SEED TREATMENT:

**ONION MAGGOT:** Trigard-treated seed is available as a pelleted or film-coated seed. Check with your seed supplier.

### AT-PLANTING TREATMENT:

**ONION MAGGOT:** Apply to open furrow immediately after seeding but before furrow is closed. Use on dry bulb onions only.

Chlorpyrifos

- *Lorsban 15 G* (3.7 oz/1,000 row ft.) or *Lorsban 4 E / Lorsban Advanced* (32 fl oz.) or *Lorsban 75 WG* (1.33 lb.) (RUP)

### FOLIAR TREATMENT:

**ONION MAGGOT:** Apply as a directed spray or drench in a minimum of 100 gallons of water to the base of onion seedlings or transplants during peak egg laying of the onion maggot adults. Proper timing is critical.

Cypermethrin

- *Ammo 2.5 EC*, 2.5 to 5 fl oz. (7 days) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (7 days) (RUP)
- *Holster*, 2.5 to 5 fl oz. (7 days) (RUP)
- *UP-Cyde 2.5 EC*, 2.5 to 5 fl oz. (7 days) (RUP)  
or

Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (14 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (14 days) (RUP)
- *Warrior II with Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior with Zeon Technology* (1.92 to 3.2 fl oz.) (14 days) (RUP)  
or

*Lorsban 4 E / Lorsban Advanced*, 1 qt. (60 days) Use on dry bulb onions only. Maximum of 2 applications, maximum of 1 application if Lorsban 4 E or 15 G was used at planting (Special Michigan SLN label). (RUP)

orMalathion

- *Malathion* 5, or *Malathion* 5 EC (1.5 to 2.5 pt.) or *Malathion* 5 EC (2.5 to 3 pt.) or *Malathion* 8 (2 pt.) (3 days)

orPermethrin

- *Ambush* 25 W, 6.4 to 19.2 oz. (1 day) (RUP)
- *Perm-UP* 25DF (9.6 to 19.2 oz.) or *Perm-UP* 3.2 EC (4 to 12 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 6.4 to 19.2 oz. (1 day) (RUP)

**CUTWORM, ARMYWORM: Apply in late evening when first seen.****Repeat treatments if needed.**Cypermethrin

- *Ammo* 2.5 EC, 2.5 to 5 fl oz. (7 days) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (7 days) (RUP)
- *Holster*, 2.5 to 5 fl oz. (7 days) (RUP)
- *UP-Cyde* 2.5 EC, 2.5 to 5 fl oz. (7 days) (RUP)

or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 9 oz per acre per crop. Do not make more than 5 applications per year.

orMustang Max, 2.2 to 4 oz. (7 days) (RUP)orPerm-UP 25DF, 9.6 to 19.2 oz. (1 day) (RUP)

**THRIPS:** Usually appear around mid-summer. Damage is most severe on the new growth. Dry growing conditions usually intensify the problem. Treat when damage becomes visible or numbers exceed 10 to 15 per plant. Repeat as needed.

\* Cypermethrin

- *Ammo* 2.5 EC, 4 to 5 fl oz. (7 days) (RUP)
- *Cypermethrin*, 4 to 5 fl oz. (7 days) (RUP)
- *Holster*, 4 to 5 fl oz. (7 days) (RUP)
- *UP-Cyde* 2.5 EC, 4 to 5 fl oz. (7 days) (RUP)

or\* Methomyl

- *Lannate* LV (3 pt.) or *Lannate* SP (1 lb.) (7 days) (RUP)
- *Nudrin* LV (3 pt.) or *Nudrin* SP (1 lb.) (7 days) (RUP)

or\* Mustang Max, 2.9 to 4 oz. (7 days) (RUP)or

*Assail* 30 SG, 5 to 8 oz. (7 days) Do not make more than 4 applications per season.

orDiazinon AG 500, 0.5 to 1 pt. (10 days) (RUP)or

*Entrust*, 1.25 to 2.5 oz. (1 day) Do not apply more than 9 oz per acre per crop. Do not make more than 5 applications per year.

orLambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (14 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (14 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

orMalathion

- *Malathion* 5, or *Malathion* 5 EC (1.5 to 2 pt.) or *Malathion* 5 EC (1.5 pt.) or *Malathion* 8 (2 pt.) (3 days)

orPennkap-M 2 F, 2 pt. (15 days) (RUP)orPermethrin

- *Ambush* 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
- *Perm-UP* 25DF (9.6 to 19.2 oz.) or *Perm-UP* 3.2 EC (6 to 12 oz.) (1 day) (RUP)
- *Pounce* 25 WP, 9.6 to 19.2 oz. (1 day) (RUP)

or

*Radiant* SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 30 fl oz. per season.

orVydate L, 1 to 2 pt. (14 days) Dry bulb onions only. (RUP)**ARMYWORM:**Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (14 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (14 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

orMethomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (7 days) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (7 days) (RUP)

orPermethrin

- *Ambush* 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
- *Perm-UP* 3.2 EC, 6 to 12 oz. (1 day) (RUP)
- *Pounce* 25 WP, 9.6 to 19.2 oz. (1 day) (RUP)

*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 30 fl oz. per season.

**CUTWORM:**Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (14 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (14 days) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (14 days) (RUP)

orMethomyl

- *Lannate* LV (3 pt.) or *Lannate* SP (1 lb.) (7 days) (RUP)
- *Nudrin* LV (3 pt.) or *Nudrin* SP (1 lb.) (7 days) (RUP)

orPermethrin

- *Ambush* 25 W, 6.4 to 19.2 oz. (1 day) (RUP)
- *Perm-UP* 3.2 EC, 4 to 12 oz. (1 day) (RUP)
- *Pounce* 25 WP, 6.4 to 19.2 oz. (1 day) (RUP)

**DISEASES****PREPLANT SOIL FUMIGATION:**

**PINK ROOT (*Phoma terrestris*):** Apply as a broadcast or row treatment, placing the fumigant at least 12 to 14 inches below the final soil surface.

**Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.**

1,3 Dichloropropene/chloropicrin

- *Telone* C35, 13-35 gal. (RUP)

orMetam Sodium

- *Sectagon* 42, *Vapam* HL, 37.5-75 gal.

orPotassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels.

Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## Onions

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### AT-PLANTING TREATMENT:

**SMUT (*Urocystis cepulae*):** Apply in planter box at seeding or purchase treated seed. Note: Use only as directed; overtreatment may cause injury.

#### Mancozeb

- *Dithane* DF Rainshield, *Dithane* M-45, *Dithane* WSP, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).
- *Dithane* F-45 Rainshield, 2 to 4 qt per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).
- *Manzate* Pro-Stick, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).
- *Penncozeb* 4 F, 2.4 qt. (7 days)
- *Penncozeb* 75 DF, *Penncozeb* 80 WP, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).

#### or Maneb

- *Maneb* 75 DF, *Maneb* 80 WP, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).
- *Manex*, 2.4 qt. Apply 75 to 100 gal as a furrow drench.

#### Thiophanate-Methyl

- *Topsin* M 70 WP, *Topsin* M WSB, 2 lb (broadcast).

**DAMPING OFF (*Pythium* spp. only):** Apply as a seed treatment before planting.

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold SL, 0.5-1 pt.
- *Ultra* Flourish, 1 to 2 pt.

#### or Thiram

- 42-S Thiram, 6 oz/100 lb seed.

### FOLIAR TREATMENT:

**BOTRYTIS LEAF BLIGHT (*Botrytis squamosa*):** Apply every 7 to 10 days after the 4-leaf stage or according to the onion leaf blight predictor.

#### \* Azoxystrobin/Chlorothalonil

- *Quadris* Opti, 1.6 to 3.2 pt. (7 days)

#### or

#### \* Azoxystrobin/Difenoconazole

- *Quadris* Top, 14 fl oz. (1 day) One application before alternating with another chemical.

#### or

#### \* Azoxystrobin/Propiconazole

- *Quilt* (14 to 27.5 fl oz) or *Quilt* Xcel (17.5 to 26 fl oz) (14 days)

#### or

#### \* Chlorothalonil

- *Bravo Ultrex*, 0.9 to 2.7 lb. (7 days) May be applied through sprinkler irrigation systems. Applications of more than 9 lb of *Bravo Ultrex* per season may result in yield reductions.

- *Bravo Weather Stik*, *Equus* 720 SST, 1 1/2 to 3 pt (green bunching) (14 days) or 1 to 3 pt (dry bulb) (7 days). Do not apply more than 3 times per season on green bunching onions.

- *Bravo Weather Stik Zn*, 1 to 2 pt. (7 days dry bulb onions; 14 days green onions)

- *Echo* 720, 1 to 2 pt. (7 days)

- *Echo* 90 DF, 1.2 to 1.7 lb. (7 days)

- *Equus* DF, 0.9 to 2.7 lb. (7 days)

#### or \* DCNA

- *Botran* 75 W, 1 1/2 to 2 2/3 lb. (14 days) Maximum 5 1/3 lb per season.

#### or

#### \* Difenoconazole/Cyprodnil

- *Inspire* Super, 16 to 20 fl oz. (7 days)

#### or

#### \* Iprodione

- *Iprodione* 4L AG, 1.5 pt. (7 days)

- *Rovral*, 1 lb as tank mix with another fungicide, 7-day intervals. (7 days) Note: See label for permissible crop rotations. Maximum 5 applications.

- *Rovral* 4 F, 1 1/2 pt, 14-day interval. (7 days) Or 1 pt as tank mix with another fungicide, 7-day intervals. Note: See label for permissible crop rotations. Maximum 5 applications.

#### or \* Mancozeb

- *Dithane* DF Rainshield, *Dithane* M-45, 3 lb. (7 days)

- *Dithane* F-45 Rainshield, 2.4 qt. (7 days)

- *Manzate* Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.

- *Penncozeb* 4 F, 1.6 to 2.4 qt. (7 days)

- *Penncozeb* 75 DF, *Penncozeb* 80 WP, 2 to 3 lb. (7 days)

#### or \* Maneb

- *Maneb* 75 DF, *Maneb* 80 WP, 2 to 3 lb. (7 days)

- *Manex*, 1.6 to 2.4 qt. (7 days)

#### or Azoxystrobin

- *Amistar*, 3 to 5 oz. (0 days)

- *Quadris*, 9.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of *Amistar* and *Quadris* or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

#### or Boscalid

- *Endura*, 6.8 oz. (7 days)

#### or

#### Copper Resinate

- *Tenn-Cop* 5 E, 3 pt. (0 days)

#### or

#### Cyprodinil/Fludioxonil

- *Switch* 62.5 WG, 11 - 14 oz every 7 to 10 days. (7 days)

#### or

#### Mancozeb/Copper Hydroxide

- *Mankocide*, 2 1/2 lb. (7 days)

#### or

#### Mancozeb/Copper Sulfate

- *Cuprofix* MZ Disperss, 5 - 7.25 lb. (7 days)

#### or

#### Neem Oil

- *Trilogy*, 2 pt. (0 days)

#### or

#### Propiconazole

- *Propimax* EC, 4 fl oz. (14 days)

- *Tilt*, 4-8 fl oz. (14 days)

#### or

#### Pyraclostrobin

- *Cabrio*, 12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.

#### or

#### Pyraclostrobin/Boscalid

- *Pristine*, 14.5 to 18.5 oz. (7 days)

#### or

Pyrimethanil

- *Scala*, 18 fl oz. (7 days) 12 hr REI.

**DOWNTY MILDEW (*Peronospora destructor*): Apply after the 4-leaf stage.**\* Famoxadone/Cymoxanil

- *Tanos*, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or

\* Fosetyl-Aluminum

- *Aliette WDG*, 2 to 3 lb, 7- to 14-day intervals. (7 days) Do not make more than 7 applications per season. Do not tank mix with copper fungicides.  
or

\* Mancozeb

- *Dithane DF Rainshield*, *Dithane M-45*, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.

- *Dithane F-45 Rainshield*, 2.4 qt. (7 days)

- *Manzate Pro-Stick*, 3 lb. (7 days)

- *Penncozeb 4 F*, 1.6 to 2.4 qt. (7 days)

- *Penncozeb 75 DF*, *Penncozeb 80 WP*, 2 to 3 lb. (7 days)  
or

\* Maneb

- *Maneb 75 DF*, *Maneb 80 WP*, 2 to 3 lb. (7 days)

- *Manex*, 1.6 to 2.4 qt. (7 days)  
or

\* Mefenoxam/Chlorothalonil

- *Ridomil Gold Bravo*, 2 lb. (7 days dry bulb onions, maximum 4 applications; 21 days green onion) Maximum 3 applications.  
or

\* Mefenoxam/Copper Hydroxide

- *Ridomil Gold Copper*, 2 lb. (10 days dry bulb onions, maximum 4 applications; 7 days green onion) Maximum 3 applications.  
or

\* Mefenoxam/Mancozeb

- *Ridomil Gold MZ*, 2.5 lb. (7 days - dry bulb, maximum 4 applications) (21 days - green onion, maximum 3 applications). (7 days) See label.

Note: It is not legal to plant any crop not on the Ridomil Gold MZ label for 12 months following the last application, except that wheat, barley, or oats may be planted 40 days after the last application. It is not legal to plant any crop not on the Ridomil Gold-Bravo label for 12 months following the last application. This restriction includes celery and carrots.

or

Azoxystrobin

- *Amistar*, 3 to 5 oz every 5 - 7 days. (0 days)
- *Quadris*, 9.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 2.4 to 3.6 pt. (7 days)

or

Chlorothalonil. Downy mildew suppression.

- *Bravo Ultrex*, 0.9 - 2.7 lb every 7 to 10 days. (7 days)
- *Bravo Weather Stik*, *Equus 720 SST*, 1 to 3 pt. (7 days dry bulb onions; 14 days green bunching onions)
- *Echo 90 DF*, 1.2 to 2.4 lb. (7 days)  
or

Dimethomorph

- *Forum*, 6 fl oz. (0 days)

or

Fenamidone

- *Reason 500 SC*, 5.5 fl oz every 5 to 10 days. (7 days)  
or

Mancozeb/Copper Sulfate

- *Cuprofix MZ Disperss*, 5 - 7.25 lb. (7 days)

or  
Mandipropamid

- *Revus*, 8 fl oz. (7 day)

or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Phostrol*, 2.5 to 3.75 pt every 7 - 14 days. (0 days)

- *Prophyt*, 4 pt. (0 days)

or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

Potassium phosphite/chlorothalonil

- *Catamaran*, 4-7 pt. (7 days)

or

Pyraclostrobin

- *Cabrio*, 12 oz. (7 days) Do not apply more than one application before alternating with another chemical.

or

Pyraclostrobin/Boscalid

- *Pristine*, 18.5 oz (suppression). (7 days)

**Note:** Most fungicides that protect against purple blotch may also provide limited downy mildew protection.

**PURPLE BLOTCH (*Alternaria porri*): Apply every 7 to 10 days after the 4-leaf stage.**\* Azoxystrobin

- *Amistar*, 2 to 4 oz every 7 - 14 days. (0 days)

- *Quadris*, 6.2 to 12.3 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 1.6 to 3.2 pt. (7 days)

or

\* Azoxystrobin/Propiconazole

- *Quilt* (14 to 27.5 fl oz) or *Quilt Xcel* (14 to 21 fl oz) (14 days)

or

\* Chlorothalonil

- *Bravo Ultrex*, 0.9 to 2.7 lb. (7 days) May be applied through sprinkler irrigation systems. Applications of more than 9 lb of Bravo Ultrex per season may result in yield reductions.

- *Bravo Weather Stik*, *Equus 720 SST*, 1 1/2 to 3 pt (green bunching) (14 days) or 1 to 3 pt (dry bulb) (7 days). (14 days) Do not apply more than 3 times per season on green bunching onions.

- *Bravo Weather Stik Zn*, 1 to 2 pt. (7 days dry bulb onions; 14 days green onions)

- *Echo 720*, 1 to 2 pt. (7 days)

- *Echo 90 DF*, 1.2 to 1.7 lb. (7 days)

- *Equus DF*, 0.9 to 2.7 lb. (7 days)

or

\* Cyprodinil/Fludioxonil

- *Switch 62.5 WG*, 11-14 oz. (7 days)

or

\* Difenoconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days)

or

\* Iprodione

- *Iprodione*, *Rovral 4 F*, 1.5 pt, 14-day intervals or 1 pt as tank mix with another fungicide, 7-day intervals. (7 days)

- *Rovral*, 1 lb as tank mix with another fungicide, 7-day intervals.

Note: See label for permissible crop rotations. Maximum 5 applications.

or

\* Mancozeb

- *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 2 to 3 lb. (7 days)

- *Dithane F-45 Rainshield*, 2.4 qt. (7 days)

## Parsnips

- Manzate Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.
- Penncozeb 4 F, 1.6 to 2.4 qt. (7 days)

- Penncozeb 75 DF, Penncozeb 80 WP, 2 to 3 lb. (7 days)  
or

\* Maneb

- Maneb 75 DF, Maneb 80 WP, 2 to 3 lb. (7 days)
- Manex, 1.6 to 2.4 qt. (7 days)  
or

\* Pyraclostrobin

- Cabrio, 8-12 oz. (7 days) Do not apply more than one application before alternating with another chemical.  
or

\* Pyraclostrobin/Boscalid

- Pristine, 10.5 to 18.5 oz. (7 days)  
or

Copper Ammonium Carbonate

- Copper Count N, 2 qt. (0 days)  
or

Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, Nu-Cop 50 DF, 2 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)  
or

Copper Sulfate

- Cuprofix Ultra, 1.25 to 3 lb. (0 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.  
or

Fenamidone

- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (7 days)

or

Fosetyl-Aluminum

- Alette WDG, 2 to 3 lb, 7- to 14-day intervals. (7 days) Do not tank mix with copper fungicides.  
or

Mancozeb/Copper Hydroxide

- ManKocide, 2.5 lb. (7 days)  
or

Mancozeb/Copper Sulfate

- Cuprofix MZ Disperss, 5 - 7.25 lb. (7 days)  
or

Neem Oil

- Trilogy, 2 pt. (0 days)  
or

Potassium phosphite/chlorothalonil

- Catamaran, 4-7 pt. (7 days)  
or

Propiconazole

- Propimax EC, 4 fl oz. (14 days)
- Tilt, 4-8 fl oz. (14 days)  
or

Pyrimethanil

- Scala, 18 fl oz. (7 days) 12 hr REI.  
or

Tebuconazole

- Folicur 3.6F, 4-6 fl oz. (7 days) Maximum 12 fl oz/acre/season. 12 hr REI.

### NECK ROT (*Botrytis* spp.):

Bacillus subtilis

- Serenade, 6 to 10 lb. (0 days) Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

or  
Chlorothalonil

- Bravo Ultrex, 1.25 - 2.7 lb every 7 days. (7 days)  
or

Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)  
or

Mancozeb

- Penncozeb 4 F, 1.6 to 2.4 qt. (7 days)  
or

Neem Oil

- Trilogy, 2 pt. (0 days)

**Note:** Treatments for onion leaf blight may retard or prevent symptomless spread in the field prior to harvest.

### BACTERIAL BLIGHT (*Erwinia carotovora* subsp. *carotovora*, *Pseudomonas* spp.):

Copper Hydroxide. Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foliar phytotoxicity.

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Kocide 2000, 3/4 to 1 1/4 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)  
or

Copper Sulfate

- Cuprofix Ultra, 1.25 to 3 lb. (0 days)  
or

Famoxadone/Cymoxanil

- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

### ALTERNARIA BLIGHT (*Alternaria* spp.):

\* Azoxystrobin/Difenoconazole

- Quadris Top, 14 fl oz. (1 day) One application before alternating with another chemical.

### WHITE ROT (*Sclerotium cepivorum*):

\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 to 3.2 pt. (7 days)

## Parsnips

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Northern root-knot nematodes can reduce parsnip yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for parsnips, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of root-knot nematodes in parsnip production.

### FALL SOIL TREATMENT (BROADCAST):

1,3-D

Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6 inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## INSECTS

### SOIL TREATMENT:

**LEAFHOPPERS, APHIDS, FLEA BEETLE:** See label for application methods.

#### Imidacloprid

- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 fl oz. (21 days)

or

*Platinum*, 5 to 12 fl oz. (30 days) See label for application methods.

#### CUTWORM:

10% *Sevin Granules*, 20 lb. (7 days)

### FOLIAR TREATMENT:

**FLEA BEETLE:** Apply as needed, usually soon after plants come up.

*Actara*, 1.5 to 3 oz. (7 days)

or

#### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

#### Carbaryl

- *Carbaryl 4L*, 0.5 to 1 qt. (7 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (7 days)

or

#### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days)

**LEAFHOPPERS:** Apply when first seen. Repeat as needed.

*Actara*, 1.5 to 3 oz. (7 days)

or

#### Carbaryl

- *Carbaryl 4L*, 0.5 to 2 qt. (7 days)
- *Sevin 4 F* (0.5 to 2 qt.) or *Sevin 80 S* (0.63 to 2.5 lb.) or *Sevin XLR Plus* (0.5 to 2 qt.) (7 days)

or

#### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days)

**ARMYWORM, CUTWORM:** Apply if needed. Repeat as needed.

#### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

#### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (7 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

or

*Entrust*, 1 to 2 oz. (3 days)

or

*Radiant SC*, 6 to 8 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

### APHIDS: Apply if necessary.

*Actara*, 1.5 to 3 oz. (7 days)

or

#### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

#### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days)

or

*Malathion 57 EC*, 2 pt. (7 days)

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF (*Pythium* spp.):

*Bacillus subtilis* GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).

#### Fludioxinil

- *Maxim 4 FS*, 0.08 to 0.16 oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.

### PREPLANT INCORPORATED:

#### DAMPING OFF (*Pythium* and *Phytophthora* spp., *Rhizoctonia solani*):

#### Fludioxinil

- *Maxim 4 FS*, 0.08 to 0.16 oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.

#### Fluopicolide

- *Presidio*, 3-4 fl oz. (7 days) Must be mixed with another fungicide active on pathogen.

or

*Mefenoxam*. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. sprinkler irrigation.

- *Ridomil Gold SL*, 1-2 pt.

- *Ultra Flourish*, 2 to 4 pt.

### FOLIAR TREATMENT:

#### CERCOSPORA LEAF SPOT (*Cercospora* spp.), ALTERNARIA LEAF SPOT (*Alternaria* spp.): Apply at first sign of disease and repeat every 7 to 10 days.

#### \* Azoxystrobin

- *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)

- *Quadris*, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

#### \* Pyraclostrobin

- *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

## Peas

### \* Trifloxystrobin

- *Flint* (2 to 3 oz) or *Gem 500* (1.9 to 2.9 fl oz) (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action. 12 hr REI.

or

### Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb. (10 days) (*Alternaria*) Do not apply more than 4 times per season.
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (10 days) (*Alternaria*) Do not apply more than 4 times per season.
- *Echo 90 DF*, 1.2 to 1.7 lb. (10 days)

or

### Neem Oil

- *Trilogy*, 2 pt. (0 days)

### POWDERY MILDEW, RUST:

#### Trifloxystrobin

- *Flint* (2 to 3 oz) or *Gem 500* (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/year. 12 hr REI.

## Peas

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## INSECTS

### SEED TREATMENT:

Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions. Handle seed carefully to prevent cracking.

### APHIDS, BEAN LEAF BEETLE, MEXICAN BEAN BEETLE, LEAFHOPPERS, SEED CORN MAGGOT: Early season protection.

*Cruiser 5 FS*, 1.28 fl oz/100 lb seed.

### SOIL TREATMENT:

#### LEAFHOPPERS, APHIDS:

##### Imidacloprid

- *Admire Pro*, 7.0 - 10.5 fl oz. (21 days) See label for application methods.
- *Nuprid 2 F*, 16 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.

### CUTWORM:

10% *Sevin Granules*, 15 lb. (3 days)

or

*Diazinon 50 W*, 4 to 8 lb. (RUP)

### ARMYWORM, CUTWORM:

*Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

### SEEDCORN MAGGOT:

*Brigade WSB*, 8 to 16 oz. (RUP)

### FOLIAR TREATMENT:

#### ARMYWORM, LOOPERS, CUTWORM: Apply if there are more than 1/25 sweeps. Pay special attention to grassy areas in the field.

- \* *Baythroid XL*, 2.4 to 3.2 fl oz. (7 days) (RUP)

or

##### \* Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)

- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)

- *Tundra EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)

or

##### \* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

- *Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

or

- *Entrust*, 1.25 to 2 oz. (3 days)

or

- *Hero*, 4 to 10.3 oz. (3 days) (RUP)

or

- *Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

- *Mustang Max*, 1.3 to 4.0 oz. (1 day) (RUP)

or

- *Radiant SC*, 4 to 8 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

### LEAFHOPPERS: Apply as necessary

- *Assail 30 SG*, 2.5 to 5.3 oz. (7 days)

or

- *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

##### Bifenthrin

- *Bifenthrin 2EC AG*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Bifenture EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Brigade 2EC* (1.6 to 6.4 fl oz.) or *Brigade WSB* (4 to 16 oz.) (3 days) (RUP)

- *Capture 2 EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Discipline 2EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Fanfare 2EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Sniper*, 1.6 to 6.4 fl oz. (3 days) (RUP)

- *Tundra EC*, 1.6 to 6.4 fl oz. (3 days) (RUP)

or

- *Brigadier*, 3.8 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

or

##### Carbaryl

- *Sevin 4 F* (1 qt.) or *Sevin 80 S* (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)

or

- *Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)

or

- *Hero*, 4 to 10.3 oz. (3 days) (RUP)

or

##### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)

- *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

or

##### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)

- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)

- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

- *Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

- *Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

### APHIDS: Apply if there are more than 1/pod or 10/sweep

- *Assail 30 SG*, 2.5 to 5.3 oz. (7 days)

or

##### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (3 days) (RUP)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

- *Bifenture EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - or
  - Brigadier*, 3.8 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)
    - or
    - Diazinon AG 500*, 1 pt. (7 days) (RUP)
      - or
- *Dibrom 8 Emulsive*, 1 pt. (1 day) Note: Do not feed treated vines to livestock. (RUP)
  - or
- *Dimethoate*
  - *Dimethoate 2.67 EC* (0.5 pt.) or *Dimethoate 400* (0.32 pt.) (0 days)
  - *Dimethoate 4E*, 0.33 to 1 pt. (2 days)
    - or

**Esfenvalerate**

- *Adjourn*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *Asana XL*, 2.9 to 5.8 fl oz. (3 days) (RUP)
- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (3 days) (RUP)
  - or
- *Imidacloprid*
  - *Admire Pro*, 1.2 fl oz. (7 days)
  - *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.
    - or

**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)
  - or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

*or*  
*Malathion 57 EC*, 2 pt. (3 days; 7 days if vines are fed to livestock)

**Methomyl**

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (1 day) (RUP)

**PEA WEEVIL: Apply when they appear at blossom time, usually at 10 to 50% bloom and 7 days later.**

*Baythroid XL*, 1.6 to 2.4 fl oz. (7 days) (RUP)

*or*

**Bifenthrin**

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - or

*Brigadier*, 5.1 to 5.5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 16.6 fl oz. per season. (RUP)

*or*

**Carbaryl**

- *Sevin 4 F* (1.5 qt.) or *Sevin 80 S* (1.87 lb.) or *Sevin XLR Plus* (1.5 qt.) (3 days) See label for pre-harvest intervals for forage and fodder.

*or*  
*Hero*, 4 to 10.3 oz. (3 days) (RUP)

*or*

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

*or*

*Malathion 57 EC*, 2 pt. (3 days; 7 days if vines are fed to livestock)

*or*

*Mustang Max*, 2.8 to 4.0 oz. (1 day) (RUP)

**CUTWORM:****\* Lambda-cyhalothrin**

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (7 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (7 days) (RUP)
- *Warrior II with Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior with Zeon Technology* (1.92 to 3.2 fl oz.) (7 days) (RUP)
  - or

**Carbaryl**

- *Sevin 4 F* (1 to 1.5 qt.) or *Sevin 80 S* (1.25 to 1.87 lb.) or *Sevin XLR Plus* (1 to 1.5 qt.) (3 days)
  - or

**Methomyl**

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (1 day) (RUP)
- *Lannate SP* (0.5 to 1 lb.) or *Nudrin LV* (1.5 to 3 pt.) (1 day) (RUP)

**ARMYWORM:****Carbaryl**

- *Sevin 4 F* (1 to 1.5 qt.) or *Sevin 80 S* (1.25 to 1.87 lb.) or *Sevin XLR Plus* (1 to 1.5 qt.) (3 days)
  - or

**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)
  - or

**Methomyl**

- *Lannate LV* (0.75 to 3 pt.) or *Lannate SP* (0.25 to 1 lb.) (1 day) (RUP)
- *Nudrin LV* (0.75 to 3 pt.) or *Nudrin SP* (0.25 to 1 lb.) (1 day) (RUP)

**LOOPERS:**

*Dibrom 8 Emulsive*, 1 pt. (1 day) (RUP)

*or*

**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)
  - or

**Methomyl**

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (1 day) (RUP)

**MITES**

Apply if necessary. Usually most serious in dry weather.

**Bifenthrin**

- *Bifenture EC*, *Brigade 2EC*, *Capture 2 EC*, 5.1 to 6.4 oz. (3 days) (RUP)
  - or

*Danitol 2.4 EC*, 10 2/3 fl oz. (7 days) (RUP)

*or*

**Naled**

- *Dibrom 8 Emulsive*, 1 pt. (1 day) Do not feed treated vines to livestock. (RUP)

## Peppers

### DISEASES

#### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):** Use slurry or dust method. Note: If possible, buy fungicide treated seed instead of treating seed on the farm.

Bacillus subtilis GB03

- *Kodiak*, 0.125 oz/100 lb seed (*Fusarium*, *Rhizoctonia*).  
or

Captan

- *Captan* 30-DD, 2 oz/100 lb seed.
- *Captan* 400, 2 1/2 oz/100 lb seed.  
or

Fludioxinil

- *Maxim* 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).

Commercial seed treatment plants only.

or

Mefenoxam

- *Apron XL LS*, 0.32 to 0.64 fl oz/100 lb seed (*Pythium* and *Phytophthora*) or 1.28 oz/100 lb seed (*Pythium* and systemic downy mildew).  
or

Metalaxyll

- *Allegiance-FL*, 0.75 fl oz/100 lb seed (*Pythium*) or 1.5 fl oz/100 lb seed (systemic downy mildew).
- *Apron 50 W*, 1/2 to 1 oz/100 lb seed (*Pythium* and *Phytophthora*) or 2 1/4 oz/100 lb seed (*Pythium* and systemic downy mildew).
- *Apron FS*, 0.75 to 1.5 oz/100 lb seed (*Pythium*) or 3.4 oz/100 lb seed (*Pythium* and systemic downy mildew).  
or

Thiram

- 42-S *Thiram* (3 oz/100 lb seed) or *Thiram* 50 WP Dyed (8 oz/100 lb seed)

#### PREPLANT INCORPORATED:

**DAMPING OFF (*Pythium* spp.):**

Azoxystrobin

- *Quadris*, 0.4 to 0.8 fl oz per 1000 ft in furrow.  
or

Mefenoxam

- *Ridomil Gold SL*, 0.5-1 pt.

#### FOLIAR TREATMENT:

**POWDERY MILDEW (*Erysiphe polygoni*):** Apply every 7 to 10 days after disease appears.

Copper Hydroxide

- *Champ DP*, 1 to 2 lb every 7 days. (0 days)
- *Champ Formula 2 F*, 1 to 2 pt. (0 days)
- *Champion WP*, *Nu-Cop 50 DF*, 1 1/2 to 3 lb. (7 days)
- *Kocide 2000*, 1 1/4 to 2 1/4 lb.
- *Kocide 3000*, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or

Copper Sulfate

- *Cuprofix Ultra*, 1 to 2 lb. (0 days)  
or

Sulfur

- *Kumulus DF*, 3 to 5 lb. (0 days)
- *Thiolux Jet*, 3 to 10 lb. (0 days)

**ANTHRACNOSE (*Colletotrichum lindemuthianum*), ALTERNARIA**

**BLIGHT (*Alternaria* spp.), RUST (*Phakospora* spp.):**

Azoxystrobin

- *Quadris*, 6.2 - 15.4 fl oz every 7 - 14 days. Follow guidelines for resistance management.

## Peppers

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Northern root-knot nematodes can reduce pepper yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant parasitic nematode is present at a population density above the economic threshold for peppers, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot nematodes in pepper production.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

#### FALL SOIL TREATMENT (BROADCAST):

1,3-D

- *Telone II*, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at 6-inch depth are above 50F. Inject the fumigant to soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### SOIL INJECTION:

Metam Sodium

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with injector, shanks spaced 5 inches apart at a depth of 4 to 10 inches. Roll and irrigate treated surfaces to prevent escape of gas.

#### TRANSPLANT WATER TREATMENT:

Apply as needed.

*Vydate L*, 2 pt in at least 200 gallons of water. Do not apply during periods of slow plant growth, such as when temperatures are below 45F. (RUP)

This treatment should be followed by broadcast or band applications using ground equipment at 1 gal/A in 20-50 gal water. Response is usually best if application is made to seedling plants from flag leaf to 2 or 3 true leaves.

#### CHEMIGATION TREATMENT:

Metam Sodium

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil). Apply with an irrigation system. Soil should be moist prior to treatment. Do not plant for 14 to 30 days after treatment (the wetter the soil, the longer the waiting period).

### INSECTS

#### SOIL TREATMENT:

**CUTWORM:**

- 10% *Sevin Granules*, 20 lb. (3 days)

**AT PLANTING OR TRANSPLANTING:****APHIDS, FLEA BEETLE:**

- Belay*, 9 to 12 fl oz. See label for application methods.  
or
- Durivo*, 10 to 13 fl oz. (30 days) See label for application methods.  
or
- Imidacloprid*. Additional generic brands available.
  - *Admire Pro*, 7.0 to 14.0 fl oz. (21 days)
  - *Nuprid 2 F*, 16 to 32 fl oz. (21 days)  
or
- Thiamethoxam*
  - *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) See label for application methods.  
or
  - *Venom 20 SG*, 1.13 to 1.34 lb. (21 days)

**FLEA BEETLE:**

- *Venom*, 5 to 6 oz. (21 days)

**FLEA BEETLE, PEPPER WEEVIL:**

- *Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)

**CUTWORM, FLEA BEETLE LARVAE:**

- *Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods.  
(RUP)

**FOLIAR TREATMENT:****FLEA BEETLE:**

- *Actara*, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or

- *Athena*, 7 to 17 fl oz. (7 days) (RUP)

or

- *Baythroid XL*, 2.8 fl oz. (7 days) (RUP)

or

- *Belay*, 3 to 4 fl oz. (21 days)

or

**Bifenthrin**

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

**Carbaryl**

- *Carbaryl 4L*, 0.5 to 1 qt. (3 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin 80 WSP* (0.67 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (3 days)

or

- *Dibrom 8 Emulsive*, 1 to 2 pt. (1 day) (RUP)

or

**Dinotefuran**

- *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom 20 SG* (0.44 to 0.895 lb.) (1 day)

or

**Endosulfan**

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (4 days) (RUP)
- *Thionex 3EC*, 0.66 to 1.33 qt. (4 days) (RUP)

or

- *Thionex 50W*, 1 to 2 lb. (9 days) (RUP)

**Esfenvalerate**

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

- *Hero*, 4 to 10.3 oz. (7 days) (RUP)

**or**  
**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

or

- *Leverage 360*, 4.1 fl oz. (7 days) (RUP)

or

- *Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

or

**Permethrin**. Bell peppers only.

- *Ambush 25 W*, 6.4 to 12.8 oz. (3 days) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (3 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (3 days) (RUP)

or

- *Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)

or

- *Swagger*, 10.2 to 19.7 fl oz. (7 days) (RUP)

or

- *Voliam Flexi*, 4 to 7 oz. (1 day)

Consult label for rotation restrictions.

**CUTWORM: Apply as needed to protect new transplants.**

- \* **Permethrin**. Bell peppers only.
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (3 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (3 days) (RUP)

\* *Warrior* with Zeon Technology, 1.3 to 3.8 fl oz. (5 days) (RUP)

or

- *Athena*, 7 to 17 fl oz. (7 days) (RUP)

or

- *Baythroid XL*, 2.1 to 2.8 fl oz. (7 days) (RUP)

or

**Bifenthrin**

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Empower*, 3.5 to 8.7 lb. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or

**Carbaryl**

- *Carbaryl 4L*, 2 qt. (3 days)
- *Sevin 4 F* (2 qt.) or *Sevin 80 S* (2.5 lb.) or *Sevin 80 WSP* (2.5 lb.) or *Sevin XLR Plus* (2 qt.) (3 days)

or

**Confirm 2F**

- *Confirm 2F*, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season) (7 days)

or

- *Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

- *Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

**Lambda-cyhalothrin**

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)

or

- *Leverage 360*, 3.8 to 4.1 fl oz. (7 days) (RUP)

or

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## Peppers

### Methomyl

- *Lannate* LV (0.75 to 1.5 pt.) or *Lannate* SP (0.25 to 0.5 lb.) (3 days) (RUP)
- *Nudrin* LV (0.75 to 1.5 pt.) or *Nudrin* SP (0.25 to 0.5 lb.) (3 days) (RUP)  
or  
*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)  
or  
*Swagger*, 10.2 to 19.7 fl oz. (7 days) (RUP)  
or  
*Synapse* WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.  
or  
*Vetica*, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season.

### APHIDS: Apply if needed.

#### \* Acephate

- *Acephate* 90 WDG, or *Acephate* 90 WSP (8 to 17.6 oz for bell; 8 oz for non-bell) or *Acephate* 97 UP (8 to 16 oz for bell; 8 oz for non-bell) or *Acephate* 97 UP (8 to 16 oz for bell; 8 oz for non-bell) (7 days)
- *Bracket* 97, 8 to 16 oz for bell; 8 oz for non-bell. (7 days)
- *Orthene* 97, 8 to 17.6 oz for bell; 8 oz for non-bell. (7 days)  
or  
\* *Actara*, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.  
or  
\* *Assail* 30 SG, 1.9 to 2.8 oz. (7 days)  
or

#### \* Imidacloprid. Additional generic brands available.

- *Admire* Pro, 1.3 to 2.2 fl oz. (0 days)
  - *Nuprid* 1.6 F, 3.8 to 6.2 fl oz. (0 days)
- Do not use if neonicitinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

or  
*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or

*Belay*, 3 to 4 fl oz. (21 days)  
or

*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)  
or

#### Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 9.8 fl oz. (7 days) (RUP)
- *Swagger*, 7.6 to 19.7 fl oz. (7 days) (RUP)  
or  
*Dibrom* 8 Emulsive, 1 to 2 pt. (1 day) (RUP)  
or

#### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1 pt.) or *Dimethoate* 4 EC (0.5 to 0.66 pt.) or *Dimethoate* 400 (0.5 to 0.66 pt.) (0 days)
- *Dimethoate* 4E, 11 oz. (2 days)  
or  
*Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

#### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (4 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (4 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (9 days) (RUP)

Consult label for rotation restrictions.

or  
*Fulfill*, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.

or  
*Leverage* 360, 3.8 to 4.1 fl oz. (7 days) (RUP)  
or

### Malathion

- *Malathion* 5 (1 pt.) or *Malathion* 5 EC (1 to 2.5 pt.) or *Malathion* 57 EC (1.25 to 1.5 pt.) or *Malathion* 8 (1.5 pt.) (3 days)

#### Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (3 days) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (3 days) (RUP)  
or

*Movento*, 4 to 5 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or  
*Venom* 20 SG, 0.44 to 0.895 lb. (1 day)  
or

*Voliam* Flexi, 4 to 7 oz. (1 day)  
or

*Vydate* L, 2 to 4 pt. (7 days) (RUP)

**EUROPEAN CORN BORER:** Apply treatments to coincide with fruit formation and second-brood egg-laying period (usually around July 20 to August 15) and continue as needed. Direct spray to underside of leaves and cap area of fruit.

\* Acephate. Bell peppers only.

- *Acephate* 90 WDG, or *Acephate* 90 WSP (12.8 to 17.6 oz.) or *Acephate* 97 (12 to 16 oz.) or *Acephate* 97 UP (12 to 16 oz.) (7 days)

- *Bracket* 97, 12 to 16 oz. (7 days)

- *Orthene* 97, 12 to 16 oz. (7 days)  
or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or

*Baythroid* XL, 1.6 to 2.8 fl oz. (7 days) (RUP)  
or

#### Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 12.8 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
or

#### Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (3 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (3 days)  
or

*Confirm* 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)  
or

*Coragen*, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.  
or

*Entrust*, 1 to 2 oz. (1 day) Do not apply more than 3 times in 21 days.  
or

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)  
or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)  
or

*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or  
Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

or  
Leverage 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

or  
Methomyl

- *Lannate LV* (3 pt.) or *Lannate SP* (1 lb.) (3 days) (RUP)
- *Nudrin LV* (3 pt.) or *Nudrin SP* (1 lb.) (3 days) (RUP)

or  
Mustang Max, 2.2 to 4 oz. (1 day) (RUP)

or  
Permethrin. Bell peppers only.

- *Ambush 25 W*, 12.8 oz. (3 days) (RUP)
- *Perm-UP 25DF* (12.8 oz.) or *Perm-UP 3.2 EC* (8 oz.) (3 days) (RUP)
- *Pounce 25 WP*, 12.8 oz. (3 days) (RUP)

or  
Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or  
Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

or  
Swagger, 10.2 to 19.7 fl oz. (7 days) (RUP)

or  
Synapse WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.

or  
Vetica, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season.

#### PEPPER WEEVIL:

*Actara*, 3 to 5.5 oz. (0 days)

or  
Athena, 7 to 17 fl oz. (7 days) (RUP)

or  
Belay, 3 to 4 fl oz. (21 days)

or  
Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade 2EC* (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (7 days) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)

or  
Imidacloprid. Additional generic brands available.

- *Admire Pro*, 2.2 fl oz. (0 days)
- *Nuprid 1.6 F*, 6.2 fl oz. (0 days)

or  
Permethrin

- *Ambush 25 W*, 6.4 to 12.8 oz. (3 days) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (3 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (3 days) (RUP)

or  
Scorpion 35SL, 2 to 7 fl oz. (1 day)

or  
Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

or  
Swagger, 10.2 to 19.7 fl oz. (7 days) (RUP)

or  
Voliam Flexi, 4 to 7 oz. (1 day)

#### MITES

Apply if needed.

*Agri-Mek* 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

or  
Bifenthrin

- *Bifenture EC*, 5.1 to 6.4 oz. (7 days) (RUP)

or  
Fenpyroximate

- *Portal*, 2.0 pt. (1 day) Do not make more than 2 applications per season; do not apply more than 4 pt. per season.

or  
*Hero*, 10.3 oz. (7 days) (RUP)

or  
*Kelthane MF*, 3/4 to 1 1/2 pt. (2 days) Limited to 2 applications per season.

or  
*Oberon 2 SC*, 7 to 8.5 fl oz. (7 days)

or  
*Zeal*, 2 to 3 oz. (7 days)

#### DISEASES

##### SEED TREATMENT:

**PRE-EMERGENCE DAMPING OFF (*Rhizoctonia solani*, *Pythium* spp.,**

***Phytophthora* spp.):**

*Bacillus subtilis* GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).

or  
*Captan*

- *Captan 30-DD*, 2 1/3 oz/100 lb seed.

- *Captan 400*, 2 to 3 oz/100 lb seed.

or  
*Fludioxinil*

- *Maxim 4 FS*, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia solani*).

or  
*Thiram*

- 42-S *Thiram*, *Thiram 50 WP Dyed*, 8 oz/100 lb seed.

##### SOIL FUMIGATION:

**VERTICILLIUM WILT, PHYTOPHTHORA:** Apply to production fields before planting. Note: Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

**Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.**

1,3 Dichloropropene/chloropicrin

- *Telone C35*, 13-35 gal. (RUP)

or  
Metam Sodium

- *Sectagon 42*, *Vapam HL*, 37.5-75 gal.

or  
Potassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at epa.gov/fumiganttoolbox. Michigan soil fumigant distributors can provide e-templates for the management plans.

## Peppers

### GREENHOUSE PREPLANT INCORPORATION:

#### DAMPING OFF (*Pythium* spp.) AND ROOT ROT (*Rhizoctonia* spp.):

##### Gliocladium virens GL-21

- *SoilGard* 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

#### ROOT/STEM ROT (*Rhizoctonia solani*):

##### PCNB

- *Terraclor* 400, see label for rates specific to soil depth.

### PREPLANT OR AT PLANTING INCORPORATED:

#### DAMPING OFF (*Pythium* spp.), PHYTOPHTHORA CROWN, STEM and FRUIT ROT (*Phytophthora capsici*):

Mefenoxam, Ridomil and Ultra Flourish must be applied to the soil before the plants are infected with Phytophthora to obtain satisfactory disease control).

- *Ridomil* Gold SL, 1 pt. (7 days)
- *Ultra* Flourish, 2 pt. (7 days)

Incorporate mechanically before planting or move into root zone after planting with 1/2 to 1 inch sprinkler water. For banded applications, use 12- to 16-inch band. One supplemental directed application at 1 pt (Ridomil Gold EC) or 2 pt (Ultra Flourish) should be made 30 days later followed by foliar applications of Ridomil Gold/Copper (MEFENOXAM/COPPER), 2 1/2 lb (1/4 lb a.i.) (7 days). Make 3 to 4 applications of Ridomil Gold/Copper at 10 to 14 day intervals.

Note: Observe limit of active ingredient/crop on label.

### DRIP APPLICATION:

#### PHYTOPHTHORA BLIGHT (*Phytophthora capsici*):

- \*Fluopicolide
- *Presidio*, 3-4 fl oz. (2 days)

### FOLIAR TREATMENT:

#### GRAY MOLD (*Botrytis* spp.), CLADOSPORIUM LEAF MOLD

#### (*Cladosporium capsici*), SCLEROTINIA WHITE MOLD (*Sclerotinia sclerotiorum*):

##### Bacillus subtilis

- *Serenade*, 4 to 8 lb (*Botrytis*). (0 days) Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

or

##### Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

##### Potassium Bicarbonate

- *Armicarb* 100, 2.5 to 5 lb (*Botrytis*). (0 days)

#### ANTHRACNOSE (*Colletotrichum* spp.), ALTERNARIA (RIPE) ROT (*Alternaria tenuis*): Apply when disease threatens and every 7 to 10 days.

##### \*Azoxystrobin

- *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

##### \*Boscalid

- *Endura*, 2.5 to 3.5 oz (alternaria rot only). (0 days)

or

##### \*Maneb

- *Maneb* 75 DF, *Maneb* 80 WP, 1.5 to 3 lb. (7 days)
- *Manex*, 1.2 to 2.4 qt. (7 days)

or

##### \*Pyraclostrobin

- *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

##### \*Trifloxystrobin

- *Flint*, 3 to 4 oz. (3 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

or

##### Copper Hydroxide

- *Kocide* 3000, 0.5-1.25 lb. (0 day)

or

##### Copper Sulfate

- *Basic Copper* 53, 3 to 4 lb. (0 days)

- *Basicop*, 2 to 4 lb. (0 days)

- *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)

or

##### Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

##### Potassium Bicarbonate

- *Armicarb* 100, 2.5 to 5 lb.

#### BACTERIAL SPOT (*Xanthomonas campestris* pv. *vesicatoria*): Apply as needed every 5 to 7 days.

##### Copper Ammonium Carbonate

- *Copper Count N*, 1 1/2 to 3 qt. (0 days)

or

##### Copper Hydroxide

- *Champ DP*, 1 1/3 to 2 lb. (0 days)

- *Champ Formula 2 F*, 1 1/3 to 2 pt. (0 days)

- *Champion WP*, *Nu-Cop 50 DF*, 2 to 3 lb. (0 days)

- *Kocide 2000*, 1 1/2 to 2 1/4 lb. (0 days)

- *Kocide 3000*, 0.5-1.25 lb. (0 day)

- *Nu-Cop 3 L*, 1 1/3 to 4 pt, 7- to 10-day intervals. (0 days)

or

##### Copper Resinate

- *Tenn-Cop 5 E*, 3 to 4.5 pt. (0 days)

or

##### Copper Sulfate

- *Basic Copper* 53, 3 to 4 lb. (0 days)

- *Basicop*, 2 to 4 lb. (0 days)

- *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)

or

##### Famoxadone/Cymoxanil

- *Tanos*, 8 - 10 oz every 5 - 7 days. (3 days)

#### PHYTOPHTHORA BLIGHT (*Phytophthora capsici*):

##### \*Dimethomorph

- *Forum*, 6 fl oz. (0 days)

or

##### \*Famoxadone/Cymoxanil

- *Tanos*, 8 to 10 oz. (3 days)

or

##### \*Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

or

##### \*Mefenoxam/Copper Hydroxide

- *Ridomil* Gold Copper, 1 lb. (7 days) Make 3-4 applications of Ridomil Gold Copper (2.5 lb) at 10 to 14 day intervals.

or

##### Cyazofamid

- *Ranman*, 2.75 fl oz. (0 days)

or

##### Fenamidone

- *Reason 500 SC*, 8.2 fl oz. (2 days) No more than 1 application before alternating.

or

**Mandipropamid**

- *Revus*, 8 fl oz. (1 day)  
or

**Maneb**

- *Maneb* 75 DF, *Maneb* 80 WP, 1 1/2 to 3 lb, 7- to 10-day intervals. (7 days)
- *Manex*, 1.2 to 2.4 qt, 7- to 10-day intervals. (7 days)  
or

**Mono-, dibasic sodium salts of phosphorous acid**

- *Fosphite*, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or
- **Mono-, dibasic sodium, potassium and ammonium phosphites**
- *Phostrol*, 1 to 2 qt every 14 - 21 days. (0 days)
- *Prophyt*, 6 pt. (0 days)

**ANTHRACNOSE:****\* Azoxystrobin/Difenoconazole**

- *Quadris Top*, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or
- **Trifloxystrobin**
- *Flint*, 3 to 4 oz. (3 days) Suppression. 12 hr REI.

**GRAY LEAFSPOT:****\* Azoxystrobin/Difenoconazole**

- *Quadris Top*, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

## Potatoes

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Root-lesion, root-knot and potato rot nematodes can reduce potato yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If these plant-parasitic nematodes are present in population densities above the economic threshold for potatoes, crop rotation or application of a nematicide is recommended. Potato growers should not rely on a single strategy or tactic for their total nematode control program. The following nematicides are suitable for control of these nematodes in potato production.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**FALL SOIL TREATMENT (BROADCAST):****1,3-D**

- *Telone II*, 25 gal/A for muck soil, 9-18 gal/A for mineral soil.  
or

**1,3-D and chloropicrin**

- *Telone C-17*, 27-30 gal/A for muck soil, 10-21 gal/A for mineral soil. (RUP)  
or

**Metam Sodium**

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with injector, shanks spaced 5 inches apart at a depth of 4 to 10 inches. Material should be applied with at least equal parts water or in a 2 to 1, water to fumigant, ratio. Seal surface after application.

Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the

label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

**PREPLANT SOIL TREATMENT:**

*Mocap* 15 G, broadcast 40 to 60 lb and incorporate to a depth of 2 to 4 inches. (RUP)

or  
*Mocap* 6 EC, broadcast 1 to 1.5 gal/A within 2 weeks before planting until crop emergence. (RUP)

**SOIL TREATMENT AT PLANTING:**

*Mocap* 15 G, 20 lb/acre (36 inch row spacing) or 1/4 lb/1000 row feet in a band 12 inches wide on the row at planting. Mix with the top 2-4 inches of soil

Note: *Mocap* use may result in delayed emergence particularly if excessive quantities of material contact seed. (RUP)

or  
*Vydate L*, 1 to 2 gal in at least 20 gallons of water in furrow at planting. May aid in early season insect control. (RUP)

**CHEMIGATION TREATMENT:****Metam Sodium**

- *Vapam HL*, 37.5 to 75 gal/A (use higher rate for muck soil) for mineral soil situations. Apply in the fall, although in some years spring application is possible.

Fall application in center pivot irrigation water. Have local product distributor provide additional application methodology and safety details from manufacturer. All recommended safety equipment must be installed to prevent groundwater contamination.

## INSECTS

**RESISTANCE MANAGEMENT.:**

Insecticide resistance is a severe problem with Colorado potato beetle. Crop rotation is the single most effective practice for managing Colorado potato beetle and resistance problems. If a neonicotinoid insecticide is used at planting, foliar application of any neonicotinoid later in the season must be avoided. Likewise, repeated application of any insecticide is likely to result in resistance problems.

**SEED TREATMENT:****APHIDS, COLORADO POTATO BEETLE, FLEA BEETLE, LEAFHOPPERS:**

*Belay*, 0.4 to 0.6 fl oz.

or  
**Imidacloprid**

- *Admire Pro*, 0.17 to 0.35 fl oz/100 lbs seed.
- *Nuprid 2 F*, 0.4 to 0.8 fl oz/100 lbs seed.

or  
**Thiamethoxam**

- *Cruiser 5 FS*, *Cruiser Maxx Potato*, . See label for rates and application methods.

**SOIL TREATMENT:****CUTWORM:**

10% *Sevin Granules*, 20 lb. (7 days)

**SOIL TREATMENT AT PLANTING:****WIREWORM:****Bifenthrin**

- *Bifenture EC*, 19.2 fl oz.. (RUP)

## Potatoes

- *Brigade* 2EC, 9.6 to 19.2 fl oz. (RUP)
- *Capture* LFR, 25.5 fl oz. (RUP)
- *Sniper*, 19.2 fl oz. (RUP)
- *Tundra* EC, 19.2 fl oz. (RUP)

See label for application methods.

or

*Mocap* 15 G, 27 to 40 lb. Broadcast evenly on soil surface and incorporate 4 to 6 inches deep prior to planting. (RUP)

or

*Regent* 4SC, 3.2 fl oz. Broadcast evenly on soil surface and incorporate 4 to 6 inches deep prior to planting. (RUP)

**WHITE GRUBS:** Effective chemical control is not presently available. Rotation to a less sensitive crop like corn, with a soil insecticide, is recommended.

### Bifenthrin

- *Bifenture* EC, . (RUP)
- *Brigade* 2EC, . (RUP)
- *Capture* LFR, . (RUP)
- *Sniper*, . (RUP)
- *Tundra* EC, . (RUP)

See label for rates and application methods.

## FURROW TREATMENT:

### APHIDS, FLEA BEETLE, LEAFHOPPERS:

*Belay*, 9 to 12 fl oz.

or

### Imidacloprid

- *Admire* Pro, 5.7 to 8.7 fl oz..
- *Nuprid* 2 F, 0.9 to 1.3 fl oz per 1,000 row ft..

or

### Thiamethoxam

- *Platinum* (5 to 8 fl oz.) or *Platinum* 75 SG (1.66 to 2.67 oz.) (30 days) See label for application methods.

or

*Thimet* 20 G, 8.5 to 11.3 oz. (for light, sandy soils) or 13 to 17.3 oz. (for heavy, clay soils) / 1,000 row ft. (90 days) May also help control Colorado potato beetle. See label for application methods. (RUP)

or

*Venom* 20 SG, 1.4 to 1.65 lb. See label for application methods.

### COLORADO POTATO BEETLE:

*Belay*, 9 to 12 fl oz. See label for application methods.

or

### Dinotefuran

- *Scorpion* 35SL, 11 to 13 fl oz.
- *Venom* (6.5 to 7.5 oz.) or *Venom* 20 SG (1.4 to 1.65 lb.)

See label for application methods.

or

### Imidacloprid. Additional generic brands available.

- *Admire* Pro, 5.7 to 8.7 fl oz.
- *Nuprid* 2 F, 0.9 to 1.3 oz per 1,000 row ft.

See label for application methods.

or

### Thiamethoxam

- *Platinum* (5 to 8 fl oz.) or *Platinum* 75 SG (1.66 to 2.67 oz.) (30 days) See label for application methods.

### FLEA BEETLE, LEAFHOPPERS:

### Dinotefuran

- *Scorpion* 35SL, 11 to 13 fl oz. See label for application methods.
- *Venom*, 6.5 to 7.5 oz.

### WIREWORM:

*Thimet* 20 G, 8.5 to 11.3 oz. (for light, sandy soils) or 13 to 17.3 oz. (for heavy, clay soils) / 1,000 row ft. (90 days) (RUP)

## FOLIAR TREATMENT:

**FLEA BEETLE:** Apply if there are more than 50/25 sweeps. May occur soon after plants emerge and again in late July and August.

*Actara*, 1.5 to 3 oz. (14 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 6 oz/acre per season.

or

*Assail* 30 SG, 1.4 to 2.5 oz. (7 days)

or

*Athena*, 7 to 17 fl oz. (21 days) (RUP)

or

*Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

*Belay*, 2 to 3 fl oz. (14 days) Minimum of 7 days between applications; do not apply more than 12 fl oz. per season.

or

### Bifenthrin

- *Bifenture* EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Brigade* 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (21 days) (RUP)

or

*Brigadier*, 4.15 to 6.14 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 25.6 fl oz. per season. (RUP)

or

### Carbaryl

- *Carbaryl* 4L, 0.5 to 1 qt. (7 days)
- *Sevin* 4 F (0.5 to 1 qt.) or *Sevin* 80 S (0.63 to 1.25 lb.) or *Sevin* XLR Plus (0.5 to 1 qt.) (7 days)

or

### Dinotefuran

- *Scorpion* 35SL, 2 to 2.75 fl oz. (7 days)
- *Venom* (1 to 1.5 oz.) or *Venom* 20 SG (0.33 lb.) (7 days)

or

*Endigo* ZC, 2.5 to 4.5 fl oz. (14 days) (RUP)

or

### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (1 day) Consult label for rotation restrictions. (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (7 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (12 days) (RUP)

or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

### Imidacloprid. Additional generic brands available.

- *Admire* Pro, 1.3 fl oz.
  - *Nuprid* 1.6 F, 3.8 fl oz. (7 days)
- Do not use if neonicitinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

*Leverage* 360, 2.8 fl oz. (14 days) (RUP)

or

### Methomyl

- *Lannate* LV (1.5 pt.) or *Lannate* SP (0.5 lb.) (6 days) (RUP)
- *Nudrin* LV (1.5 pt.) or *Nudrin* SP (0.5 lb.) (6 days) (RUP)

or

*Penncap-M* 2 F, 2 to 4 pt. (5 days) (RUP)

or

### Permethrin

- *Ambush* 25 W, 3.2 to 12.8 oz. (14 days) (RUP)

- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (14 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)
  - or
  - Steed*, 2.5 to 3.5 fl oz. (21 days) (RUP)
    - or
    - Voliam Flexi*, 4 oz. (14 days)

**COLORADO POTATO BEETLE:** Apply if there is more than 1 large larva or adult per plant. Piperonyl butoxide (Butacide, Prentox PBO-8, Incite) at 0.5 to 1 pt. per acre may be effective as a synergist to block resistance to organophosphate (Guthion, Imidan, etc.) and pyrethroid (Asana, etc.) insecticides.

- \* *Actara*, 1.5 to 3 oz. (14 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 6 oz/acre per season.
    - or
    - \* *Agri-Mek* 0.15 EC, 8 to 16 fl oz. (14 days) (RUP)
      - or
    - \* *Assail* 30 SG, 1.5 to 4 oz. (7 days) Do not apply if a neonicitinoid was used at planting.
      - or
  - \* *Dinotefuran*
  - *Scorpion* 35SL, 2 to 2.75 fl oz. (7 days)
  - *Venom* (1 to 1.5 oz.) or *Venom* 20 SG (0.33 lb.) (7 days)
- Do not apply if a neonicitinoid was used at planting.
- or
  - \* *Entrust*, 1 to 2 oz. (7 days) Do not apply more than 3 times in 30 days.
    - or
    - \* *Imidacloprid*. Additional generic brands available.
  - *Admire Pro*, 1.3 fl oz.
  - *Nuprid* 1.6 F, 3.8 fl oz. (7 days)
- Do not use if neonicitinoids were applied at planting. Do not exceed 19.2 oz/acre per season.
- or
  - \* *Rimon*, 9 to 12 fl oz. (14 days) Small larvae only. 2 applications per year.
    - or
    - Athena*, 7 to 17 fl oz. (21 days) (RUP)
      - or
      - Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)
        - or
  - Belay*, 2 to 3 fl oz. (14 days) Minimum of 7 days between applications; do not apply more than 12 fl oz. per season. Do not apply if a neonicitinoid was used at planting.

- or
- Brigadier*, 4.15 to 6.14 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 25.6 fl oz. per season. Do not apply if a neonicitinoid was used at planting. (RUP)

#### Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (7 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (7 days)
  - or

- Endigo ZC*, 2.5 to 4.5 fl oz. (14 days) Do not apply if a neonicitinoid was used at planting. (RUP)

#### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (7 days) (RUP)
- *Thionex* 50W, 1 to 2 lb. (12 days) (RUP)
  - or

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana* XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - or
  - Imidan* 70 WP, 1.33 lb. (7 days)
    - or

#### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
    - or
- Leverage* 360, 2.8 fl oz. (14 days) Do not apply if a neonicitinoid was used at planting. (RUP)
- or

- Penncap-M* 2 F, 2 to 6 pt. (5 days) (RUP)
  - or

#### Permethrin

- *Ambush* 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (14 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)
  - or

- Radiant* SC, 4.5 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.
  - or

#### Rynaxypyr

- *Altacor*, 2 to 3 oz. (14 days) Minimum of 5 days between applications; do not apply more than 9 oz. per season.
- *Coragen*, 3.5 to 5 fl oz. (14 days) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.
  - or

- Voliam Flexi*, 4 oz. (14 days) Do not apply if a neonicitinoid was used at planting.
  - or

- Vydate L*, 2 to 4 pt. (7 days) (RUP)

**LEAFHOPPERS:** Apply if there are more than 0.5 adults/sweep or 1 nymph/10 leaves.

- Actara*, 1.5 to 3 oz. (14 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 6 oz/acre per season.

- or
- Assail* 30 SG, 1.5 to 4 oz. (7 days) Do not apply if a neonicitinoid was used at planting.

- or
- Athena*, 7 to 17 fl oz. (21 days) (RUP)

- or
- Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)
  - or

- Belay*, 2 to 3 fl oz. (14 days) Minimum of 7 days between applications; do not apply more than 12 fl oz. per season. Do not apply if a neonicitinoid was used at planting.

- or
- Brigadier*, 4.15 to 6.14 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 25.6 fl oz. per season. Do not apply if a neonicitinoid was used at planting. (RUP)

#### Carbaryl

- *Carbaryl* 4L, 0.5 to 2 qt. (7 days)
- *Sevin* 4 F (0.5 to 2 qt.) or *Sevin* 80 S (0.63 to 2.5 lb.) or *Sevin* XLR Plus (0.5 to 2 qt.) (7 days)
  - or

#### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) (0 days)
- *Dimethoate* 4E, 0.5 to 1 pt. (2 days)
  - or

#### Dinotefuran

- *Scorpion* 35SL, 2 to 2.75 fl oz. (7 days)
- *Venom* (1 to 1.5 oz.) or *Venom* 20 SG (0.33 lb.) (7 days)

- Do not apply if a neonicitinoid was used at planting.

- or
- Endigo ZC*, 2.5 to 4.5 fl oz. (14 days) Do not apply if a neonicitinoid was used at planting. (RUP)
  - or

#### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)

## Potatoes

- Thionex 3EC, 0.66 to 1.33 qt. (7 days) (RUP)
- Thionex 50W, 1 to 2 lb. (12 days) (RUP)

or

### Esfenvalerate

- Adjourn, 2.9 to 9.6 fl oz. (7 days) (RUP)
- Asana XL, 2.9 to 9.6 fl oz. (7 days) (RUP)
- S-FenvatoStar, 2.9 to 9.6 fl oz. (7 days) (RUP)

or

Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 fl oz.

- Nuprid 1.6 F, 3.8 fl oz. (7 days)

Do not use if neonicitinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

or

- Imidan 70 WP, 1.33 lb. (7 days)

or

### Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

or

Leverage 360, 2.8 fl oz. (14 days) Do not apply if a neonicitinoid was used at planting. (RUP)

or

### Malathion

- Malathion 5 (1 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (1 pt.) (0 days)

or

### Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (6 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (6 days) (RUP)

or

- PennCap-M 2 F, 2 to 4 pt. (5 days) (RUP)

or

### Permethrin

- Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)

- Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)

or

Voliam Flexi, 4 oz. (14 days) Do not apply if a neonicitinoid was used at planting.

**APHIDS:** Treat if numbers exceed 1 per leaf (1/10 leaves for seed potatoes). Control is especially important to reduce virus disease in seed potato production.

- \* Assail 30 SG, 2.3 to 4 oz. (7 days)

or

- \* Fulfill, 2.75 to 5.5 oz. (14 days) Do not apply more than 11 oz/acre per season. May require 5 to 7 days for aphid mortality.

or

\* Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 fl oz.

- Nuprid 1.6 F, 3.8 fl oz. (7 days)

Do not use if neonicitinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

or

Actara, 3 oz. (14 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 6 oz/acre per season.

or

- Athena, 7 to 17 fl oz. (21 days) (RUP)

or

Belay, 2 to 3 fl oz. (14 days) Minimum of 7 days between applications; do not apply more than 12 fl oz. per season.

or

- Beleaf 50 SG, 2 to 2.8 oz. (7 days)

or

Brigadier, 4.15 to 6.14 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 25.6 fl oz. per season. (RUP)

or

### Dimethoate

- Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) (0 days)

- Dimethoate 4E, 0.5 to 1 pt. (2 days)

or

- Endigo ZC, 4 to 4.5 fl oz. (14 days) (RUP)

or

### Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)

- Thionex 3EC, 0.66 to 1.33 qt. (7 days) (RUP)

- Thionex 50W, 1 to 2 lb. (12 days) (RUP)

or

### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)

- S-FenvatoStar, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)

- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

- Leverage 360, 2.8 fl oz. (14 days) (RUP)

or

### Malathion

- Malathion 5 (1 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (3 pt.) (0 days)

or

### Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (6 days) (RUP)

- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (6 days) (RUP)

or

Movento, 4 to 5 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or

### Permethrin

- Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)

- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)

- Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)

or

- Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

or

- Venom 20 SG, 0.33 lb. (7 days)

or

- Voliam Flexi, 4 oz. (14 days)

## TARNISHED PLANT BUG:

- Athena, 10 to 17 fl oz. (21 days) (RUP)

or

- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

- Beleaf 50 SG, 2 to 2.8 oz. (7 days)

or

### Carbaryl

- Carbaryl 4L, 1 to 2 qt. (7 days)

- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)

or

- Endigo ZC, 3 to 4 fl oz. (14 days) (RUP)

or

### Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (1 day) (RUP)

- *Thionex 3EC*, 0.66 to 1.33 qt. (7 days) (RUP)
- *Thionex 50W*, 1 to 2 lb. (12 days) (RUP)

Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

Leverage 360, 2.8 fl oz. (14 days) (RUP)

or

PennCap-M 2 F, 2 to 4 pt. (5 days) (RUP)

or

Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (14 days) (RUP)

- *Pounce 25 WP*, 6.4 to 12.8 oz. (14 days) (RUP)

**CUTWORM, ARMYWORM, LOOPERS:** Apply if defoliation exceeds 10%.\* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (14 days) (RUP)

- *Pounce 25 WP*, 6.4 to 12.8 oz. (14 days) (RUP)

or

Athena, 7 to 17 fl oz. (21 days) (RUP)

**EUROPEAN CORN BORER:** Plan treatment to coincide with first generation egg laying if there is more than 1 egg mass per 25 leaves.

- \* *Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

\* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

Permethrin

- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (14 days) (RUP)

- *Pounce 25 WP*, 6.4 to 12.8 oz. (14 days) (RUP)

or

Athena, 7 to 17 fl oz. (21 days) (RUP)

or

Avaunt, 3.5 to 6 oz. (3 days)

or

Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (7 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

or

Endigo ZC, 3 to 4 fl oz. (14 days) (RUP)

or

Endosulfan

- *Endosulfan 3 EC*, 1 to 1.33 qt. (1 day) (RUP)
- *Thionex 3EC*, 1 to 1.33 qt. (7 days) (RUP)

- *Thionex 50W*, 1.5 to 2 lb. (12 days) (RUP)

Consult label for rotation restrictions.

or

*Entrust*, 1 to 2 oz. (7 days) Do not apply more than 3 times in 30 days.

or

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

Leverage 360, 2.8 fl oz. (14 days) (RUP)

or

*Radiant SC*, 4.5 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.

or

Rynaxypyr

- *Altacor*, 2 to 3 oz. (14 days)
- *Coragen*, 3.5 to 5 fl oz. (14 days)

or

Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

or

Voliam Flexi, 4 oz. (14 days)

**CABBAGE LOOPERS:**

- \* *Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

Endigo ZC, 3 to 4 fl oz. (14 days) (RUP)

or

*Entrust*, 1.5 to 3 oz. (7 days) Do not apply more than 3 times in 30 days.

or

Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

Leverage 360, 2.8 fl oz. (14 days) (RUP)

or

Methomyl

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (6 days) (RUP)

- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (6 days) (RUP)

or

Permethrin

- *Ambush 25 W*, 3.2 to 12.8 oz. (14 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (14 days) (RUP)

or

*Radiant SC*, 6 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.

or

Rynaxypyr

- *Altacor*, 2 to 3 oz. (14 days)
- *Coragen*, 3.5 to 5 fl oz. (14 days)

or

Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

or

Voliam Flexi, 4 oz. (14 days)

**ARMYWORM:**Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (7 days)

- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

or

Coragen, 3.5 to 5 fl oz. (1 day)

or

Endigo ZC, 3 to 4 fl oz. (14 days) (RUP)

or

Endosulfan

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (1 day) (RUP)
- *Thionex 3EC*, 0.66 to 1.33 qt. (7 days) (RUP)

- *Thionex 50W*, 1 to 2 lb. (12 days) (RUP)

or

\*Materials marked with an asterisk are particularly recommended for problem infestations.

## Potatoes

*Entrust*, 1.5 to 3 oz. (7 days) Do not apply more than 3 times in 30 days.

or  
Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

or  
Methomyl

- *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (6 days) (RUP)
  - *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (6 days) (RUP)
- or  
*Radiant SC*, 6 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.
- or  
*Voliam Flexi*, 4 oz. (14 days)

### CUTWORM:

- \* *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or  
Carbaryl

- *Carbaryl* 4L, 1 to 2 qt. (7 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1.5 to 2 qt.) (7 days)

or  
*Endigo ZC*, 2.5 to 4.5 fl oz. (14 days) (RUP)

or  
Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (7 days) (RUP)
- *Warrior II* with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

or  
*Leverage 360*, 2.8 fl oz. (14 days) (RUP)

or  
Methomyl

- *Lannate LV* (1.5 pt.) or *Lannate SP* (0.5 lb.) (6 days) (RUP)
- *Nudrin LV* (1.5 pt.) or *Nudrin SP* (0.5 lb.) (6 days) (RUP)

### WHITE GRUBS, WIREWORM:

Bifenthrin

- *Bifenture EC*, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC*, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (21 days) (RUP)

## DISEASES

### SEED TREATMENT:

**FUSARIUM TUBER ROT (*Fusarium spp.*):** Fall treatment. Treat seed going into storage or at the time of shipping. This must be done at least 6 weeks before planting.

Thiabendazole

- *Mertect 340*, 0.42 fl oz/ton of potatoes. Apply in enough water for complete coverage. Apply as a spray to potato tubers (seed and table stock) at time of storage and again at removal. See manufacturer's recommendations for equipment and methods to use. Treatment may be applied to washed or unwashed potatoes.

### SOFT ROT and BLACK LEG (*Pectobacterium carotovorum*):

Streptomycin sulfate

- *Agri-mycin 17*, 100 ppm. Mix with Maxim 4FS or Maxim MZ.
- *Bac-master*, 100 ppm. Mix with Maxim 4FS or Maxim MZ.

### SEED TREATMENT AND HANDLING:

**FUSARIUM TUBER ROT (*Fusarium spp.*):** Pre-planting treatment. Dust or spray cut or whole seed before planting.

Captan

- *Captan 10 Potato Seed Protectant*, 0.75 lb per 100 lb cut seed pieces.

or  
Fludioxinil

- *Maxim MZ* 0.5 D, 0.5 lb per 100 lb seed potatoes.

or  
Mancozeb

- *Dithane F-45 Rainshield*, 2 pt per 50 gal water. Treat as above.
- *Dithane M-45*, 1.25 lb per 50 gal water. Treat as above.
- *Koverall 75 WP*, 1.25 lb. per 50 gal water. Treat as above.
- *Manzate 200 80 W*, 2.5 lb per 100 gal water. Drain and plant as soon as possible.

- *Penncozeb 80 WP*, 1.25 lb per 50 gal water.. (3 days) Treat as above.

or  
Maneb

- *Maneb 80 WP*, 1 lb per 10 gal water. Treat as above.
- *Manex 4 F*, 1.6 pt per 10 gal water. Dip whole or cut tubers. Place in a clean container and plant as soon as possible after treatment.

or  
*Moncoat MZ*, 0.75-1.0 lb/100 lb of seed potatoes.

or  
*Tops MZ* 8.5 DS, 0.5 lb per 100 lb seed.

Use only as directed. **Note:** DO NOT feed treated seed to livestock.

**RHIZOCTONIA DISEASE (*Rhizoctonia solani*):** Dust cut or whole seed just before planting.

Fludioxinil

- *Maxim 0.5 D*, 0.5 lb per 100 lb seed potatoes.
- *Maxim 4 FS*, 0.08 fl oz. Note: If Maxim 4 FS is used for potatoes for seed production, a labeled rate of mancozeb seed treatment dust must be applied to seed tubers after the Maxim 4 FS treatment. Alternatively, an in-furrow application of Quadris at 6.1 - 9.2 fl oz/A may be used (34" row spacing).

- *Maxim MZ* 0.5 D, 0.5 lb per 100 lb seed potatoes.

or  
Flutololnil

- *Moncut*, 0.71 - 1.1 lb/A in-furrow at planting with a minimum of 3 gal/A. 1.1 lb maximum per season.

or  
*Moncoat MZ*, 0.75-1.0 lb/100 lb seed potatoes.

or  
*Tops MZ* 8.5 DS, 0.5 lb/100 lb seed.

### SILVER SCURF (*Helminthosporium solani*):

Fludioxinil

- *Maxim 0.5 D*, 0.5 lb per 100 lb seed potatoes.
- *Maxim 4 FS*, 0.08 fl oz/100 lb seed potatoes. Note: If Maxim 4 FS is used for potatoes for seed production, a labeled rate of mancozeb seed treatment dust must be applied to seed tubers after the Maxim 4 FS treatment.
- *Maxim MZ* 0.5 D, 0.5 lb per 100 lb seed potatoes.

or  
*Moncoat MZ*, 0.75 - 1.0 lb pre-plant per 100 lb seed. Maximum 1.0 lb per season.

### DISINFECTION OF CUTTING KNIVES: Spray or mist surface of knives:

Quaternary ammonium compounds

- *Green Shield*, 0.5 fl oz per gallon of water.
- *Hypochlorite* 5.25% bleach, 1 part commercial formulation in 50 parts of water (2%).

**PRE-PLANT TREATMENT:****WHITE MOLD (*Sclerotinia sclerotiorum*):**Coniothyrium Minitans

- *Contans*, 1 - 4 lb.

**IN FURROW AT PLANTING TREATMENTS:**

For control of seed-borne and soil-borne diseases.

**BLACK DOT (*Colletotrichum coccodes*):**Azoxystrobin

- *Quadris*, in-furrow at planting at 6.1 - 9.2 fl oz/A (34" row spacing). Maximum 7.5 pt/A per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

**RHIZOCTONIA DISEASE (*Rhizoctonia solani*):**Azoxystrobin

- *Quadris*, in-furrow at planting at 6.1 - 9.2 fl oz/A (34" row spacing). Maximum 7.5 pt/A/season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

Flutonil

- *Moncut*, 0.71 - 1.1 lb/A with a minimum of 3 gal/A. Maximum of 1.1 lb/season.

**SILVER SCURF (*Helminthosporium solani*):**Azoxystrobin

- *Quadris*, 6.2 to 9.2 fl oz. Maximum 7.5 pt/A/season.

Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

**BLACK DOT, PINK ROT, PYTHIUM LEAK, PYTHIUM SEEDLING****BLIGHT, RHIZOCTONIA STEM CANKER:**

*Quadris Ridomil Gold*, 12.6 fl oz. (48 hours) See label for plantback restrictions.

**PINK ROT (*Phytophthora erythroseptica*), PYTHIUM LEAK (*Pythium ultimum*):**Cyazofamid

- *Ranman*, 0.42 fl oz.

or

Mono-, dibasic sodium, potassium and ammonium phosphites

- *Prophyt*, 4 - 10 pt. Apply at least 3 gallons of mix per acre. Add Ridomil.

**FOLIAR TREATMENT:****BLACK DOT (*Colletotrichum coccodes*):**Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 1.6 pt/A every 7 - 14 days. Maximum of 9.6 pt/season. (14 days).

or

Mandipropamid/Difenoconazole

- *Revus Top*, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

or

Potassium Bicarbonate

- *Armicarb 100*, 2.5 to 5 lb every 5-14 days. (0 days)

**EARLY BLIGHT (*Alternaria solani*): Apply every 5 to 7 days after emergence.**Azoxystrobin

- *Quadris*, 6.2 to 15.4 fl oz. Maximum 7.5 pt/A/season. Note: It is recommended that a protectant partner such as an EDBC

(mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 1.6 pt/A every 5 - 7 days. (14 days) Maximum of 9.6 pt/season.

or

Bacillus pumilis

- *Sonata*, 4 - 8 pt/A every 5 - 7 days.

or

Bacillus subtilis

- *Serenade*, 6 lb/A every 5 - 7 days.

or

Boscalid

- *Endura*, 2.5 - 4.5 oz every 7 - 14 days. (10 days) Maximum of 20 oz/season.

or

Chlorothalonil

- *Applause 720*, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.

- *Bravo Ultrex*, 0.9 to 1.4 lb. (7 days) Do not apply more than 14.5 lb in a growing season.

- *Bravo Weather Stik*, 1 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.

- *Echo Zn*, 1.5 to 2.2 pt. (7 days) Do not apply more than 21.5 pt in a growing season.

- *Equus 720 SST*, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.

- *Initiate 720*, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.

Note: All chlorothalonil products may be applied through irrigation water.

or

Copper Hydroxide

- *Badge SC*, 0.9 - 3.7 pt every 7-10 days.

- *C-O-C-S WDG*, 1.5 to 4 lb every 7-10 days. (0 days)

- *Kentan DF*, 3 lb every 7-10 days.

or

Copper Hydroxide/Copper Oxychloride

- *Badge SC*, 0.9 - 3.7 pt every 7-10 days.

- *C-O-C-S WDG*, 1.5 to 4 lb every 7-10 days. (0 days)

- *Kentan DF*, 3 lb every 7-10 days.

or

Copper Oxychloride / Copper Sulfate

- *Badge SC*, 0.9 - 3.7 pt every 7-10 days.

- *C-O-C-S WDG*, 1.5 to 4 lb every 7-10 days. (0 days)

- *Kentan DF*, 3 lb every 7-10 days.

or

Famoxadone/Cymoxanil

- *Tanos*, 6 oz/A every 7 to 10 days. (14 days) Maximum 3.0 lb/season.

or

Fenamidone

- *Reason 500 SC*, 5.5 - 8.2 fl oz every 5 to 10 days. 24.6 fl oz maximum per season.. (7 days) Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

Fluoxastrobin

- *Evito 480SC*, 3.8 fl oz every 7-10 days. It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product.

## Potatoes

Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

### Iprodione

- Iprodione 4L, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- Nevado 4F, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- Rovral 4 F, 1 to 2 pt. (7 days) See label for rotational crop and other restrictions.
- Rovral 50 W, 2 lb. (14 days) See label for rotational crop restrictions.

Note: Garlic, dry bulb onions, broccoli, lettuce, peanuts, carrots, beans and potatoes can be rotated after harvest. Root crops, tomatoes and cotton may be rotated one month after last application.

or

### Mancozeb

- Dithane DF Rainshield, Dithane M-45, 2 lb. (3 days) May be used through irrigation equipment.
- Koverall 75 WP, 1 to 2 lb. (3 days)
- Manex II, 3.2 pt. (3 days)
- Manzate Pro-Stick, 1 to 2 lb. (3 days) May be used through irrigation equipment.
- Penncozeb 75 DF, Penncozeb 80 WP, 2 lb. (3 days)

or

### Mancozeb/Zoxamide

- Gavel 75 DF, 1.5 - 2.0 lb every 5 - 7 days. Maximum 12.0 lb/season.. (3 days)

or

### Mandipropamid/Difenoconazole

- Revus Top, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

or

### Maneb

- Maneb 80 WP, 1 1/2 to 2 lb. (3 days)

or

### Organotin-Based Compounds

- Agritin 80 WP, Supertin 80 WP, 2.5 to 3.75 oz. (21 days) Use only in tank mixture with other fungicides. Do not apply more than 11.5 oz/acre in a growing season.

or

### Polymram 80 DF

- 2 lb. (3 days)

or

### Potassium Bicarbonate

- Armicarb 100, 2.5 to 5 lb every 5-14 days. (0 days)

or

### Pyraclostrobin

- Headline EC, Headline SC, 6-9 fl oz. (3 days) Do not apply more than 72 fl. oz per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

### Pyrimethanil

- Scala, 7 fl oz every 7 - 14 days. (7 days) Maximum of 35 fl oz per season. Note: It is recommended that Scala is used in a tank mix with a labeled dose rate of another effective early blight fungicide.

or

### Trifloxystrobin

- Gem 25 WDG (6.0-8.0 oz) or Gem 500 (2.9 to 3.8 fl oz) (7 days) Do not apply more than 48 oz. per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

**LATE BLIGHT (*Phytophthora infestans*): Apply after plants are 6 inches tall and every 5-7 days until vines are completely dead.**

### Azoxystrobin

- Quadris, 6.2-15.4 fl oz.

Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

### Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 pt/A every 5 - 7 days. (14 days) Maximum 9.6 pt/season.

or

### Bacillus subtilis

- Serenade, 6 lb/A every 5 - 7 days.

or

### Chlorothalonil

- Applause 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.
- Bravo Ultrex, 0.9 to 1.4 lb. (7 days)
- Bravo Weather Stik, 1 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.
- Bravo Weather Stik Zn, 1.0 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.
- Echo Zn, 1.5 to 2 pt/A. (7 days) Do not apply more than 21.5 pt in a growing season.
- Equus 720 SST, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.
- Initiate 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.

Note: All chlorothalonil products may be applied through irrigation water.

or

### Copper Hydroxide

- Badge SC, 0.9 - 3.7 pt every 7-10 days.
- Champ Formula 2 F, 1 1/3 to 2 pt. (0 days)
- C-O-C-S WDG, 1.5 to 4 lb every 7-10 days. (0 days)
- Kocide 2.4 LF, 2 lb. (0 days)

Note: During growing season, use copper-based compounds in mixture with chlorothalonil.

or

### Copper Hydroxide/Copper Oxychloride

- Badge SC, 0.9 - 3.7 pt every 7-10 days.
- Champ Formula 2 F, 1 1/3 to 2 pt. (0 days)
- C-O-C-S WDG, 1.5 to 4 lb every 7-10 days. (0 days)
- Kocide 2.4 LF, 2 lb. (0 days)

Note: During growing season, use copper-based compounds in mixture with chlorothalonil.

or

### Copper Oxychloride / Copper Sulfate

- Badge SC, 0.9 - 3.7 pt every 7-10 days.
- Champ Formula 2 F, 1 1/3 to 2 pt. (0 days)
- C-O-C-S WDG, 1.5 to 4 lb every 7-10 days. (0 days)
- Kocide 2.4 LF, 2 lb. (0 days)

Note: During growing season, use copper-based compounds in mixture with chlorothalonil.

or

### Copper-based compounds

- Badge SC, 0.9 - 3.7 pt every 7-10 days.
- Champ Formula 2 F, 1 1/3 to 2 pt. (0 days)
- C-O-C-S WDG, 1.5 to 4 lb every 7-10 days. (0 days)
- Kocide 2.4 LF, 2 lb. (0 days)

Note: During growing season, use copper-based compounds in mixture with chlorothalonil.

or  
Cyazofamid

- *Ranman*, 1.4 to 2.75 fl oz every 7 to 10 days. (7 days) Maximum 27.5 fl oz/A/season.

or  
Cymoxanil

- *Curzate* 60 DF, 0.21 lb. (14 days) Use only in tank mixture with other fungicides from when foliage meets within rows to early senescence. May be used to prevent spread to uninfected foliage from within infected fields. Must be mixed with a fungicide partner such as an EBDC or chlorothalonil

or  
Dimethomorph

- *Forum*, 4 to 6 fl oz. (4 days) Use from when foliage meets within rows to late senescence. May be used to prevent spread to uninfected foliage from within infected fields. Must be mixed with a fungicide partner such as an EBDC or chlorothalonil.

or  
Famoxadone/Cymoxanil

- *Tanos*, 6 - 8 oz/A every 7 to 10 days. (14 days) Maximum 3.0 lb/season.

or  
Fenamidone

- *Reason* 500 SC, 5.5 - 8.2 fl oz every 5 to 10 days. (7 days) Maximum 24.6 fl oz/season.

Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or  
Fluazinam

- *Omega* 500 F, 5.5 fl oz/A. (14 days) Do not apply more than 3.5 pt in a growing season.

or  
Fluopicolide

- *Presidio*, 3-4 fl oz every 10 days. (7 days) Tank mix with another labeled product fungicide with a different mode of action.

or  
Fluoxastrobin

- *Evito* 480SC, 3.8 fl oz every 7-10 days. It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product.

Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or  
Mancozeb

- *Dithane* DF Rainshield (2 lb) or *Manzate* Pro-Stick (1 to 2 lb) (3 days) May be used through irrigation equipment.
- *Koverall* 75 WP, 1 to 2 lb. (3 days)
- *Manex* II, 3.2 pt. (3 days)
- *Penncozeb* 75 DF (2 lb) or *Penncozeb* 80 WP (1 to 2 lb) (3 days)

or  
Mancozeb/Zoxamide

- *Gavel* 75 DF, 1.5 - 2.0 lb every 5 - 7 days. (3 days) Maximum 12.0 lb/season.

or  
Mandipropamid/Difenoconazole

- *Revus Top*, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

or  
Maneb

- *Maneb* 80 WP, 1 1/2 to 2 lb. (3 days)

or  
Mefenoxam/Chlorothalonil

- *Ridomil* Gold Bravo, 2 lb. (7 days)

• *Ridomil* Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

- *Ridomil* Gold MZ, 2.5 lb. (7 days)

or  
Mefenoxam/Copper Hydroxide

- *Ridomil* Gold Bravo, 2 lb. (7 days)

• *Ridomil* Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

- *Ridomil* Gold MZ, 2.5 lb. (7 days)

or  
Mefenoxam/Mancozeb

- *Ridomil* Gold Bravo, 2 lb. (7 days)

• *Ridomil* Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

- *Ridomil* Gold MZ, 2.5 lb. (7 days)

or  
Mono-, dibasic sodium, potassium and ammonium phosphites

• *Phostrol*, 3.75 - 10 pt/A every 5 to 10 days. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture.

- *Prophyt*, 4 pt every 5-10 days.

or  
Organotin-Based Compounds

- *Agritin* 80 WP, *Supertin* 80 WP, 2.5 to 3.75 oz. (21 days) Use only in tank mixture with other fungicides. Do not apply more than 11.5 oz per growing season.

or  
Polyram 80 DF, 2 lb. (3 days)

or  
Propamocarb

- *Previcur Flex*, 0.9 to 1.2 pt/acre depending on disease pressure; with chlorothalonil-based product at 2/3 rate or with EBDC-based product at 2/3 rate. (14 days)

or  
Pyraclostrobin

- *Headline* EC, *Headline* SC, 6-9 fl oz. (3 days) Do not apply more than 72 fl. oz per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or  
Trifloxystrobin

- *Gem* 25 WDG, 6.0-8.0 oz. (7 days) Do not apply more than 48 oz. per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.
- *Gem* 500, 3.8 fl oz. (7 days) Tank mix only with protectant.

**LATE BLIGHT TUBER ROT (*Phytophthora infestans*), LEAK (*Phythium* spp.), PINK ROT (*Phytophthora erythroseptica*): Apply at flowering and again 14 days later.**

Mefenoxam/Chlorothalonil

- *Ridomil* Gold Bravo, or *Ridomil* Gold Copper (2 lb) or *Ridomil* Gold MZ (2.5 lb) (21 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

or

Mefenoxam/Copper Hydroxide

- *Ridomil* Gold Bravo, or *Ridomil* Gold Copper (2 lb) or *Ridomil* Gold MZ (2.5 lb) (21 days) Apply when foliage meets within the row

## Potatoes

and may be applied once more after 14 days. Use protectant fungicides between applications.

or

### Mefenoxam/Mancozeb

- *Ridomil Gold Bravo*, or *Ridomil Gold Copper* (2 lb) or *Ridomil Gold MZ* (2.5 lb) (21 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

**BOTRYTIS BLIGHT (*Botrytis cinerea*): Apply after mid-season when disease symptoms are likely to appear.**

### Chlorothalonil

- *Applause 720*, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.
- *Bravo Ultrex*, 0.9 to 1.4 lb. (7 days) Do not apply more than 21.5 lb in a growing season.
- *Bravo Weather Stik*, *Equus 720 SST*, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.
- *Echo Zn*, 1.5 to 2.2 pt. (7 days) Do not apply more than 21.5 pt in a growing season.
- *Initiate 720*, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.

Note: All chlorothalonil products may be applied through irrigation water.

or

### Mancozeb

- *Dithane DF Rainshield*, 2 lb. (3 days) May be used through irrigation equipment.
- *Koverall 75 WP*, 1 to 2 lb. (3 days)
- *Manzate Pro-Stick*, 1 to 2 lb. (3 days)
- *Penncozeb 75 DF* (2 lb) or *Penncozeb 80 WP* (1 to 2 lb) (3 days)

or

### Maneb

- *Maneb 80 WP*, 1 1/2 to 2 lb. (3 days)
- *Manex 4 F*, 3.2 pt. (3 days)

or

### Polyram 80 DF, 2 lb. (3 days)

or

### Pyrimethanil

- *Scala*, 7 fl oz every 7 - 14 days. (7 days) Maximum of 35 fl oz per season. It is recommended that Scala is used in a tank mix with a labeled dose rate of another effective early blight fungicide.

**WHITE MOLD (*Sclerotinia sclerotiorum*): Apply at first sign of disease or immediately prior to row closing, and again 28 days later if needed.**

### Boscalid

- *Endura*, 5.5 - 10 oz/A every 14 days. (30 days) Maximum 20 oz/season.

or

### Fluazinam

- *Omega 500 F*, 5.5 fl oz. (14 days) Do not apply more than 3.5 pt in a growing season.

or

### Iprodione

- *Iprodione 4L*, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- *Nevado 4F*, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- *Rovral 4 F*, 2 pt in at least 10 gallons of water per acre. (14 days) See label for rotational crop restrictions.

or

### Thiophanate-Methyl

- *Topsin M 70 WSB*, 1-2 lb. (21 days) Do not apply more than 4 lb per season.

## BROWN LEAF SPOT (*Alternaria alternata*):

### Famoxadone/Cymoxanil

- *Tanos DF*, 6 oz every 7-10 days. (14) Maximum 3 lb/A/season. It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

or

### Mandipropamid/Difenoconazole

- *Revus Top*, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

## PINK ROT:

### Fluopicolide

- *Presidio*, 3-4 fl oz every 10 days. (7 days) Maximum of 12 fl oz/acre per season. Tank mix with another labeled product fungicide with a different mode of action.

## PRE-HARVEST SPRAYS:

### LATE BLIGHT: When vines are seriously infected at harvest time.

#### Apply as necessary.

*Blue Viking Star Glow Powder* 100 SC, 10 lb.

*Blue Viking Star Shine Crystals* 100 SC, 10 lb.

Note: The Blue Viking Concentrates should only be applied at vine-kill as they are phytotoxic.

or

### Copper Hydroxide

- *Champ Formula 2 F*, 2 to 5 pt.

or

### Copper-based compounds

- *Kocide 2.4 LF*, 2 lb.

## STORAGE DISINFECTION:

To disinfect storages, boxes, truck beds, bags and equipment (tools, farm machinery), spray or drench surfaces with one of the following compounds: Note: It is important to remove all dirt and trash from surfaces to be treated.

### Hydrogen peroxide

- *Oxidate*, 1.5 to 2.5 fl oz per 100 gal water. Apply at 1 gal of solution per 2000 lb of tubers.

or

### Quaternary ammonium compounds

- *Aquahyme (E-Z Flo)*, Use according to manufacturer's recommendations.

• *Green Shield*, 0.5 fl oz per gallon of water.

- *Hy 2389 (Rohm & Haas)*, Use according to manufacturer's recommendations.

• *Odorless Disinfectant (Haviland)*, Use according to manufacturer's recommendations.

The addition of a wetting agent with quaternary ammonium sprays or drenches is suggested to obtain more uniform coverage of surfaces. Use only those wetting agents recommended by the manufacturer because some are not compatible. Rinse food containers and implements that come in contact with food after treatment.

or

### Sodium Hypochlorite

- *Chlorine* solution, 1,000 to 2,000 ppm concentration. Commercial formulations vary in concentration; therefore, follow manufacturer's recommendation when mixing solutions. Example: Perchlorin is a granule containing 70% calcium hypo-chlorite. It takes 5 teaspoons in 3 gallons of water to make a solution of 1,000 ppm. Rinse food containers and implements that come in contact with food after treatment.

or

*Soluble copper sulfate (blue vitriol; bluestone; etc.)*, 10 to 15 lb in 100 gallons of water.

## PRE-STORAGE TREATMENTS FOR STORAGE DISEASES:

**BACTERIAL SOFT ROT (*Erwinia carotovora*):** Wash potatoes in chlorinated water to (1) disinfect tuber surfaces; (2) cauterize wounds; and (3) promote rapid formation of protective tissue over injured surfaces.

### Hydrogen peroxide

- **Oxidate**, 1.5 to 2.5 fl oz per 100 gal water. Apply at 1 gal of solution per 2000 lb of tubers. May also be applied in humidification water (see manufacturers' recommendations).

or

### Sodium Hypochlorite

- **Chlorine** solution, . Add a concentrated stock solution of chlorine to wash water to give a concentration of 200 ppm (= 2 pt household bleach (5.25% sodium hypochlorite) per 60 gallons of water or 1 gal of bleach per 240 gallons of water).

Mix stock solutions of chlorine in earthen-ware crocks or plastic containers. DO NOT USE metal containers. Dry washed potatoes before bagging or bulk storing by passing hot air over the end of the sorting table. Usually, the sponge drying technique is inadequate without the addition of heat.

## FUSARIUM DRY ROT (*Fusarium* spp.):

### Hydrogen peroxide

- **Oxidate**, 1.5 to 2.5 fl oz per 100 gal water. Apply at 1 gal of solution per 2000 lb of tubers. May also be applied in humidification water (see manufacturers' recommendations).

or

### Thiabendazole

- **Mertect 340**, 42 oz flowable formulation in 100 gallons of water. Apply as a spray to potato tubers (seed and table stock) at time of storage and again at removal; 1 gal of solution per 2,000 lb of tubers. See manufacturer's recommendations for equipment and methods to use. Treatment may be applied to washed or unwashed potatoes. Addition of chlorine (200 ppm) to solution will help control bacterial soft rot. It is advisable to add a wetting agent when treating before storage to ensure good coverage.

## LATE BLIGHT (*Phytophthora infestans*):

### Mono-, dibasic sodium, potassium and ammonium phosphites

- **Phostrol**, 0.1 gal/ton. Apply at 2-4 pt/2000 lb of tubers.
- **Prophyt**, 13 fl oz/ton.

## PINK ROT (*Phytophthora erythroseptica*):

### Mono-, dibasic sodium, potassium and ammonium phosphites

- **Phostrol**, 0.1 gal/ton. Apply at 2-4 pt/2000 lb of tubers.
- **Prophyt**, 13 fl oz/ton.

## PYTHIUM LEAK (*Pythium ultimum*):

### Mono-, dibasic sodium, potassium and ammonium phosphites

- **Phostrol**, 0.1 gal/ton. Apply at 2-4 pt/2000 lb of tubers.

## Pumpkins

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Pumpkins are hosts for root-knot and lesion nematodes. These nematodes can reduce pumpkin yields but yield losses in Michigan have not been documented. If you suspect nematodes are reducing pumpkin yields collect root and soil samples for analysis as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds; control options will be suggested. Vydate 2L is labeled for use in pumpkins.

## INSECTS

### SEED TREATMENT:

#### CUCUMBER BEETLE:

*Cruiser 5 FS*, . See label for rates and application methods.

### SOIL TREATMENT:

#### APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:

*Durivo*, 10 to 13 fl oz. (30 days)

or

#### Thiamethoxam

• *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) See label for application methods.

#### THRIPS, LEAFHOPPERS, SQUASH BUG:

*Venom*, 5 to 6 oz. (21 days) See label for application methods

#### APHIDS, LEAFHOPPERS, THRIPS:

*Venom 20 SG*, 1.13 to 1.34 lb. (21 days)

#### CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS, SQUASH BUG, THRIPS:

*Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)

#### CUTWORM, FLEA BEETLE LARVAE:

*Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

#### SEED CORN MAGGOT:

*Athena*, 8.5 to 17 fl oz. (RUP)

or

#### Bifenthrin

• *Brigade WSB*, 8 to 16 oz. (RUP)

• *Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

See label for application methods.

#### APHIDS, CUCUMBER BEETLES, FLEA BEETLES, LEAFHOPPERS:

*Belay*, 9 to 12 fl oz.

#### APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THRIPS:

#### Imidacloprid

• *Admire Pro*, 7.0 to 10.5 fl oz. (21 days)

• *Nuprid 2 F*, 16 to 24 fl oz. (21 days)

#### FOLIAR TREATMENT:

Pumpkin plants may be sensitive to insecticide formulations under certain conditions. Be sure a problem exists before treatment. Read and observe restrictions or the label. To avoid killing bees, do not treat pumpkins during bloom. See the Insecticide Effectiveness table for bee toxicity.

#### CUTWORM: Apply when damage is first seen and repeat as needed.

\* *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

#### \* Bifenthrin

• *Bifenthrin 2EC AG*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Brigade 2EC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)

• *Capture 2 EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Discipline 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Empower*, 3.5 to 8.7 lb. (3 days) (RUP)

• *Fanfare 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)

• *Tundra EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

#### \* Esfenvalerate

• *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)

• *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

• *S-FenvaloStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

## Pumpkins

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### \* Permethrin

- Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)  
or  
Athena, 7 to 17 fl oz. (7 days) (RUP)

### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or  
Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

or  
Synapse WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.

or  
Vetica, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.

### STRIPED and SPOTTED CUCUMBER BEETLE: Apply as soon as beetle are seen and repeat as needed to prevent bacterial wilt disease.

Assail 30 SG, 2.5 to 5.3 oz. (0 days)

or  
Athena, 7 to 17 fl oz. (7 days) (RUP)

or  
Baythroid XL, 2.4 to 2.8 fl oz. (0 days) (RUP)

or  
Belay, 3 to 4 fl oz. (21 days)  
or

### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)  
or

### Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)  
or

Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)

or

### Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)  
or

### Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Thionex 50W, 1 to 2 lb. (16 days) (RUP)  
or

### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)  
or

### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)

- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or  
Malathion 5, 3 pt. (3 days) Do not apply unless plants are dry.  
or

### Permethrin

- Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)  
or  
Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

### FLEA BEETLE: Apply as needed.

Actara, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.  
or  
Belay, 3 to 4 fl oz. (21 days)

### Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)  
or

### Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day) (RUP)
- Venom, 3 to 4 oz. (1 day)  
or

### Endosulfan

- Thionex 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Thionex 50W, 1 to 2 lb. (16 days) (RUP)  
or

### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)  
or  
Voliam Flexi, 4 to 7 oz. (1 day)

### LEAFHOPPERS: Apply when damage is seen.

Athena, 7 to 17 fl oz. (7 days) (RUP)

or  
Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or  
Belay, 3 to 4 fl oz. (21 days)

### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)  
or

### Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)  
or

### Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom (1 to 4 oz.) or Venom 20 SG (0.44 to 0.895 lb.) (1 day)  
or

### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - or
  - Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
    - or
- Permethrin
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - or
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**SQUASH BUG: Apply as needed.**

- \* Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - or
- \* Permethrin
- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (12.8 oz.) or *Perm-UP* 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
  - or
  - Assail 30 SG, 5.3 oz. (0 days)
    - or
- Athena, 7 to 17 fl oz. (7 days) (RUP)
  - or
- Belay, 3 to 4 fl oz. (21 days)
  - or
- Bifenthrin
- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or
- Carbaryl
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
  - or
- Dinotefuran
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)
  - or
- Endosulfan
- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Thionex 50W, 1 to 2 lb. (16 days) (RUP)
  - or
- Lambda-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - or
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**SQUASH VINE BORER: Apply to base of plants when moths are active, usually starting when plants start to vine. Repeat every 3 to 5 days for 3 weeks.**

Assail 30 SG, 5.3 oz. (0 days)

- or
- Athena, 7 to 17 fl oz. (7 days) (RUP)
  - or
- Bifenthrin
- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or

Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Thionex 50W, 1 to 2 lb. (16 days) (RUP)
  - or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - or

Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - or

*Malathion* 5, 3 pt. (3 days) Do not apply unless plants are dry.Permethrin

- Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - or
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
    - or

Synapse WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.

*Vetica*, 12 to 17 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 38 fl oz. per season.**APHIDS: Apply as needed to prevent disease transmission to plants. Repeat as needed.**

Actara, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.

or  
Assail 30 SG, 2.5 to 4 oz. (0 days)or  
Athena, 7 to 17 fl oz. (7 days) (RUP)or  
Belay, 3 to 4 fl oz. (21 days)or  
Beleaf 50 SG, 2 to 2.8 oz. (0 days)Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - or

## Pumpkins

### Endosulfan

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex 3EC*, 0.66 to 1.33 qt. (11 days) (RUP)
- *Thionex 50W*, 1 to 2 lb. (16 days) (RUP)  
or

*Fulfill*, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.92 fl oz.) or *Warrior* with Zeon Technology (3.84 fl oz.) (1 day) (RUP)  
or

### Malathion

- *Malathion 5*, *Malathion 57 EC*, 1.5 pt. (3 days) Do not apply unless plants are dry.  
or

### Permethrin

- *Perm-UP 25DF* (12.8 oz.) or *Perm-UP 3.2 EC* (8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 12.8 oz. (0 days) (RUP)  
or  
*Venom 20 SG*, 0.44 to 0.895 lb. (1 day)  
or  
*Voliam Flexi*, 4 to 7 oz. (1 day)

### THRIPS:

*Athena*, 13.5 to 17 fl oz. (7 days) (RUP)

or

*Entrust*, 2 to 2.5 oz. (3 days)

or

*Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

or

*Radiant SC*, 6 to 10 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

*Scorpion 35SL*, 2 to 7 fl oz. (1 day)

### SEED CORN MAGGOT:

*Empower*, 3.5 to 8.7 lb. (3 days) (RUP)

## MITES

Apply when needed. Usually a problem only in hot dry weather.

*Agri-Mek 0.15 EC*, 8 to 16 fl oz. (7 days) (RUP)

or

### Bifenthrin

- *Bifenthrin EC*, *Brigade 2EC*, *Capture 2 EC*, 5.1 to 6.4 oz. (3 days) (RUP)

or

*Danitol 2.4 EC*, 10 2/3 fl oz. (7 days) (RUP)

or

### Malathion

- *Malathion 57 EC*, 1 1/2 pt. (3 days)

or

*Oberon 2 SC*, 7 to 8.5 fl oz. (7 days)

or

*Zeal*, 2 to 3 oz. (7 days)

## SLUGS

*Deadline M-Ps 4%* (20 to 40 lb) or *Metaldehyde 3.5 G* (30 to 40 lb)

Apply between rows. Avoid contact with edible product.

## DISEASES

### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Phytophthora* spp., *Rhizoctonia solani*): Use only as directed; over-treatment may cause injury.**

### Bacillus subtilis GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

### Captan

- *Captan 30-DD*, 1 2/3 oz/100 lb seed.
- *Captan 400*, 1 1/2 to 2 oz/100 lb seed.

or

### Fludioxinil

- *Maxim 4 FS*, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.

or

### Thiram

- 42-S *Thiram*, *Thiram 50 WP Dyed*, 4 1/2 oz/100 lb seed.

## PRE-PLANT FUMIGATION:

**PHYTOPHTHORA:** Apply to production fields before planting. Note: Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

### 1,3 Dichloropropene/chloropicrin

- *Telone C35*, 13-35 gal. (RUP)

or

### Metam Sodium

- *Sectagon 42*, *Vapam HL*, 37.5-75 gal.

or

### Potassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal.

Do not plant for 14 to 30 days after treatment (the wetter the soil, the longer the waiting period).

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## GREENHOUSE PREPLANT INCORPORATION:

### DAMPING OFF (*Pythium* spp.), ROOT ROT (*Rhizoctonia* spp.):

### Gliocladium virens GL-21

- *SoilGard 12 G*, 1 to 1.5 lb per cubic yard.

Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

## PREPLANT INCORPORATED:

### DAMPING OFF and COTTONY LEAK (*Pythium* spp.):

**Mefenoxam.** Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil Gold SL*, 1-2 pt.

- *Ultra Flourish*, 2 to 4 pt.

## DRIP APPLICATION:

### PHYTOPHTHORA BLIGHT (*Phytophthora capsici*), DOWNY MILDEW (*Pseudoperonospora cubensis*):

### \* Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**FOLIAR TREATMENT:**

**ALTERNARIA LEAF SPOT (*Alternaria cucumerina*), ANTHRACNOSE (*Colletotrichum lagenarium*):** Apply every 7 to 14 days after disease appears.

**\* Azoxystrobin**

- Amistar, 3.5 to 5 oz. (1 day)
- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

**\* Azoxystrobin/Chlorothalonil**

- Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)
- or

**\* Azoxystrobin/Difenoconazole**

- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.
- or

**\* Chlorothalonil**

- Bravo Ultrex (1.4 to 1.8 lb (*Anthracnose*) or 1.8 to 2.7 lb (*Alternaria*)) or Equus DF (1.4 to 1.8 lb) (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt, (*Anthracnose*) or 2 to 3 pt (*Alternaria*). (0 days)
- Echo 90 DF, 1.3 to 1.6 lb every 7 days. (0 days)
- or

**\* Pyraclostrobin**

- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- or

**\* Pyraclostrobin/Boscalid**

- Pristine, 12.5 to 18.5 oz for *Alternaria*, 18.5 oz for *Anthracnose*. (0 days)
- or

**\* Thiophanate-Methyl**

- Topsin 4.5 FL, 10 fl oz. (1 day)
- Topsin 70 W, Topsin M WSB, 1/4 to 1/2 lb (*Anthracnose*). (0 days)
- or

**Boscalid**

- Endura, 6.5 oz. (0 days)
- or

**Copper Ammonium Carbonate**

- Copper Count N, 1 to 2 qt. (0 days)
- or

**Copper Hydroxide**

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 to 4 pt. (0 days)
- or

**Copper Oxychloride / Copper Sulfate**

- C-O-C-S WDG, 2 to 4 lb every 7 days. (0 days)
- or

**Copper Resinate**

- Tenn-Cop 5 E, 3 pt. (0 days)
- or

**Copper Sulfate**

- Cuprofix Ultra, 1.25 lb. (0 days)
- or

**Difenoconazole/Cyprodinil**

- Inspire Super, 16 to 20 fl oz. (7 days)
- or

**Famoxadone/Cymoxanil**

- Tanos, 8 oz. (3 days)
- or

**Mancozeb/Copper Hydroxide**

- ManKocide, 2-3 lb. (5 days)
- or

**Mancozeb/Zoxamide**

- Gavel 75 DF, 1.5 - 2.0 lb. (5 days)
- or

**Neem Oil**

- Trilogy, 2 pt. (0 days)
- or

**Potassium Bicarbonate**

- Armicarb 100, 2.5 to 5 lb.
- or

**Potassium phosphite/chlorothalonil**

- Catamaran, 4 pt. (1 day)
- or

**Potassium phosphite/chlorothalonil**

- Catamaran, 6 pt. (1 day)

**ANGULAR LEAF SPOT (*Pseudomonas lachrymans*):** Spray every 7 days, starting before the first fruit forms and continue to protect fruit at all stages of development.

**Copper Ammonium Carbonate**

- Copper Count N, 1 to 2 qt. (0 days)
- or

**Copper Hydroxide**

- Champ DP, 1 1/3 lb. (0 days)

- Champ Formula 2 F, 1 1/3 pt. (0 days)

- Champion WP, 1.5 to 3 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.5-1.25 lb. (0 day)

- Nu-Cop 3 L, 1 to 4 pt. (0 days)
- or

**Copper Resinate**

- Tenn-Cop 5 E, 3 pt. (0 days)
- or

**Copper Sulfate**

- Cuprofix Ultra, 1.25 lb. (0 days)
- or

**Neem Oil**

- Trilogy, 2 pt. (0 days)

**SCAB (*Cladosporium cucumerinum*):** Apply every 7 to 10 days after plants are 2 to 3 inches tall.

**\* Chlorothalonil**

- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)

- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)
- or

**Copper Resinate**

- Tenn-Cop 5 E, 3 pt. (0 days)
- or

**Mancozeb/Copper Hydroxide**

- ManKocide, 2-3 lb. (5 days)
- or

**Neem Oil**

- Trilogy, 2 pt. (0 days)
- or

**Potassium phosphite/chlorothalonil**

- Catamaran, 6 pt. (1 day)

**POWDERY MILDEW (*Sphaerotheca fuliginea*, *Erysiphe cichoracearum*):** Treat at disease appearance and at 7-day intervals.

**\* Azoxystrobin/Difenoconazole**

- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.
- or

**\* Kresoxim-methyl**

- Sovran, 3.2 to 4.8 oz. (0 days)
- or

## Pumpkins

### \* Myclobutanil

- *Rally* 40 WSP, 2.5 to 5 oz, 7 to 10 day schedule. (0 days) Do not apply more than 1.5 lb per acre per crop.  
or

### \* Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

### \* Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days)  
or

### \* Quinoxystrobin

- *Quintec*, 4 to 6 fl oz. (3 days) Apply as preventative and tank mix.  
or

### \* Thiophanate-Methyl

- *Topsin* 4.5 FL, 10 fl oz. (1 day)
- *Topsin* 70 W, *Topsin M WSB*, 1/4 to 1/2 lb. (0 days)  
or

### \* Trifloxystrobin

- *Flint*, 1 1/2 to 2 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season.  
or

### Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)
- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

### Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or

### Bacillus subtilis

- *Serenade*, 6 to 8 lb every 7 days. (0 days)
- *Serenade Max*, 1 - 3 lb every 7 to 10 days. (0 days)

Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

or

### Boscalid

- *Endura*, 6.5 oz. (0 days)  
or

### Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb (*Sphaerotheca*). (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 3 pt (*Sphaerotheca*). (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or

### Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)  
or

### Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP*, *Nu-Cop 50 DF*, 1 1/2 to 3 lb. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or

### Copper Resinate

- *Tenn-Cop 5 E*, 3 pt. (0 days)  
or

### Copper Sulfate

- *Cuprofix Ultra*, 1.25 lb. (0 days)  
or

### Difenconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days) Suppression.  
or

### Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

### Potassium Bicarbonate

- *Armicarb* 100, 2.5 to 5 lb. (0 days)

or

### Sulfur

- *Microthiol Disperss*, 5 to 10 lb. (0 days)

- *Thiolux Jet*, 4 to 6 lb, 10- to 14-day intervals. (0 days)

or

### Tebuconazole

- *Folicur 3.6F*, 4-6 fl oz. (7 days) 12 hr REI.

or

### Tebuconazole

- *Folicur 3.6F*, 4-6 fl oz. (7 days)

or

### Triflumizole

- *Procure 480 SC*, 4 to 8 fl oz every 7-14 days. (0 days)

**GUMMY STEM BLIGHT, BLACK ROT (*Didymella bryoniae* also called *Mycosphaerella melonis*): Begin at the 2-leaf stage and apply every 7 to 14 days.**

\* Azoxystrobin. Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action

- *Amistar* (3.5 to 5 oz) or *Quadris* (11.0 to 15.4 fl oz) (1 day)  
or

### \* Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)  
or

### \* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb. (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 3 pt. (0 days)
- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)  
or

### \* Thiophanate-Methyl

- *Topsin* 4.5 FL, 10 fl oz. (1 day)
- *Topsin M 70 WP*, *Topsin M WSB*, 1/4 to 1/2 lb. (0 days)  
or

### Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)  
or

### Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champion WP*, 1.5 to 3 lb. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Nu-Cop 3 L*, 1 to 4 pt. (0 days)  
or

### Copper Sulfate

- *Cuprofix Ultra*, 1.25 lb. (0 days)  
or

### Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days)  
or

### Tebuconazole

- *Folicur 3.6F*, 8 fl oz. (7 days) Approved for gummy stem blight. Suppression only.

**DOWNY MILDEW (*Pseudoperonospora cubensis*): Begin applications when conditions are favorable for disease, but before infection.**

### \* Chlorothalonil

- *Bravo Ultrex*, *Equus DF*, 1.8 to 2.7 lb. (0 days)

- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 3 pt. (0 days)

- *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)

or  
 \* Cyazofamid  
 • Ranman, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)  
 or

\* Cymoxanil  
 • Curzate 60 DF, 3.2 oz every 5 - 7 days. (3 days)  
 or

\* Famoxadone/Cymoxanil  
 • Tanos, 8 oz. (3 days)  
 or

\* Mancozeb/Zoxamide  
 • Gavel 75 DF, 1.5 - 2.0 lb. (5 days)  
 or

\* Propamocarb  
 • Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)  
 or

#### Azoxystrobin

- Amistar, 3.5 to 5 oz. (1 day)
- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

#### Azoxystrobin/Chlorothalonil

- Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)  
 or

#### Dimethomorph

- Forum, 6 fl oz. (0 days)  
 or

#### Fenamidone

- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)  
 or

#### Fluopicolide

- Presidio, 3-4 fl oz. (2 days)  
 or

#### Fosetyl-Aluminum

- Alette WDG, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.  
 or

#### Mancozeb/Copper Hydroxide

- ManKocide, 2-3 lb. (5 days)  
 or

#### Mandipropamid

- Revus, 8 fl oz. (0 day)  
 or

#### Maneb

- Maneb 75 DF, Maneb 80 WP, 1.5 to 2 lb. (5 days)
- Manex, 2.4 to 3.2 pt. (5 days)  
 or

#### Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 2 lb. Do not apply to mature or senescent plants. Maximum 4 applications.  
 or

#### Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 lb. (5 days) Maximum 4 applications.  
 or

#### Mono-, dibasic sodium salts of phosphorous acid

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.  
 (0 days)  
 or

#### Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt every 7 - 14 days. (0 days)
- Prophyl, 2 to 4 pt. (0 days)  
 or

#### Neem Oil

- Trilogy, 2 pt.  
 or

#### Potassium Bicarbonate

- Armicarb 100, 2.5 to 5 lb.

#### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (1 day)  
 or

#### Pyraclostrobin

- Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
 or

#### Pyraclostrobin/Boscalid

- Pristine, 12.5 to 18.5 oz. (0 days)  
 or

#### Trifloxystrobin

- Flint, 4 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo.

#### **PHYTOPHTHORA ROOT and FRUIT ROT (*Phytophthora* spp.):**

#### \* Dimethomorph

- Forum, 6 fl oz. (0 days)  
 or

#### \* Famoxadone/Cymoxanil

- Tanos, 8 - 10 oz every 5 - 7 days. (3 days)  
 or

#### \* Fosetyl-Aluminum

- Aliette WDG, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.  
 or

#### \* Mancozeb/Zoxamide

- Gavel 75 DF, 1.5 - 2.0 lb. (5 days)  
 or

#### Cyazofamid

- Ranman, 2.75 fl oz every 7 to 10 days. (0 days)  
 or

#### Fluopicolide

- Presidio, 3-4 fl oz. (2 days)  
 or

#### Mandipropamid

- Revus, 8 fl oz. (0 day)  
 or

#### Mono-, dibasic sodium salts of phosphorous acid

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water.  
 (0 days)  
 or

#### Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt every 7 - 14 days. (0 days)

- Prophyl, 4 pt. (0 days) See label.

**Note:** Most fungicides applied to control downy mildew may have limited efficacy against Phytophthora root and fruit rot.

#### **GUMMY STEM BLIGHT:**

#### \* Azoxystrobin/Difenoconazole

- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
 or

#### Boscalid

- Endura, 6.5 oz. (0 days)  
 or

#### Difenoconazole/Cyprodinil

- Inspire Super, 16 to 20 fl oz. (7 days)  
 or

#### Kresoxim-methyl

- Sovran, 4.8 oz. (0 days)  
 or

#### Potassium phosphite/chlorothalonil

- Catamaran, 6 pt. (1 day)  
 or

#### Tebuconazole

- Folicur 3.6F, 8 fl oz. (7 days)

## **Radishes**

### **Radishes**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## **NEMATODES**

Root-knot nematodes can reduce radish yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the root-knot nematode is present at a population density above the economical threshold for radishes, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of root-knot nematodes in radish production. Application is only needed before the first crop. The radish life cycle is shorter than that of the northern root-knot nematode and radishes serve as a good trap crop for this nematode.

## **FALL SOIL TREATMENT (BROADCAST):**

### 1,3-D

- *Telone II*, 25 gal/A (muck soil). Fumigate in the fall when soil temperatures at a 6 inch depth are above 50F. Inject the fumigant to soil depth of 6 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.**

**Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.**

## **INSECTS**

### **SOIL TREATMENT:**

#### **CABBAGE MAGGOT:**

##### Chlorpyrifos

- *Lorsban 15 G* (3.3 oz/1,000 ft of row, in row with seed at time of planting) or *Lorsban 4 E / Lorsban Advanced* (1 fl oz/1,000 ft of row, in row with seed at time of planting) (RUP)

**LEAFHOPPERS, APHIDS, FLEA BEETLE:** See label for application method.

##### Imidacloprid

- *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 10 to 24 oz. (21 days)  
or  
*Platinum*, 5 to 6.5 fl oz.

#### **CUTWORM:**

- 10% *Sevin Granules*, 20 lb. (7 days)  
or

##### Diazinon

- *Diazinon 50 W* (4 to 8 lb.) or *Diazinon AG 500* (2 to 4 qt.) or *Diazinon AG600* (51 to 102 fl oz.) (RUP)

#### **FOLIAR TREATMENT:**

##### **ARMYWORM, CUTWORM: Apply as needed.**

- Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or

##### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (7 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)  
or  
*Entrust*, 1 to 2 oz. (3 days)  
or  
*Radiant SC*, 6 to 8 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 24 fl oz. per season.

#### **FLEA BEETLE: Apply when damage is first seen. Repeat if needed.**

- Actara*, 1.5 to 3 oz. (7 days)

or

- Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or

##### Carbaryl

- *Carbaryl 4L*, 0.5 to 1 qt. (7 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (7 days)  
or

- Diazinon AG 500*, 0.5 to 1 pt. (14 days) (RUP)

or

##### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)  
or

##### Imidacloprid

- *Admire Pro*, 1.2 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 3.5 oz/Acre per season.  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

#### **CABBAGE "WORM": Apply as needed.**

##### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, . (0 days)  
or

##### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

#### **APHIDS: Apply as necessary.**

- Actara*, 1.5 to 3 oz. (7 days)

or

\*Materials marked with an asterisk are particularly recommended for problem infestations.

### Bifenthrin

- *Bifenture EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Brigade 2EC* (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)
- *Fanfare 2EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)
- *Tundra EC*, 5.12 to 6.4 fl oz. (21 days) (RUP)  
or  
*Diazinon AG 500*, 0.5 to 1 pt. (14 days) (RUP)  
or
- Imidacloprid**
  - *Admire Pro*, 1.2 fl oz. (7 days)
  - *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 3.5 oz/Acre per season.  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)  
or  
*Malathion 57 EC*, 2 pt. (7 days)

### **CUTWORM:**

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

### **LEAFHOPPER:**

#### Carbaryl

- *Carbaryl 4L*, 0.5 to 2 qt. (7 days)
- *Sevin 4 F* (0.5 to 2 qt.) or *Sevin 80 S* (0.63 to 2.5 lb.) or *Sevin XLR Plus* (0.5 to 2 qt.) (7 days)  
or
- Imidacloprid**
  - *Admire Pro*, 1.2 fl oz. (7 days)
  - *Nuprid 1.6 F*, 3.5 fl oz. (7 days)  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

### **TARNISHED PLANT BUG:**

#### Carbaryl

- *Carbaryl 4L*, 1 to 2 qt. (7 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)  
or  
*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

### **ARMYWORM:**

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (7 days) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (7 days) (RUP)

## SLUGS

*Deadline M-Ps 4%* (20 to 40 lb) or *Metaldehyde 3.5 G* (30 to 40 lb)  
Apply between rows. Avoid contact with edible product.

## DISEASES

### **SEED TREATMENT:**

#### **DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):**

##### Bacillus subtilis GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

##### Captan

- *Captan 30-DD*, 1 1/4 oz/100 lb seed.
- *Captan 400*, 1 to 2 oz/100 lb seed.  
or

##### Fludioxinil

- *Maxim 4 FS*, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.

##### Thiram

- 42-S *Thiram*, *Thiram 50 WP Dyed*, 8 oz/100 lb seed.

### **SOIL TREATMENT:**

#### **DAMPING OFF (*Pythium* and *Phytophthora* spp.):**

##### Fluopicolide

- *Presidio*, 3-4 fl oz. (7 days) Must be mixed with another fungicide active on pathogen.  
or

**Mefenoxam**. Apply as a broadcast preplant application or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil Gold SL*, 1-2 pt.
- *Ridomil Gold WSP*, 1 to 2 lb.

### **FOLIAR TREATMENT:**

#### **ALTERNARIA LEAF SPOT (*Alternaria raphani*):**

##### \* Azoxystrobin

- *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

##### Pyraclostrobin

- *Cabrio*, 8 to 12 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

##### Trifloxystrobin

- *Flint*, 2 to 4 oz. (7 days) Maximum 8 oz/year. 12 hr REI.

**WHITE RUST (*Albugo candida*):** Apply foliar spray 40 to 50 days following Ridomil at-planting application and make 2 to 4 applications on a 14-day schedule depending on disease development.

##### Mefenoxam/Chlorothalonil

- *Ridomil Gold Bravo*, 2 lb. (7 days)

##### Pyraclostrobin

- *Cabrio*, 8 to 16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

#### **SEPTORIA LEAF SPOT (*Septoria lycopersici*):**

##### Trifloxystrobin

- *Flint*, 2 to 4 oz. (7 days) Maximum 8 oz/year. 12 hr REI.

## Rhubarb

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## INSECTS

### **SOIL TREATMENT:**

#### **CUTWORM:**

- 10% *Sevin Granules*, 20 lb. (14 days)

#### **AT PLANTING OR SIDE DRESS:**

#### **APHIDS: Apply preplant, in furrow or as a post-planting drench.**

##### Imidacloprid

- *Admire Pro*, 4.4 - 10.5 fl oz. (45 days)
- *Nuprid 2 F*, 10 to 24 fl oz. (45 days)  
or

*Platinum*, 5 to 11 oz. (30 days) See label for application methods.

#### **APHIDS, LOOPERS:**

- Durivo*, 10 to 13 fl oz. (30 days)

## Rutabagas

### FOLIAR TREATMENT:

#### CUTWORM, LOOPERS:

*Baythroid* XL, 1.6 to 3.2 fl oz. (0 days) (RUP)

or

*Brigade WSB*, 5.3 to 16 oz. (7 days) (RUP)

or

*Entrust*, 1 to 2 oz. (1 day)

or

*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

*Larvin* 3.2 EC, 16 to 30 oz. (14 days)

or

*Permethrin*

• *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)

• *Perm-UP* 3.2 EC (4 to 8 oz) or *Pounce* 25 WP (6.4 to 12.8 oz) (1 day) (RUP)

or

*Radiant* SC, 5 to 10 fl oz. (1 day) Do not make more than 6

applications or exceed 34 fl oz/acre per season.

or

*Synapse* WG, 2 to 3 oz. (1 day)

#### APHIDS:

*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.

or

*Assail* 30 SG, 1.9 to 2.8 oz. (7 days)

or

*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)

or

*Brigade WSB*, 5.3 to 16 oz. (7 days) (RUP)

or

*Fulfill*, 2.75 oz. (7 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.

or

*Movanto*, 4.0 to 5.0 fl oz. (3 days) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

#### RHUBARB CURCULIO:

No materials are currently registered for this use.

#### LOOPERS:

*Confirm* 2F, 6 to 8 fl oz. (7 days)

## DISEASES

### SEED TREATMENT:

#### DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):

*Bacillus subtilis* GB03

• *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).

or

*Fludioxinil*

• *Maxim* 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).

Commercial seed treatment plants only.

### PREPLANT INCORPORATED:

#### DAMPING OFF (*Pythium* spp.):

*Mefenoxam*. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

• *Ridomil* Gold GR, 20 to 40 lb.

• *Ridomil* Gold SL, 1-2 pt.

• *Ridomil* Gold WSP, 1 to 2 lb.

• *Ultra Flourish*, 2 to 4 pt.

### FOLIAR TREATMENT:

#### LEAF ROT, BOTRYTIS GRAY MOLD (*Botrytis cinerea*):

Azoxystrobin

• *Quadris*, 6 to 15.5 fl oz every 5 - 14 days. (0 days)

or

DCNA

• *Botran* 75 W, 1 1/3 lb (for greenhouse use only). (3 days)

#### ALTERNARIA LEAF SPOT:

\* Chlorothalonil

• *Bravo Weather Stik*, 3 pt. (7 days)

#### CERCOSPORA LEAF SPOT (*Cercospora* spp.), EARLY BLIGHT

#### (*Cercospora apii*), LATE BLIGHT (*Septoria apicola*):

\* Trifloxystrobin

• *Flint*, 2 to 3 oz. (7 days)

## Rutabagas

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## INSECTS

### SOIL TREATMENT:

#### CABBAGE MAGGOT: Apply in a 4- to 6-inch band around seed at time of planting so plants grow in treated soil.

Chlorpyrifos

• *Lorsban* 15 G (4.6 to 9.2 oz per 1,000 ft of row) or *Lorsban* 4 E / *Lorsban Advanced* (1.6 to 3.3 fl oz per 1,000 ft of row) (RUP)

or

Diazinon

• *Diazinon* 50 W (4 to 6 lb.) or *Diazinon AG600* (51 to 102 fl oz.) (RUP)

#### LEAFHOPPERS, APHIDS, FLEA BEETLE: See label for application methods.

Imidacloprid

• *Admire Pro*, 4.4 - 10.5 fl oz. (21 days)

• *Nuprid* 2 F, 10 to 24 fl oz. (21 days) Apply pre-plant or in furrow.

or  
*Platinum*, 5 to 12 fl oz. (30 days) See label for application methods.

### FOLIAR TREATMENT:

#### FLEA BEETLE: Apply if necessary.

*Actara*, 1.5 to 3 oz. (7 days)

or

Bifenthrin

• *Bifenture* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

• *Brigade* 2EC (5.12 to 6.4 fl oz.) or *Brigade WSB* (12.8 to 16 oz.) (21 days) (RUP)

• *Fanfare* 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

• *Sniper*, 5.12 to 6.4 fl oz. (21 days) (RUP)

• *Tundra* EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

Carbaryl

• *Carbaryl* 4L, 0.5 to 1 qt. (7 days)

• *Sevin* 4 F (0.5 to 1 qt.) or *Sevin* 80 S (0.63 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (7 days)

or

Imidacloprid

• *Admire Pro*, 1.2 fl oz. (7 days)

• *Nuprid* 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

**CABBAGE "WORM": Apply if damage is severe.**\* Bacillus thuringiensis

- Agree, Biobit, Dipel, Javelin, . (0 days)  
or  
Bifenthrin
- Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Brigade 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

**APHIDS: Apply as needed to prevent population build up.**

Actara, 1.5 to 3 oz. (7 days)

or

Bifenthrin

- Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Brigade 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- or  
Imidacloprid
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.
- or  
Malathion 57 EC, 1 1/2 pt. (1 day)

**LEAFHOPPER:**Carbaryl

- Carbaryl 4L, 0.5 to 2 qt. (7 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)
- or  
Imidacloprid
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days)

**DISEASES****SEED TREATMENT:****DAMPING OFF (*Pythium* and *Phytophthora* spp.):**Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or  
Fludoxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*). Commercial seed treatment plants only.

Fluopicolide

- Presidio, 3-4 fl oz. (7 days) Must be mixed with another fungicide active on pathogen.

**SOIL TREATMENT:****DAMPING OFF (*Pythium* spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold SL, 1-2 pt.
- Ridomil Gold WSP, 1 to 2 lb.
- Ultra Flourish, 2 to 4 pt.

**FOLIAR TREATMENT:****LEAF ROT, BOTRYTIS GRAY MOLD (*Botrytis cinerea*):**Azoxystrobin

- Quadris, 6 to 15.5 fl oz. (0 days)

**ALTERNARIA LEAF SPOT:**Pyraclostrobin

- Cabrio, 8 to 12 oz. (0 days)

**Spinach**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**INSECTS****SOIL TREATMENT:****APHIDS:**Imidacloprid

- Admire Pro, 4.4 - 10.5 fl oz. (21 days) See label for application methods.
- Nuprid 2 F, 10 to 24 fl oz. (21 days)

**APHIDS, FLEA BEETLE, LEAF MINERS, LEAFHOPPER:**Platinum, 5 to 11 oz. (30 days) See label for application methods.**CABBAGE LOOPERS:**Coragen, 3.5 to 5.0 fl oz. (1 day) See label for application methods.**LEAF MINERS:**Coragen, 5.0 to 7.5 fl oz. (1 day) See label for application methods.**APHIDS, FLEA BEETLES, LEAFHOPPERS:**Belay, 9 to 12 fl oz.**LEAFHOPPERS:**Imidacloprid

- Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 fl oz. (21 days)

**ARMYWORM:**Capture LFR, 3.4 to 6.8 fl oz. (RUP)**FOLIAR TREATMENT:****FLEA BEETLE: May be a problem on young seedlings. Apply as needed.**Actara, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)or  
Belay, 3 to 4 fl oz. (21 days)or  
Bifenthrin

- Bifenthrin 2EC AG, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Bifenture EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Brigade 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (40 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- or  
Brigadier, 5.1 to 6.14 fl oz. (40 days) Minimum of 7 days between applications; do not apply more than 30.7 fl oz. per season. (RUP)
- or  
Carbaryl
- Carbaryl 4L, 0.5 to 1 qt. (14 days)

## Spinach

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- *Sevin* 4 F (0.5 to 1 qt.) or *Sevin* 80 S (0.63 to 1.25 lb.) or *Sevin* 80 WSP (0.67 to 1.25 lb.) or *Sevin* XLR Plus (0.5 to 1 qt.) (14 days) or  
Imidacloprid
- *Admire* Pro, 1.3 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.  
or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)  
or  
*Mustang Max*, 2.4 to 4.3 oz. (1 day) (RUP)  
or  
*Venom*, 2 to 3 oz. (7 days)

### CROWN MAGGOTS (SEVERAL SPECIES ARE INVOLVED):

Chemical control is not presently available for this use.

### LEAFHOPPERS: Apply as necessary.

- *Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.  
or  
*Baythroid* XL, 0.8 to 1.6 fl oz. (0 days) (RUP)  
or  
*Belay*, 3 to 4 fl oz. (21 days)  
or  
*Brigadier*, 5.1 to 6.1 fl oz. (40 days) (RUP)  
or  
Carbaryl
- *Carbaryl* 4L, 0.5 to 2 qt. (14 days)
- *Sevin* 4 F (0.5 to 2 qt.) or *Sevin* 80 S (0.63 to 2.5 lb.) or *Sevin* 80 WSP (0.67 to 2.5 lb.) or *Sevin* XLR Plus (0.5 to 2 qt.) (14 days) or  
Imidacloprid

- *Admire* Pro, 1.3 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.  
or

*Leverage* 360, 3 fl oz. (7 days) (RUP)

or  
*Mustang Max*, 2.4 to 4.3 oz. (1 day) (RUP)  
or

### Permethrin

- *Ambush* 25 W, 6.4 oz. (1 day) (RUP)
- *Perm-UP* 3.2 EC (4 oz) or *Pounce* 25 WP (6.4 oz) (1 day) (RUP)

### LOOPERS, ARMYWORM: Apply when insects are small.

- \* *Baythroid* XL, 2.4 to 3.2 fl oz. (0 days) (RUP)  
or
- \* Methomyl
- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (7 days) Do not apply to seedlings less than 3 inches in diameter. (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (7 days) (RUP) or  
Permethrin
- *Ambush* 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP* 3.2 EC (4 to 8 oz) or *Pounce* 25 WP (6.4 to 12.8 oz) (1 day) (RUP)  
or

*Avaunt*, 3.5 oz. (3 days) Do not exceed 14 oz/acre per crop.

### Bacillus thuringiensis

- *Agree*, *Biobit*, *Dipel*, *Javelin*, *Xentari*, . (0 days)  
or  
Bifenthrin
- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (40 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Fanfare* 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)

- *Sniper*, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (40 days) (RUP)  
or  
*Brigadier*, 5.1 to 6.14 fl oz. (40 days) Minimum of 7 days between applications; do not apply more than 30.7 fl oz. per season. (RUP)  
or  
*Confirm* 2F, 6 to 8 fl oz. (7 days)  
or  
*Entrust*, 1 to 2 oz. (1 day)  
or  
*Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or  
*Larvin* 3.2 EC, 16 to 30 oz. (14 days)  
or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)  
or  
*Movanto*, 4.0 to 5.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.  
or  
*Mustang Max*, 3.4 to 4.3 oz. (1 day) (RUP)  
or  
*Radiant* SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or  
*Synapse* WG, 2.0 to 3.0 oz. (1 day) Do not apply more than 3.0 oz/Acre per 3-day interval; do not apply more than 9.0 oz/Acre per crop season.

### APHIDS: Apply as needed to avoid contamination at harvest.

- \* *Assail* 30 SG, 1.9 to 2.8 oz. (7 days)  
or  
*Actara*, 1.5 to 3 oz. (7 days) Do not exceed 11.0 oz/Acre per season.  
or  
*Belay*, 3 to 4 fl oz. (21 days)  
or  
*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)  
or  
*Brigadier*, 3.8 to 6.14 fl oz. (40 days) Minimum of 7 days between applications; do not apply more than 30.7 fl oz. per season. (RUP)  
or  
*Diazinon* AG 500, 0.5 to 1 pt. (14 days) (RUP)  
or  
*Endosulfan* 3 EC, 1 qt. (21 days) Maximum of one application. (RUP)  
or  
*Fulfill*, 2.75 oz. (7 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.  
or  
Imidacloprid
- *Admire* Pro, 1.3 fl oz. (7 days)
- *Nuprid* 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.  
or  
*Leverage* 360, 3 fl oz. (7 days) (RUP)  
or  
*Malathion* 57 EC, 2 pt. (7 days)

### LEAF MINERS: Apply when eggs are first seen on undersides of leaves to prevent miners from entering leaves. Treatment after larvae are in the leaf is generally unsuccessful. Early-planted spinach usually is less susceptible to damage than when planted late.

- Bifenthrin
- *Bifenthrin* 2EC AG, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- *Brigade* 2EC (2.1 to 6.4 fl oz.) or *Brigade* WSB (5.3 to 16 oz.) (40 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (40 days) (RUP)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

- Discipline 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (40 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - or
  - Brigadier, 5.1 to 6.1 fl oz. (40 days) (RUP)
    - or
    - Coragen, 5.0 to 7.5 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.
      - or
      - Diazinon AG 500, 0.5 to 1 pt. (14 days) (RUP)
        - or
        - Entrust, 2 to 3 oz. (1 day)
          - or
          - Permethrin
            - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
            - Perm-UP 3.2 EC (4 to 8 oz) or Pounce 25 WP (6.4 to 12.8 oz) (1 day) (RUP)
              - or
              - Radiant SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
                - or
                - Venom, 1 to 3 oz. (7 days)

**LOOPERS:**

Coragen, 3.5 to 5.0 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

**DIAMONDBACK MOTH:**

Synapse WG, 2.0 to 3.0 oz. (1 day) Do not apply more than 3.0 oz/Acre per 3-day interval; do not apply more than 9.0 oz/Acre per crop season.

**ARMYWORM:**Carbaryl

- Carbaryl 4L, 1 to 2 qt. (14 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

**SLUGS**

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

**DISEASES****SEED TREATMENT:****DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):**Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).
  - or

Captan

- Captan 30-DD, 4 3/4 oz/100 lb seed.
- Captan 400, 4 to 6 oz/100 lb seed.
  - or

Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.
  - or

Mefenoxam

- Apron XL LS, 0.32 to 0.64 fl oz/100 lb seed (*Pythium*).
  - or

Metalaxyl

- Allegiance-FL, 0.75 fl oz/100 lb seed (*Pythium*).
- Apron 50 W, 1/2 to 1 oz/100 lb seed (*Pythium*).
  - or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

**PREPLANT INCORPORATED:****WHITE RUST (*Albugo occidentalis*), DAMPING OFF (*Pythium* spp.), DOWNTY MILDEW (*Peronospora effusa*):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation. Observe limit of amount of a.i./A per season.

- Ridomil Gold GR, 20 to 40 lb.
- Ridomil Gold SL, 1-2 pt (*Pythium*) or 0.25 pt (downty mildew or white rust; 7 day PHI).
- Ridomil Gold WSP, 1 to 2 lb.
- Ultra Flourish, 2 to 4 pt.

**DRIP APPLICATION:****DOWNTY MILDEW (*Bremia lactucae*):**

- \* Fluopicolide
- Presidio, 3-4 fl oz. (2 days)

**FOLIAR TREATMENT:****DOWNTY MILDEW (*Peronospora effusa*):**

- \* Famoxadone/Cymoxanil
- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.
  - or
- \* Fosetyl-Aluminum
- Alette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.
  - or
- \* Mefenoxam

• Ridomil Gold GR, 5 lb as a side-dressing. (21 days) Apply first as a preplant incorporated. Then apply shanked in 21 days after planting or after first cutting. One other application may be shanked in after the next cutting. A total of 2 supplemental applications may be used on a 21-day interval. Observe limit of amount of a.i./A per season.

- Ridomil Gold WSP, 1/4 lb. (21 days)
  - or

\* Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 1/2 lb, 14-day intervals. (21 days) Maximum 2 applications. Note: Apply 21 days after Ridomil Gold at planting or after each repeated cutting.
  - or

Acibenzolar-S-methyl

- Actigard, 3/4 oz per 20 gal (ground) or 10 gal (aerial) of water. (14 days) Do not apply more than 2-1/4 oz o Actigard per acre per season.
  - or

Fluopicolide

- Presidio, 3-4 fl oz. (2 days)
  - or

Mandipropamid

- Revus, 8 fl oz. (1 day)
  - or

Mono-, dibasic sodium salts of phosphorous acid

- Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)
  - or

Mono-, dibasic sodium, potassium and ammonium phosphites

- Phostrol, 2.5 to 5 pt every 7 - 21 days. (0 days)
  - or

- Prophyt, 2 to 4 pt. (0 days)

**Note:** Fungicides that protect against Anthracnose and Cercospora leaf spot provide limited downty mildew protection.

## Squash

**ANTHRACNOSE (*Colletotrichum spinaciae*), CERCOSPORA LEAF SPOT (*Cercospora beticola*):** Apply at 7 to 10 day intervals.

\* Azoxystrobin

- *Amistar*, 2 to 5 oz. (0 days)
- *Quadris*, 6.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Copper Ammonium Carbonate

- *Copper Count N*, 1 1/2 qt. (0 days)

or

Copper Hydroxide

- *Champ Formula 2 F*, *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt. (0 days)
- *Champion WP*, *Nu-Cop 50 DF*, 2 to 4 lb. (0 days)
- *Kocide 2000*, 1 1/2 to 2 1/4 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)

or

Copper Sulfate

- *Basicop 53 WP*, 2 to 4 lb. (0 days)
- *Cuprofix Ultra*, 1.25 to 2 lb. (0 days)

**WHITE RUST (*Albugo occidentalis*):**

Azoxystrobin

- *Amistar*, 2 to 5 oz every 7 - 14 days. (0 days)
- *Quadris*, 6.2 - 15.4 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Copper Hydroxide

- *Champ Formula 2 F*, *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt, 7- to 10-day intervals. (0 days)
- *Champion WP*, *Nu-Cop 50 DF*, 2 to 4 lb, 7- to 10-day intervals. (0 days)
- *Kocide 2000*, 1 1/2 to 2 1/4 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 day)

or

Copper Sulfate

- *Basicop 53 WP*, 2 to 4 lb, 7- to 10-day intervals. (0 days)
- *Cuprofix Ultra*, 1.25 to 2 lb. (0 days)

or

Fenamidone

- *Reason 500 SC*, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating. 12 hr REI.

or

Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

or

Fosetyl-Aluminum

- *Aliette WDG*, 2 to 5 lb, 7- to 10-day intervals. (0 days)

or

Mefenoxam/Copper Hydroxide

- *Ridomil Gold Copper*, 2 1/2 lb, 14-day intervals. (21 days) Maximum 2 applications. Note: Apply 21 days after Ridomil Gold at planting or after each repeated cutting.

## Squash

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Squash are hosts for root-knot and lesion nematodes. These nematodes can reduce squash yields but yield losses in Michigan have not been

documented. If you suspect nematodes are reducing squash yields collect root and soil samples for analysis as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds; control options will be suggested. Vydate 2L is labeled for use in squash.

## INSECTS

**SEED TREATMENT:**

**CUCUMBER BEETLE:**

*Cruiser 5 FS*, . See label for rates and application methods.

**SOIL TREATMENT:**

**APHIDS, FLEA BEETLE, LEAFHOPPER, THrips:**

*Durivo*, 10 to 13 fl oz. (30 days)

or

Thiamethoxam

- *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) See label for application methods.

**THRIPS, LEAFHOPPER, SQUASH BUG:**

*Venom*, 5 to 6 oz. (21 days) See label for application methods.

**CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS, SQUASH BUG, THrips:**

*Scorpion 35SL*, 9 to 10.5 fl oz. (21 days) See label for application methods.

**APHIDS, LEAFHOPPERS, THrips:**

*Venom 20 SG*, 1.13 to 1.34 lb. (21 days) See label for application methods.

**CUTWORM, FLEA BEETLE LARVAE:**

*Capture LFR*, 3.4 to 6.8 fl oz. (RUP)

**CUTWORM:**

10% *Sevin Granules*, 10 lb. (3 days)

**APHIDS, CUCUMBER BEETLE, FLEA BEETLE, LEAFHOPPERS:**

*Belay*, 9 to 12 fl oz. See label for application methods.

**APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THrips:**

Imidacloprid

- *Admire Pro*, 7.0 to 10.5 fl oz. (21 days)
- *Nuprid 2 F*, 16 to 24 fl oz. (21 days)

**FOLIAR TREATMENT:**

Summer and winter squash plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat plants during bloom.

**CUTWORM: Apply if >1% of plants are injured.**

\* *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

\* Bifenthrin

- *Bifenthrin 2EC AG*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade 2EC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
- *Capture 2 EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Empower*, 3.5 to 8.7 lb. (3 days) (RUP)
- *Fanfare 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

\* Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (3 days) (RUP)

- *S-FenvaLoStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - or
  - \* *Permethrin*
- *Ambush 25 W*, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (0 days) (RUP)
  - or
- Athena*, 7 to 17 fl oz. (7 days) (RUP)
  - or
- Lambda-cyhalothrin
  - *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
    - or
- Methomyl
  - *Lannate LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - *Nudrin LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
    - or
  - Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)
    - or
  - Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.
    - or
  - Vetica*, 12 to 17 fl oz. (7 days)
- STRIPED and SPOTTED CUCUMBER BEETLE: Apply to hard squash if numbers exceed 0.1 to 1/plant to prevent bacterial wilt disease.**
  - Assail 30 SG*, 2.5 to 5.3 oz. (0 days)
    - or
  - Athena*, 7 to 17 fl oz. (7 days) (RUP)
    - or
  - Baythroid XL*, 2.4 to 2.8 fl oz. (0 days) (RUP)
    - or
  - Belay*, 3 to 4 fl oz. (21 days)
    - or
- Bifenthrin
  - *Bifenthrin 2EC AG*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Brigade 2EC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
  - *Capture 2 EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Discipline 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Fanfare 2EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - *Tundra EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
    - or
- Carbaryl
  - *Carbaryl 4L*, 1 qt. (3 days)
  - *Sevin 4 F* (1 qt.) or *Sevin 80 S* (1.25 lb.) or *Sevin XLR Plus* (1 qt.) (3 days)
    - or
- Danitol 2.4 EC*, 10.66 to 16 fl oz. (7 days) (RUP)
  - or
- Dibrom 8 Emulsive*, 1 to 2 pt. (1 day) Use on summer squash only. (RUP)
  - or
- Dinotefuran
  - *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
  - *Venom*, 3 to 4 oz. (1 day)
    - or
- Endosulfan
  - *Endosulfan 3 EC*, 0.66 to 1.33 qt. (2 days) (RUP)
  - *Thionex 3EC*, 0.66 to 1.33 qt. (4 days for summer squash, 11 days for winter squash) (RUP)
  - *Thionex 50W*, 1 to 2 lb. (4 days for summer squash, 16 days for winter squash) (RUP)
    - or
- Lambda-cyhalothrin
  - *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
    - or
- Methomyl
  - *Lannate LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) Use on summer squash only. (RUP)
  - *Nudrin LV* (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin SP* (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
    - or

## Squash

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or  
Voliam Flexi, 4 to 7 fl oz. (1 day)

### LEAFHOPPERS: Apply if necessary.

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

or

Belay, 3 to 4 fl oz. (21 days)

or

#### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

#### Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

or

#### Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)

or

#### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

#### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

#### Permethrin

- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

or

Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

### SQUASH BUG: Apply if egg masses exceed 1/plant. Large nymphs and adults are difficult to control.

#### \* Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

Assail 30 SG, 5.3 oz. (0 days)

or

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Belay, 3 to 4 fl oz. (21 days)

or

#### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)

- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

#### Carbaryl

- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

or

#### Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)

or

#### Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 0.66 to 1.33 qt. (4 days for summer squash, 11 days for winter squash) (RUP)
- Thionex 50W, 1 to 2 lb. (4 days for summer squash, 16 days for winter squash) (RUP)

or

#### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

or

#### Permethrin

- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)

or

Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

### SQUASH VINE BORER: Apply to base of plants when moths are active, or when the first tunnels appear, usually starting when plants start to vine. Repeat in 5 to 7 days.

Assail 30 SG, 5.3 oz. (0 days)

or

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

#### Bifenthrin

- Bifenthrin 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

or

#### Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 0.66 to 1.33 qt. (4 days for summer squash, 11 days for winter squash) (RUP)
- Thionex 50W, 1 to 2 lb. (4 days for summer squash, 16 days for winter squash) (RUP)

or

#### Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

or

#### Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

orMalathion

- *Malathion* 5, or *Malathion* 5 EC (3 pt.) or *Malathion* 8 (1.75 pt.) (1 day) Do not apply unless plants are dry.  
or

Permethrin

- *Ambush* 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (6.4 to 12.8 oz.) or *Perm-UP* 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)  
or  
*Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)  
or  
*Synapse* WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 7-day interval; do not apply more than 9 oz/Acre per crop season.  
or  
*Vetica*, 12 to 17 fl oz. (7 days)

**APHIDS: Apply if numbers are high.**

*Actara*, 1.5 to 3 oz. (0 days) Do not exceed 11 oz/Acre per season.

or  
*Assail* 30 SG, 2.5 to 4 oz. (0 days)  
or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or

*Belay*, 3 to 4 fl oz. (21 days)  
or

*Beleaf* 50 SG, 2 to 2.8 oz. (0 days)  
or

Bifenthrin

- *Bifenthrin* 2EC AG, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Bifenture* EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Brigade* 2EC (2.6 to 6.4 fl oz.) or *Brigade* WSB (8 to 16 oz.) (3 days) (RUP)
- *Capture* 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Discipline* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Fanfare* 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Sniper*, 2.6 to 6.4 fl oz. (3 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
or

*Dibrom* 8 Emulsive, 1 to 2 pt. (1 day) Use on summer squash only.  
(RUP)  
or

Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (4 days for summer squash, 11 days for winter squash) (RUP)
- *Thionex* 50W, 1 to 2 lb. (4 days for summer squash, 16 days for winter squash) (RUP)  
or

*Fulfill*, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.  
or

Lambda-cyhalothrin

- *Lambda-Cy*, 3.84 fl oz. (1 day) (RUP)
- *Warrior* II with Zeon Technology (1.92 fl oz.) or *Warrior* with Zeon Technology (3.84 fl oz.) (1 day) (RUP)  
or

Malathion

- *Malathion* 5 (1.5 pt.) or *Malathion* 5 EC (2 pt.) or *Malathion* 57 EC (1.5 pt.) or *Malathion* 8 (1.75 pt.) (1 day) Do not apply unless plants are dry.  
or

Methomyl

- *Lannate* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Lannate* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- *Nudrin* LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or *Nudrin* SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)  
or

Permethrin

- *Perm-UP* 25DF (12.8 oz.) or *Perm-UP* 3.2 EC (8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 12.8 oz. (0 days) (RUP)  
or  
*Venom* 20 SG, 0.44 to 0.895 lb. (1 day)  
or  
*Voliam* Flexi, 4 to 7 oz. (1 day)

**THRIPS: Apply when damage is seen. Repeat as needed.**

*Athena*, 13.5 to 17 fl oz. (7 days) (RUP)  
or

*Dibrom* 8 Emulsive, 1 to 2 pt. (1 day) Summer squash only. (RUP)  
or

Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom* 20 SG (0.44 to 0.895 lb.) (1 day)  
or
- *Entrust*, 2 to 2.5 oz. (3 days)  
or
- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)  
or
- *Malathion* 8, 1.75 pt. (1 day) Do not apply unless plants are dry.  
or
- *Radiant* SC, 6 to 10 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

**MITES**

Apply when needed. Usually a problem only in hot, dry weather.

*Agri-Mek* 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)  
or

Bifenthrin

- *Bifenture* EC, *Brigade* 2EC, *Capture* 2 EC, 5.1 to 6.4 oz. (3 days) (RUP)  
or
- *Danitol* 2.4 EC, 10 2/3 fl oz. (7 days) (RUP)  
or
- *Oberon* 2 SC, 7 to 8.5 fl oz. (7 days)  
or
- *Zeal*, 2 to 3 oz. (7 days)

**SLUGS**

*Deadline* M-Ps 4% (20 to 40 lb) or *Metaldehyde* 3.5 G (30 to 40 lb)  
Apply between rows. Avoid contact to edible product.

**DISEASES****SEED TREATMENT:****DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):**Bacillus subtilis GB03

- *Kodiak*, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

Captan

- *Captan* 30-DD, 1 2/3 oz/100 lb seed.
- *Captan* 400, 1 1/2 to 2 oz/100 lb seed.  
or

Fludioxinil

- *Maxim* 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.  
or

## Squash

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### Thiram

- 42-S Thiram, *Thiram* 50 WP Dyed, 4 1/2 oz/100 lb seed.

### PRE-PLANT FUMIGATION:

**PHYTOPHTHORA:** Apply to production fields before planting. Note: Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

### 1,3 Dichloropropene/chloropicrin

- *Telone* C35, 13-35 gal. (RUP)

or

### Metam Sodium

- *Sectagon* 42, *Vapam* HL, 37.5-75 gal.

or

### Potassium N-methylidithiocarbamate

- *Sectagon-K54*, 30-60 gal. Do not plant for 14 to 30 days after treatment (the wetter the soil, the longer the waiting period).

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

### GREENHOUSE PREPLANT INCORPORATION:

#### DAMPING OFF (*Pythium* spp.), ROOT ROT (*Rhizoctonia* spp.):

##### *Gliocladium virens* GL-21

- *SoilGard* 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

### PREPLANT INCORPORATED:

#### DAMPING OFF and COTTONY LEAK (*Pythium* spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- *Ridomil* Gold SL, 1-2 pt.
- *Ridomil* Gold WSP, 1 to 2 lb.
- *Ultra* Flourish, 2 to 4 pt.

### DRIP APPLICATION:

#### DOWNTY MILDEW (*Pseudoperonospora cubensis*), PHYTOPHTHORA

#### BLIGHT (*Phytophthora capsici*):

##### \* Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

### FOLIAR TREATMENT:

#### POWDERY MILDEW (*Sphaerotheca fuliginea* or *Erysiphe*

#### *cichoracearum*): Treat at disease appearance.

##### \* Azoxystrobin/Difenoconazole

- *Quadris* Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.

or

##### \* Kresoxim-methyl

- *Sovran*, 3.2 to 4.8 oz. (0 days)

or

##### \* Myclobutanil

- *Rally* 40 WSP, 2.5 to 5 oz, 7 to 10 day schedule. (0 days) Do not apply more than 1.5 lb per acre per crop.

or

##### \* Pyraclostrobin

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

##### \* Pyraclostrobin/Boscalid

- *Pristine*, 12.5 to 18.5 oz. (0 days)

or

##### \* Quinoxyfen

- *Quintec*, 4 to 6 fl oz. (3 days) Winter squash only.

or

##### \* Thiophanate-Methyl

- *Topsin* 4.5 FL, 10 fl oz. (1 day)

- *Topsin* 70 W, *Topsin* M WSB, 1/4 to 1/2 lb. (0 days)

or

##### \* Trifloxystrobin

- *Flint*, 1 1/2 to 2 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season.

or

##### Azoxystrobin

- *Amistar*, 3.5 to 5 oz. (1 day)

- *Quadris*, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

##### Azoxystrobin/Chlorothalonil

- *Quadris Opti*, 3.2 pt every 7 - 14 days. (1 day)

or

##### Bacillus subtilis

- *Serenade*, 6 to 8 lb every 7 days. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

- *Serenade Max*, 1 - 3 lb every 7 to 10 days. (0 days)

or

##### Boscalid

- *Endura*, 6.5 oz. (0 days)

or

##### Chlorothalonil

- *Bravo Ultrex* (1.8 to 2.7 lb) or *Equus DF* (1.8 to 2.7 lb (*Sphaerotheca*)) (0 days)

- *Bravo Weather Stik*, or *Echo* 720 (2 to 3 pt, 7-day intervals) or *Equus* 720 SST (2 to 3 pt every 7 days) (0 days) *Sphaerotheca*.

- *Echo* 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)

or

##### Copper Ammonium Carbonate

- *Copper Count N*, 1 to 2 qt. (0 days)

or

##### Copper Hydroxide

- *Champ DP*, 1 1/3 lb. (0 days)

- *Champ Formula 2 F*, 1 to 2 pt, 7-day intervals. (0 days)

- *Champion WP*, *Nu-Cop 50 DF*, 1 1/2 to 3 lb, 7-day intervals. (0 days)

- *Kocide 2000*, 1 1/2 lb. (0 days)

- *Kocide 3000*, 0.5-1.25 lb. (0 day)

- *Nu-Cop 3 L*, 1 to 4 pt, 5- to 10-day intervals. (0 days)

or

##### Copper Sulfate

- *Cuprofix Ultra*, 1.25 lb. (0 days)

or

##### Difenoconazole/Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (7 days) Suppression.

or

##### Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

Sulfur

- *Kumulus DF, Micro Sulf, Microthiol Disperss, Microthiol Special, 5 to 10 lb. (0 days)*
- *Thioulux Jet, 4 to 10 lb, 10- to 14-day intervals. (0 days)*  
or

Tebuconazole

- *Folicur 3.6F, 4-6 fl oz. (7 days) 12 hr REI.*  
or

Triflumizole

- *Procure 50 WS, 4 to 8 oz every 7 - 14 days. (0 days)*

**SCAB (*Cladosporium cucumerinum*): Treat every 7 to 10 days after plants are 2 to 3 inches tall.**

Chlorothalonil

- *Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)*
- *Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)*
- *Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)*  
or

Copper Ammonium Carbonate

- *Copper Count N, 2 to 3 qt. (0 days)*  
or

Mancozeb/Copper Hydroxide

- *ManKocide, 2-3 lb. (5 days)*  
or

Neem Oil

- *Trilogy, 2 pt. (0 days)*

**ALTERNARIA LEAF SPOT (*Alternaria cucumerina*): Treat every 7 to 10 days when conditions favor disease.**

\* Azoxystrobin

- *Amistar, 3.5 to 5 oz. (1 day)*
- *Quadris, 11.0 to 15.4 fl oz. (1 day)*

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)*  
or

\* Azoxystrobin/Difenoconazole

- *Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.*  
or

\* Chlorothalonil

- *Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)*
- *Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)*
- *Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)*  
or

\* Difenoconazole/Cyprodinil

- *Inspire Super, 16 to 20 fl oz. (7 days)*  
or

\* Pyraclostrobin

- *Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.*  
or

\* Pyraclostrobin/Boscalid

- *Pristine, 12.5 to 18.5 oz. (0 days)*  
or

Boscalid

- *Endura, 6.5 oz. (0 days)*  
or

Copper Ammonium Carbonate

- *Copper Count N, 1 to 2 qt. (0 days)*  
or

Copper Hydroxide

- *Champ DP, 1 1/3 lb. (0 days)*
- *Champ Formula 2 F, 1 1/3 pt. (0 days)*

Champion WP, 1.5 to 3 lb. (0 days)Kocide 2000, 1 1/2 lb. (0 days)Kocide 3000, 0.5-1.25 lb. (0 day)Nu-Cop 3 L, 1 to 4 pt. (0 days)

or

Copper Sulfate

- *Cuprofix Ultra, 1.25 lb. (0 days)*  
or

Famoxadone/Cymoxanil

- *Tanos, 8 oz. (3 days)*  
or

Mancozeb/Copper Hydroxide

- *ManKocide, 2-3 lb. (5 days)*  
or

Mancozeb/Zoxamide

- *Gavel 75 DF, 1.5 - 2.0 lb. (5 days)*  
or

Neem Oil

- *Trilogy, 2 pt. (0 days)*  
or

Potassium phosphite/chlorothalonil

- *Catamaran, 6 pt. (1 day)*

**ANTHRACNOSE (*Colletotrichum lagenarium*): Treat every 7 to 14 days after disease appears.**

\* Azoxystrobin

- *Amistar, 3.5 to 5 oz. (1 day)*

- *Quadris, 6.2 to 15.4 fl oz. (1 day)*

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

\* Azoxystrobin/Chlorothalonil

- *Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)*  
or

\* Azoxystrobin/Difenoconazole

- *Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.*  
or

\* Chlorothalonil

- *Bravo Ultrex, 1.4 to 1.8 lb. (0 days)*

- *Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)*

- *Echo 90 DF, 1.3 to 1.6 lb every 7 days. (0 days)*  
or

\* Mancozeb. Summer squash.

- *Dithane DF Rainshield, Manzate Pro-Stick, Penncozeb 75 DF, 2 to 3 lb. (5 days)*

- *Penncozeb 4 F, 1.6 to 2.4 qt. (5 days)*  
or

\* Maneb

- *Maneb 75 DF, Maneb 80 WP, 1 1/2 to 2 lb. (5 days)*

- *Manex, 1 1/5 to 1 3/5 qt. (5 days)*  
or

\* Pyraclostrobin

- *Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.*  
or

\* Pyraclostrobin/Boscalid

- *Pristine, 18.5 oz. (0 days)*  
or

\* Thiophanate-Methyl

- *Topsin 4.5 FL, 10 fl oz. (1 day)*

- *Topsin 70 W, Topsin M WSB, 1/4 to 1/2 lb. (0 days)*  
or

Copper Ammonium Carbonate

- *Copper Count N, 1 to 2 qt. (0 days)*  
or

## Squash

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### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 to 4 pt. (0 days)  
or

### Copper Oxychloride / Copper Sulfate

- C-O-C-S WDG, 2 to 4 lb every 7 days. (0 days)  
or

### Copper Sulfate

- Basic Copper 53, Basicop, 2 lb. (0 days)
- Cuprofix Ultra, 1.25 lb. (0 days)  
or

### Difenoconazole/Cyprodnil

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

### Famoxadone/Cymoxanil

- Tanos, 8 oz. (3 days)  
or

### Mancozeb/Copper Hydroxide

- ManKocide, 2-3 lb. (5 days)  
or

### Mancozeb/Copper Sulfate

- Cuprofix MZ Disperss, 5 - 7.25 lb. (5 days)  
or

### Mefenoxam/Chlorothalonil

- Ridomil Gold Bravo, 2 to 3 lb, 10- to 14-day intervals. Maximum 4 applications. Do not apply to mature or senescent plants.  
or

### Neem Oil

- Trilogy, 2 pt. (0 days)  
or

### Potassium phosphite/chlorothalonil

- Catamaran, 4 pt. (1 day)

**ANGULAR LEAF SPOT (*Pseudomonas lachrymans*): Spray every 7 days, starting before the first fruit forms and continue to protect fruit at all stages of development.**

### Copper Ammonium Carbonate

- Copper Count N, 1 to 2 qt. (0 days)  
or

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 to 4 pt. (0 days)  
or

### Copper Sulfate

- Basic Copper 53, Basicop, 2 lb. (0 days)
- Cuprofix Ultra, 1.25 lb. (0 days)  
or

### Neem Oil

- Trilogy, 2 pt.

**GUMMY STEM BLIGHT (*Didymella bryoniae* also called**

***Mycosphaerella melonis*):**

### \*Azoxystrobins

- Amistar, 3.5 to 5 oz. (1 day)
- Quadris, 6.2 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or

### \* Azoxystrobins/Chlorothalonil

- Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)  
or

### \* Azoxystrobins/Difenoconazole

- Quadris Top, 10 to 14 fl oz. (1 day) One application before alternating with another chemical.  
or

### \* Chlorothalonil

- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)  
or

### \* Pyraclostrobin

- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or

### \* Pyraclostrobin/Boscalid

- Pristine, 12.5 to 18.5 oz. (0 days)  
or

### \* Thiophanate-Methyl

- Topsin 4.5 FL, 10 fl oz. (1 day)
- Topsin 70 W, Topsin M WSB, 1/4 to 1/2 lb, at 7- to 14-day intervals. (0 days)  
or

### Boscalid

- Endura, 6.5 oz. (0 days)  
or

### Copper Ammonium Carbonate

- Copper Count N, 1 to 2 qt. (0 days)  
or

### Copper Hydroxide

- Champ DP, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 to 4 pt. (0 days)  
or

### Copper Sulfate

- Cuprofix Ultra, 1.25 lb. (0 days)  
or

### Difenoconazole/Cyprodnil

- Inspire Super, 16 to 20 fl oz. (7 days)  
or

### Kresoxim-methyl

- Sovran, 4.8 oz. (0 days)  
or

### Mancozeb/Copper Hydroxide

- ManKocide, 2-3 lb. (5 days)  
or

### Potassium phosphite/chlorothalonil

- Catamaran, 6 pt. (1 day)  
or

### Tebuconazole

- Folicur 3.6F, 8 fl oz. (7 days) Suppression only.

**DOWNTY MILDEW (*Pseudoperonospora cubensis*):**

### \* Chlorothalonil

- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)  
or

### \* Cyazofamid

- Ranman, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)  
or

- \* Cymoxanil
  - Curzate 60 DF, 3.2 oz every 5 - 7 days. (3 days)  
or
  - \* Famoxadone/Cymoxanil
  - Tanos, 8 oz. (3 days)  
or
  - \* Mancozeb. Summer squash only.
  - Dithane DF Rainshield, Manzate Pro-Stick, Penncozeb 75 DF, 2 to 3 lb. (5 days)
  - Penncozeb 4 F, 1.6 to 2.4 qt. (7 days) Summer squash only.  
or
  - \* Mancozeb/Zoxamide
  - Gavel 75 DF, 1.5 - 2.0 lb. (5 days)  
or
  - \* Propamocarb
  - Precur Flex, 1.2 pt every 7 - 14 days. (2 days)  
or
- Azoxystrobin
  - Amistar, 3.5 to 5 oz. (1 day)
  - Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or
- Azoxystrobin/Chlorothalonil
  - Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)  
or
- Fenamidone
  - Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)  
or
- Fluopicolide
  - Presidio, 3-4 fl oz. (2 days)  
or
- Fosetyl-Aluminum
  - Alette WDG, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.  
or
- Mancozeb/Copper Hydroxide
  - ManKocide, 2-3 lb. (5 days)  
or
- Mancozeb/Copper Sulfate. Summer squash.
  - Cuprofix MZ Disperss, 5 - 7.25 lb. (5 days)  
or
- Mandipropamid
  - Revus, 8 fl oz. (0 day)  
or
- Maneb
  - Maneb 75 DF, Maneb 80 WP, 1.5 to 2 lb. (5 days)
  - Manex, 1.2 to 1.6 qt. (5 days)  
or
- Mefenoxam/Chlorothalonil
  - Ridomil Gold Bravo, 2 lb. Maximum 4 applications. Do not apply to mature or senescent plants.  
or
- Mefenoxam/Copper Hydroxide
  - Ridomil Gold Copper, 2 to 2 1/2 lb. (5 days) Maximum 4 applications.  
or
- Mefenoxam/Mancozeb. Summer squash.
  - Ridomil Gold MZ, 2 1/2 lb. (5 days) Maximum 4 applications.  
or
  - Mono-, dibasic sodium salts of phosphorous acid
    - Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or
    - Mono-, dibasic sodium, potassium and ammonium phosphites
      - Phostrol, 2.5 to 5 pt every 7 - 14 days. (0 days)
      - Prophyt, 2 to 4 pt. (0 days)  
or

- Neem Oil
    - Trilogy, 2 pt. (0 days)  
or
  - Potassium phosphite/chlorothalonil
    - Catamaran, 4 pt. (1 day)  
or
  - Pyraclostrobin
    - Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or
  - Pyraclostrobin/Boscalid
    - Pristine, 12.5 to 18.5 oz. (0 days)  
or
  - Trifloxystrobin
    - Flint, 4 oz, 7- to 14-day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo.
- Note:** Most fungicides that protect against Alternaria, anthracnose and gummy stem blight may also provide limited downy mildew protection.
- PHYTOPHTHORA CROWN and FRUIT ROT (*Phytophthora* spp.):**
- \* Famoxadone/Cymoxanil
    - Tanos, 8 - 10 oz every 5 - 7 days. (3 days)  
or
  - \* Mancozeb/Zoxamide
    - Gavel 75 DF, 1.5 - 2.0 lb. (5 days)  
or
  - Cyazofamid
    - Ranman, 2.75 fl oz every 7 to 10 days.  
or
  - Fluopicolide
    - Presidio, 3-4 fl oz. (2 days)  
or
  - Fosetyl-Aluminum
    - Alette WDG, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.  
or
  - Mandipropamid
    - Revus, 8 fl oz. (0 day)  
or
  - Mono-, dibasic sodium salts of phosphorous acid
    - Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or
    - Mono-, dibasic sodium, potassium and ammonium phosphites
      - Phostrol, 2.5 to 5 pt every 7 - 14 days. (0 days)
      - Prophyt, 2 to 4 pt. (see label)

**Note:** Most fungicides applied to control downy mildew may have limited efficacy against Phytophthora crown and fruit rot.

## Sweet Potatoes

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### NEMATODES

Root-lesion, root-knot and other nematodes are associated with sweet potato. If you believe you have a nematode problem associated with sweet potato production, a sample should be tested (see Appendix C). If plant-parasitic nematodes are present in population densities above estimated damage thresholds for sweet potatoes, management recommendations will be provided at that time. Vydate L and Mocap 15G are labeled for use on sweet potatoes for nematode control.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

## Sweet Potatoes

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### INSECTS

#### SOIL TREATMENT:

##### APHIDS, FLEA BEETLE, LEAFHOPPER:

*Belay*, 9 to 12 fl oz.

or

##### Imidacloprid

• *Admire Pro*, 4.4 to 10.5 fl oz. (3 days leaves, 125 days corms)

• *Nuprid 2 F*, 10 to 24 fl oz. (3 days leaves, 125 days corms)

or

*Platinum*, 5 to 8 fl oz. (30 days) See label for application methods.

##### FLEA BEETLE LARVAE:

##### Bifenthrin

• *Bifenture EC*, . (RUP)

• *Brigade 2EC*, . (RUP)

• *Capture LFR*, . (RUP)

• *Sniper*, . (RUP)

• *Tundra EC*, . (RUP)

See label for application methods.

#### CUTWORM:

10% *Sevin Granules*, 20 lb. (7 days)

#### FOLIAR TREATMENT:

##### FLEA BEETLE: Apply when damage is first seen.

*Actara*, 1.5 to 3 oz. (14 days) Do not exceed 6 oz/acre per season.

or

*Assail 30 SG*, 1.4 to 2.5 oz. (7 days)

or

*Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

*Belay*, 2 to 3 fl oz. (14 days)

or

*Bifenture EC*, 2.1 to 6.4 oz. (21 days) (RUP)

or

*Brigadier*, 5.1 to 7.7 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 16.64 fl oz. per season. (RUP)

or

##### Carbaryl

• *Carbaryl 4L*, 1 to 2 qt. (7 days)

• *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (7 days)

or

*Endosulfan 3 EC*, 0.66 qt. (1 day) (RUP)

or

##### Imidacloprid

• *Admire Pro*, 1.2 fl oz. (7 days)

• *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

or

##### Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)

• *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

##### ARMYWORM, CUTWORM: Apply when feeding damage is first seen.

*Entrust*, 1.5 to 3 oz. (7 days)

or

*Radiant SC*, 6 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.

or

*Rimon*, 9 to 12 fl oz. (14 days)

##### LEAFHOPPER: Treat as necessary.

*Actara*, 1.5 to 3 oz. (14 days) Do not exceed 6 oz per season.

or

*Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

*Belay*, 2 to 3 fl oz. (14 days)

or

*Brigadier*, 3.8 to 7.7 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 16.64 fl oz. per season. (RUP)

or

##### Imidacloprid

• *Admire Pro*, 1.2 fl oz. (7 days)

• *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

or

##### Lambda-cyhalothrin

• *Lambda-Cy*, 1.92 to 3.2 fl oz. (7 days) (RUP)

• *Warrior II with Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior with Zeon Technology* (1.92 to 3.2 fl oz.) (7 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

*Malathion 57 EC*, 2 pt. (3 days)

##### APHIDS:

\* *Assail 30 SG*, 2.3 to 4 oz. (7 days)

or

\* *Fulfill*, 2.75 to 5.5 oz. (14 days) Do not apply more than 11.0 oz/acre per season. May require 5 to 7 days for aphid mortality.

or

*Actara*, 3 oz. (14 days) Do not exceed 6 oz/acre per season.

or

*Belay*, 2 to 3 fl oz. (14 days)

or

*Brigadier*, 3.8 to 7.7 fl oz. (21 days) Minimum of 7 days between applications; do not apply more than 16.64 fl oz. per season. (RUP)

or

##### Imidacloprid

• *Admire Pro*, 1.2 fl oz. (7 days)

• *Nuprid 1.6 F*, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

or

##### Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)

• *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

or

*Malathion 57 EC*, 2 pt. (3 days)

or

*Movento*, 4.0 to 5.0 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

##### CUTWORM:

##### Lambda-cyhalothrin

• *Lambda-Cy*, 1.92 to 3.2 fl oz. (7 days) (RUP)

• *Warrior II with Zeon Technology* (0.96 to 1.6 fl oz.) or *Warrior with Zeon Technology* (1.92 to 3.2 fl oz.) (7 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

##### TARNISHED PLANT BUG:

##### Lambda-cyhalothrin

• *Lambda-Cy*, 2.56 to 3.84 fl oz. (7 days) (RUP)

• *Warrior II with Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior with Zeon Technology* (2.56 to 3.84 fl oz.) (7 days) (RUP)

or

*Leverage 360*, 2.4 to 2.8 fl oz. (7 days) (RUP)

##### ARMYWORM:

##### Carbaryl

• *Carbaryl 4L*, 2 qt. (7 days)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

- Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin XLR Plus (2 qt.) (7 days) or  
Lambda-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

## DISEASES

### SEED (ROOT) TREATMENT:

**BLACK ROT, SCURF (*Ceratostomella simbriata, Monilochaetes infuscans*):** Dip roots and sprouts in one of the following suspensions. Plant immediately.

DCNA

- Botran 75 W, 1 lb/7 1/2 gal water, dip for 10 to 15 seconds, drain and plant immediately.

or

Thiabendazole

- Mertect 340, 53 1/2 oz per 50 gal of water (8 fl oz per 7 1/2 gal) dip for 1 to 2 minutes. Do not use treated roots for food or feed.

**PYTHIUM DAMPING OFF:**

Mefenoxam

- Apron XL, 0.085 - 0.64 fl oz/100 lb seed. (0 days)

**PREPLANT INCORPORATED:**

**DAMPING OFF (*Pythium* and *Phytophthora* spp.):**

Mefenoxam. Apply as a preplant incorporation or a surface application. For banded applications use a 7" band. Note: If natural rainfalls not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1" of sprinkler irrigation.

- Ridomil Gold SL, 1-2 pt.
- Ridomil Gold WSP, 1 to 2 lb.

**EARLY BLIGHT (*Alternaria solani*):**

Pyrimethanil

- Scala, 7 fl oz every 7 - 14 days. (7 days) Maximum 35 fl oz/season.

**WHITE RUST (*Albugo ipomoeae-panduratae*):**

Fenamidone

- Reason 500 SC, 5.5 - 8.2 fl oz every 5 to 10 days. (7 days) Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurine product. Strobilurines should also be used in rotation with a fungicide with a different mode of action.

**FOLIAR TREATMENT:**

**WHITE RUST (*Albugo tragoponis*):**

Azoxystrobin

- Heritage, 3.2 - 10.5 oz every 5-7 days. (0 days) Maximum 3 lb/A/season.

## Tomatoes

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## NEMATODES

Root-knot and root-lesion nematodes can reduce tomato yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for tomatoes, crop rotation or application of a nematicide is recommended.

The following nematicides are suitable for control of root-knot and root-lesion nematodes in tomato production.

1,3-D

- Telone II, 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

or

Metam Sodium

- Vapam HL, 37.5 to 75 gal/A (use higher rate for muck soil). Inject with shanks spaced 5 inches apart or to a depth of 4 to 10 inches in well prepared soil. Follow immediately with a roller to smooth and compact surface. Light watering to the treated surface helps to prevent escape of gas.

All soil fumigants were re-registered in 2011, resulting in new labels.

Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan soil fumigant distributors can provide e-templates for the management plans.

## INSECTS

**SOIL TREATMENT:**

**CUTWORM, WIREWORM:** Apply treatments evenly to soil surface before planting and incorporate to a 4- to 6-inch depth.

**LEAFHOPPER, THRIPS, FLEA BEETLE, WHITEFLIES, APHIDS, COLORADO POTATO BEETLE:** Additional generic brands available.

Imidacloprid

- Admire Pro, 7 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 16 to 24 fl oz. (21 days)

or

Thiamethoxam

- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) Apply as an in-furrow spray or narrow surface band, as a post seeding, transplant or hill drench, in trickle or drip irrigation, or shanked into root zone after establishment or transplanting.

or

- Venom 20 SG, 1.13 to 1.34 lb. (21 days)

**CUTWORM:**

- 10% Sevin Granules, 20 lb. (3 days)

or

- Brigadier, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

or

Diazinon

- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Broadcast just before planting and immediately incorporate into soil. (RUP)

**WIREWORM:**

- Athena, 8.5 to 17 fl oz. (RUP)

or

- Brigade WSB, 8 to 12.8 oz. Apply infurrow with seed or transplant. (RUP)

or

- Brigadier, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

or

Diazinon

- Diazinon 50 W (6 to 8 lb.) or Diazinon AG 500 (3 to 4 qt.) or Diazinon AG600 (76.5 to 102 fl oz.) Broadcast just before planting and immediately incorporate into soil. (RUP)

## Tomatoes

### COLORADO POTATO BEETLE, FLEA BEETLE, LEAFHOPPERS, THRIPS, WHITEFLIES:

#### Dinotefuran

- Scorpion 35SL (9 to 10.5 fl oz.) or Venom (5 to 6 oz.) (21 days)

### APHIDS, ARMYWORM, COLORADO POTATO BEETLE, FLEA BEETLE, HORNWORMS, LEAFHOPPERS, THRIPS, WHITEFLIES:

*Durivo*, 10 to 13 fl oz. (30 days)

### ARMYWORM, LOOPERS, TOMATO FRUITWORM:

*Coragen*, 3.5 to 5 fl oz. (1 day)

### CUTWORM, ARMYWORM, FLEA BEETLE LARVAE, WIREWORM:

*Capture LFR*, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

### APHIDS, COLORADO POTATO BEETLE, FLEA BEETLE, LEAFHOPPERS:

*Belay*, 9 to 12 fl oz. See label for application methods.

### FOLIAR TREATMENT:

#### CUTWORM, ARMYWORM: Apply if there is more than 1 cutworm per 100 plants on transplants or if defoliation is >10% on larger plants.

#### \*Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)

or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or

*Baythroid XL*, 2.1 to 2.8 fl oz. (0 days) (RUP)

or

#### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Brigade 2EC* (2.1 to 5.2 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)

or

#### Bifenthrin + Imidacloprid

- *Brigadier*, 5.1 to 9.85 fl oz. (1 day) (RUP)
- *Swagger*, 10.2 to 19.7 fl oz. (1 day) (RUP)

or

*Confirm 2F*, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)

or

*Danitol 2.4 EC*, 10.67 fl oz. (3 days) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

*Intrepid 2 F*, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

or

*Leverage 360*, 3.8 to 4.1 fl oz. (0 days) (RUP)

or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

or

#### Permethrin

- *Ambush 25 W*, 3.2 to 12.8 oz. (0 days) (RUP)
- *Perm-UP 25DF* (3.2 to 12.8 oz.) or *Perm-UP 3.2 EC* (2 to 8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 3.2 to 12.8 oz. (0 days) (RUP)

or

*Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.

or

*Vetica*, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season.

### FLEA BEETLE: Apply if necessary.

*Actara*, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or

*Athena*, 7 to 17 fl oz. (7 days) (RUP)

or

*Baythroid XL*, 2.8 fl oz. (0 days) (RUP)

or

*Belay*, 3 to 4 fl oz. (21 days)

or

#### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Brigade 2EC* (2.1 to 5.2 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)

#### Bifenthrin + Imidacloprid

- *Brigadier*, 5.1 to 9.85 fl oz. (1 day) (RUP)
- *Swagger*, 10.2 to 19.7 fl oz. (1 day) (RUP)

or

#### Carbaryl

- *Carbaryl 4L*, 0.5 to 1 qt. (3 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or *Sevin 80 WSP* (0.67 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (3 days)

or

#### Dinotefuran

- *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom 20 SG* (0.44 to 0.895 lb.) (1 day)

Do not use if neonicitinoids were used at planting.

or

#### Endosulfan

- *Endosulfan 3 EC*, 0.66 to 1.33 qt. (2 days) Consult label for rotation restrictions. (RUP)
- *Thionex 3EC*, 0.66 to 1.33 qt. (2 days) (RUP)

or

#### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)

or

*Hero*, 4 to 10.3 oz. (7 days) (RUP)

or

#### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (5 days) (RUP)

or

*Leverage 360*, 3.8 to 4.1 fl oz. (0 days) (RUP)

or

*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)

or

*Steed*, 3.5 to 4.7 fl oz. (1 day) (RUP)

or

*Voliam Flexi*, 4 to 7 oz. (1 day)

\*Materials marked with an asterisk are particularly recommended for problem infestations.

**COLORADO POTATO BEETLE:** Apply to entire field or field borders if needed to protect new transplants or if defoliation on larger plants is greater than 10%.

\* Actara, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or

\* Assail 30 SG, 1.9 to 2.8 oz. (7 days)

or

Dinotefuran

- Scorpion 35SL, 2 to 7 fl oz. (1 day)

- Venom (1 to 4 oz.) or Venom 20 SG (0.44 to 0.895 lb.) (1 day)

Do not use if neonicitinoids were used at planting.

or

\* Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 to 2.2 fl oz. (0 days)

- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicitinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

or

Agri-Mek 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

or

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

Belay, 3 to 4 fl oz. (21 days)

or

Bifenthrin + Imidacloprid

- Brigadier, 5.1 to 7.5 fl oz. (1 day) (RUP)

- Swagger, 10.2 to 19.7 fl oz. (1 day) (RUP)

or

Carbaryl

- Carbaryl 4L, 1 to 2 qt. (3 days)

- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

or

Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

or

Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)

- Thionex 3EC, 0.66 to 1.33 qt. (4 days) (RUP)

or

Entrust, 1 to 2 oz. (1 day)

or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)

- S-FenvatoStar, 5.8 to 9.6 fl oz. (1 day) (RUP)

or

Hero, 4 to 10.3 oz. (7 days) (RUP)

or

Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)

- Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)

- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

or

Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)

or

Mustang Max, 2.2 to 4 oz. (1 day) (RUP)

or

Novodor, 1 to 4 qts. (0 days) Small larvae only.

or

Permethrin

- Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)

- Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (0 days) (RUP)

- Pounce 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)

or

Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)

or

Voliam Flexi, 4 to 7 oz. (1 day)

**APHIDS: Apply as needed. May be a problem on transplants.**

Actara, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or

Assail 30 SG, 1.9 to 2.8 oz. (7 days)

or

Athena, 7 to 17 fl oz. (7 days) (RUP)

or

Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

Belay, 3 to 4 fl oz. (21 days)

or

Beleaf 50 SG, 2 to 2.8 oz. (0 days)

or

Bifenthrin

- Bifenthrin 2EC AG, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Brigade 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)

- Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Sniper, 2.1 to 5.2 fl oz. (1 day) (RUP)

- Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

or

Bifenthrin + Imidacloprid

- Brigadier, 3.8 to 9.85 fl oz. (1 day) (RUP)

- Swagger, 7.6 to 19.7 fl oz. (1 day) (RUP)

or

Diazinon AG 500, 0.5 pt. (1 day) (RUP)

or

Dimethoate

- Dimethoate 2.67 EC (0.75 to 1.5 pt.) or Dimethoate 4 EC (0.5 to 1 pt.) or Dimethoate 400 (0.5 to 1 pt.) or Dimethoate 4E (0.5 to 1 pt.) (7 days)

or

Endosulfan

- Endosulfan 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)

- Thionex 3EC, 0.66 to 1.33 qt. (4 days) (RUP)

or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)

- S-FenvatoStar, 5.8 to 9.6 fl oz. (1 day) (RUP)

or

Fulfill, 2.75 oz. (0 days) Do not exceed 5.5 oz/acre per season. May require 5 to 7 days for aphid mortality.

or

Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 to 2.2 fl oz. (0 days)

- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicitinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

or

Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)

or

Malathion

- Malathion 5 (1 pt.) or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 3 pt.) or Malathion 8 (1.5 pt.) (3 days for Malathion 5 EC, 1 day for others)

or

## Tomatoes

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### Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (1 day) (RUP)  
or  
*Movento*, 4 to 5 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.  
or  
*Venom* 20 SG, 0.44 to 0.895 lb. (1 day)  
or  
*Voliam* Flexi, 4 to 7 oz. (1 day)

### **LEAFHOPPERS: Occasionally a problem early in the season. Apply as needed.**

- *Actara*, 2 to 3 oz. (0 days)  
or  
*Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or  
*Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

- *Belay*, 3 to 4 fl oz. (21 days)  
or

### Bifenthrin

- *Bifenthrin* 2EC AG, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Bifenture* EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Brigade* 2EC (2.1 to 5.2 fl oz.) or *Brigade* WSB (5.3 to 12.8 oz.) (1 day) (RUP)
- *Capture* 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Discipline* 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Fanfare* 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Tundra* EC, 2.1 to 5.2 fl oz. (1 day) (RUP)  
or

### Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 9.85 fl oz. (1 day) (RUP)
- *Swagger*, 7.6 to 19.7 fl oz. (1 day) (RUP)  
or

### Carbaryl

- *Carbaryl* 4L, 0.5 to 1 qt. (3 days)
- *Sevin* 4 F (0.5 to 1 qt.) or *Sevin* 80 S (0.63 to 1.25 lb.) or *Sevin* 80 WSP (0.67 to 1.25 lb.) or *Sevin* XLR Plus (0.5 to 1 qt.) (3 days)  
or

### Dimethoate

- *Dimethoate* 2.67 EC (0.75 to 1.5 pt.) or *Dimethoate* 4 EC (0.5 to 1 pt.) or *Dimethoate* 400 (0.5 to 1 pt.) or *Dimethoate* 4E (0.5 to 1 pt.) (7 days)  
or

### Dinotefuran

- *Scorpion* 35SL, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom* 20 SG (0.44 to 0.895 lb.) (1 day)

Do not use if neonicitinoids were used at planting.

- or  
• *Hero*, 4 to 10.3 oz. (7 days) (RUP)  
or

### Imidacloprid. Additional generic brands available.

- *Admire* Pro, 1.3 to 2.2 fl oz. (0 days)
- *Nuprid* 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicitinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Warrior* II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)  
or

### Methomyl

- *Leverage* 360, 3.8 to 4.1 fl oz. (0 days) (RUP)  
or  
*Mustang* Max, 2.2 to 4 oz. (1 day) (RUP)  
or  
*Steed*, 3.5 to 4.7 fl oz. (1 day) (RUP)  
or  
*Voliam* Flexi, 4 to 7 oz. (1 day)

### **HORNWORMS: Apply if numbers exceed 1/plant.**

- *Athena*, 7 to 17 fl oz. (7 days) (RUP)  
or  
*Avaunt*, 2.5 to 3.5 oz. (3 days)  
or  
*Bacillus thuringiensis*
- *Agree*, *Biobit*, *Dipel*, *Javelin*, . (0 days)  
or  
*Baythroid* XL, 1.6 to 2.8 fl oz. (0 days) (RUP)  
or  
*Carbaryl*
- *Carbaryl* 4L, 1 to 2 qt. (3 days)
- *Sevin* 4 F (1 to 2 qt.) or *Sevin* 80 S (1.25 to 2.5 lb.) or *Sevin* 80 WSP (1.25 to 2.5 lb.) or *Sevin* XLR Plus (1 to 2 qt.) (3 days)  
or  
*Confirm* 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)  
or  
*Coragen*, 2 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

- or  
*Danitol* 2.4 EC, 10.67 fl oz. (3 days) (RUP)

### Endosulfan

- *Endosulfan* 3 EC, 0.66 to 1.33 qt. (2 days) (RUP)
- *Thionex* 3EC, 0.66 to 1.33 qt. (4 days) (RUP)  
or  
*Entrust*, 1 to 2 oz. (1 day)  
or

### Esfenvalerate

- *Adjourn*, 2.9 to 5.8 fl oz. (1 day) (RUP)
- *Asana* XL, 2.9 to 5.8 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 2.9 to 5.8 fl oz. (1 day) (RUP)  
or

- Hero*, 4 to 10.3 oz. (7 days) (RUP)  
or

- Intrepid* 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)  
or

### Lambda-cyhalothrin

- *Lambda-Cy*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Proaxis*, 1.92 to 3.2 fl oz. (5 days) (RUP)
- *Warrior* II with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)  
or

- Leverage* 360, 3.8 to 4.1 fl oz. (0 days) (RUP)  
or

### Methomyl

- *Lannate* LV (1.5 to 3 pt.) or *Lannate* SP (0.5 to 1 lb.) (1 day) (RUP)
- *Nudrin* LV (1.5 to 3 pt.) or *Nudrin* SP (0.5 to 1 lb.) (1 day) (RUP)  
or  
*Mustang* Max, 2.2 to 4 oz. (1 day) (RUP)  
or

### Permethrin

- *Ambush* 25 W, 3.2 to 12.8 oz. (0 days) (RUP)
- *Perm-UP* 25DF (3.2 to 12.8 oz.) or *Perm-UP* 3.2 EC (2 to 8 oz.) (0 days) (RUP)
- *Pounce* 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)  
or

<p><i>Radiant</i> SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season. or <i>Steed</i>, 3.5 to 4.7 fl oz. (1 day) (RUP) or <i>Synapse</i> WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season. or <i>Vetica</i>, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season. or <i>Voliam Flexi</i>, 4 to 7 oz. (1 day)</p>	<p><u>Methomyl</u> • <i>Lannate</i> LV (1.5 to 3 pt.) or <i>Lannate</i> SP (0.5 to 1 lb.) (1 day) (RUP) • <i>Nudrin</i> LV (1.5 to 3 pt.) or <i>Nudrin</i> SP (0.5 to 1 lb.) (1 day) (RUP) or <i>Mustang Max</i>, 3.2 to 4 oz. (1 day) (RUP) or <u>Permethrin</u> • <i>Ambush</i> 25 W, 3.2 to 12.8 oz. (0 days) (RUP) • <i>Perm-UP</i> 25DF (3.2 to 12.8 oz.) or <i>Perm-UP</i> 3.2 EC (2 to 8 oz.) (0 days) (RUP) • <i>Pounce</i> 25 WP, 3.2 to 12.8 oz. (0 days) (RUP) or <i>Radiant</i> SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.</p>
<p><b>CABBAGE LOOPERS:</b> Apply to prevent larvae from pupating on ripe fruit or if defoliation is greater than 10%.</p> <ul style="list-style-type: none"> <li>* <i>Avaunt</i>, 2.5 to 3.5 oz. (3 days)</li> <li>or</li> <li>* <i>Baythroid</i> XL, 2.1 to 2.8 fl oz. (0 days) (RUP)</li> <li>or</li> <li>* <u>Esfenvalerate</u></li> <li>• <i>Adjourn</i>, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>• <i>Asana</i> XL, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>• <i>S-FenvatoStar</i>, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>or</li> <li>* <u>Lambda-cyhalothrin</u></li> <li>• <i>Lambda-Cy</i>, 1.92 to 3.2 fl oz. (5 days) (RUP)</li> <li>• <i>Proaxis</i>, 1.92 to 3.2 fl oz. (5 days) (RUP)</li> <li>• <i>Warrior II</i> with Zeon Technology (0.96 to 1.6 fl oz.) or <i>Warrior</i> with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)</li> <li>or</li> <li><i>Athena</i>, 7 to 17 fl oz. (7 days) (RUP)</li> <li>or</li> </ul>	<p><i>Steed</i>, 3.5 to 4.7 fl oz. (1 day) (RUP)</p> <p>or</p> <p><i>Synapse</i> WG, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.</p> <p>or</p> <p><i>Vetica</i>, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season.</p> <p>or</p> <p><i>Voliam Flexi</i>, 4 to 7 oz. (1 day)</p>
<p><b>Bacillus thuringiensis</b></p> <ul style="list-style-type: none"> <li>• <i>Agree</i>, <i>Biobit</i>, <i>Dipel</i>, <i>Javelin</i>, . (0 days)</li> <li>or</li> <li><u>Bifenthrin</u></li> <li>• <i>Bifenthrin</i> 2EC AG, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Bifenture</i> EC, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Brigade</i> 2EC (2.1 to 5.2 fl oz.) or <i>Brigade</i> WSB (5.3 to 12.8 oz.) (1 day) (RUP)</li> <li>• <i>Capture</i> 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Discipline</i> 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Fanfare</i> 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Sniper</i>, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>• <i>Tundra</i> EC, 2.1 to 5.2 fl oz. (1 day) (RUP)</li> <li>or</li> </ul>	<p><b>TOMATO FRUITWORM:</b> Occasionally a problem after fruit begins to form. Apply if damage is observed.</p> <ul style="list-style-type: none"> <li>* <u>Esfenvalerate</u></li> <li>• <i>Adjourn</i>, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>• <i>Asana</i> XL, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>• <i>S-FenvatoStar</i>, 5.8 to 9.6 fl oz. (1 day) (RUP)</li> <li>or</li> <li>* <u>Lambda-cyhalothrin</u></li> <li>• <i>Lambda-Cy</i>, 2.56 to 3.84 fl oz. (5 days) (RUP)</li> <li>• <i>Proaxis</i>, 2.56 to 3.84 fl oz. (5 days) (RUP)</li> <li>• <i>Warrior II</i> with Zeon Technology (1.28 to 1.92 fl oz.) or <i>Warrior</i> with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)</li> <li>or</li> </ul>
<p><b>Bifenthrin + Imidacloprid</b></p> <ul style="list-style-type: none"> <li>• <i>Brigadier</i>, 5.1 to 7.5 fl oz. (1 day) (RUP)</li> <li>• <i>Swagger</i>, 10.2 to 19.7 fl oz. (1 day) (RUP)</li> <li>or</li> </ul>	<p><i>Avaunt</i>, 3.5 oz. (3 days)</p> <p>or</p> <p><i>Baythroid</i> XL, 1.6 to 2.8 fl oz. (0 days) (RUP)</p>
<p><b>Confirm</b> 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)</p> <p>or</p>	<p><i>Brigadier</i>, 5.1 to 7.5 fl oz. (1 day) (RUP)</p> <p>or</p> <p><b>Coragen</b>, 3.5 to 5 fl oz. (1 day)</p>
<p><b>Coragen</b>, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.</p> <p>or</p>	<p><b>Carbaryl</b></p> <ul style="list-style-type: none"> <li>• <i>Carbaryl</i> 4L, 1 to 2 qt. (3 days)</li> </ul>
<p><b>Endosulfan</b></p> <ul style="list-style-type: none"> <li>• <i>Endosulfan</i> 3 EC, 1 to 1.33 qt. (2 days) (RUP)</li> <li>• <i>Thionex</i> 3EC, 1 to 1.33 qt. (4 days) (RUP)</li> <li>or</li> </ul>	<p><b>Coragen</b>, 3.5 to 5 fl oz. (1 day)</p> <p>or</p> <p><b>Danitol</b> 2.4 EC, 10.67 fl oz. (3 days) (RUP)</p>
<p><b>Entrust</b>, 1 to 2 oz. (1 day)</p> <p>or</p>	<p><b>Endosulfan</b></p> <ul style="list-style-type: none"> <li>• <i>Endosulfan</i> 3 EC, 1.33 qt. (2 days) (RUP)</li> <li>• <i>Thionex</i> 3EC, 1.33 qt. (4 days) (RUP)</li> <li>or</li> </ul>
<p><b>Hero</b>, 4 to 10.3 oz. (7 days) (RUP)</p> <p>or</p>	<p><b>Entrust</b>, 1 to 2 oz. (1 day)</p> <p>or</p>
<p><b>Intrepid</b> 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)</p> <p>or</p>	<p><b>Hero</b>, 4 to 10.3 oz. (7 days) (RUP)</p> <p>or</p>
<p><b>Leverage</b> 360, 3.8 to 4.1 fl oz. (0 days) (RUP)</p> <p>or</p>	<p><b>Intrepid</b> 2 F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)</p> <p>or</p>
<p><b>Leverage</b> 360, 3.8 to 4.1 fl oz. (0 days) (RUP)</p> <p>or</p>	<p><b>Leverage</b> 360, 3.8 to 4.1 fl oz. (0 days) (RUP)</p> <p>or</p>
<p><b>Methomyl</b></p> <ul style="list-style-type: none"> <li>• <i>Lannate</i> LV (1.5 to 3 pt.) or <i>Lannate</i> SP (0.5 to 1 lb.) (1 day) (RUP)</li> </ul>	<p><b>Methomyl</b></p> <ul style="list-style-type: none"> <li>• <i>Lannate</i> LV (1.5 to 3 pt.) or <i>Lannate</i> SP (0.5 to 1 lb.) (1 day) (RUP)</li> </ul>

## Tomatoes

- *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (1 day) (RUP)  
or  
*Mustang Max*, 2.2 to 4 oz. (1 day) (RUP)  
or

### Permethrin

- *Ambush 25 W*, 3.2 to 12.8 oz. (0 days) (RUP)
- *Perm-UP 25DF* (3.2 to 12.8 oz.) or *Perm-UP 3.2 EC* (2 to 8 oz.) (0 days) (RUP)
- *Pounce 25 WP*, 3.2 to 12.8 oz. (0 days) (RUP)  
or  
*Radiant SC*, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.  
or  
*Steed*, 3.5 to 4.7 fl oz. (1 day) (RUP)
- or  
*Synapse WG*, 2 to 3 oz. (1 day) Do not apply more than 3 oz/Acre per 3-day interval; do not apply more than 9 oz/Acre per crop season.  
or  
*Vetica*, 12 to 17 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 38 fl oz. per season.  
or  
*Voliam Flexi*, 4 to 7 oz. (1 day)

### **FRUIT FLIES: May be a problem on certain varieties during harvest season. Eggs are laid in cracks of ripening fruit. Apply as needed.**

- *Diazinon AG 500*, 0.5 to 1.5 pt. (1 day) (RUP)

or

### Malathion

- *Malathion 5*, or *Malathion 5 EC* (2.5 pt.) or *Malathion 57 EC* (2.5 to 3 pt.) or *Malathion 8* (2 pt.) (3 days for Malathion 5 EC, 1 day for others)

### **THRIPS:**

- *Agri-Mek* 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

or

- *Assail 30 SG*, 4 oz. (7 days)

or

- *Athena*, 13.5 to 17 fl oz. (7 days) (RUP)

or

- *Baythroid XL*, 2.1 to 2.8 fl oz. (0 days) (RUP)

or

### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Brigade 2EC* (2.1 to 5.2 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)  
or

### Bifenthrin + Imidacloprid

- *Brigadier*, 3.8 to 9.8 fl oz. (1 day) (RUP)
- *Swagger*, 7.6 to 19.7 fl oz. (1 day) (RUP)  
or

### Dinotefuran

- *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom 20 SG* (0.44 to 0.895 lb.) (1 day) Do not use if neonicitinoids were used at planting.

Do not use if neonicitinoids were used at planting.

or

- *Hero*, 10.3 oz. (7 days) (RUP)

or

### Lambda-cyhalothrin

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (5 days) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (5 days) (RUP)

- *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (5 days) (RUP)  
or  
*Leverage 360*, 3.8 to 4.1 fl oz. (0 days) (RUP)  
or  
*Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)  
or  
*Radiant SC*, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

### **WHITEFLIES:**

*Actara*, 3 to 5.5 oz. (0 days) Do not apply if a neonicitinoid was used at planting. Do not exceed 11 oz/acre per season.

or  
*Assail 30 SG*, 0.8 to 1.2 oz. (7 days)

or  
*Athena*, 13.5 to 17 fl oz. (7 days) (RUP)

or

### Bifenthrin

- *Bifenthrin 2EC AG*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Bifenture EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Brigade 2EC* (2.1 to 5.2 fl oz.) or *Brigade WSB* (5.3 to 12.8 oz.) (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Discipline 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Sniper*, 2.1 to 5.2 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 5.2 fl oz. (1 day) (RUP)  
or

### Dinotefuran

- *Scorpion 35SL*, 2 to 7 fl oz. (1 day)
- *Venom* (1 to 4 oz.) or *Venom 20 SG* (0.44 to 0.895 lb.) (1 day)  
Do not use if neonicitinoids were used at planting.

or  
*Endosulfan*. Use 100 to 200 gallons of spray/acre.

- *Endosulfan 3 EC*, 1.33 qt. (2 days) (RUP)

- *Thionex 3EC*, 1.33 qt. (4 days) (RUP)

or

### Esfenvalerate

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvatoStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)  
or  
*Hero*, 10.3 oz. (7 days) (RUP)

or  
*Imidacloprid*. Additional generic brands available.

- *Admire Pro*, 1.3 to 2.2 fl oz. (0 days)

- *Nuprid 1.6 F*, 3.8 to 6.2 fl oz. (0 days)

Do not use if a neonicitinoid was used at planting. Do not apply more than 19.2 oz per season

or  
*Leverage 360*, 4.1 fl oz. (0 days) (RUP)

or  
*Movento*, 4.0 to 5.0 fl oz. (1 day) Minimum of 7 days between applications; do not apply more than 10 fl oz. per season. Must be tank mixed with adjuvant having spreading and penetrating properties.

or  
*Mustang Max*, 3.2 to 4 oz. (1 day) (RUP)

or  
*Oberon 2 SC*, 7 to 8.5 fl oz. (7 days)

or  
*Voliam Flexi*, 4 to 7 oz. (1 day)

### **CUTWORM:**

#### Carbaryl

- *Carbaryl 4L*, 2 qt. (3 days)
- *Sevin 4 F* (2 qt.) or *Sevin 80 S* (2.5 lb.) or *Sevin 80 WSP* (2.5 lb.) or *Sevin XLR Plus* (2 qt.) (3 days)

Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (5 days) (RUP)
  - Proaxis, 1.92 to 3.2 fl oz. (5 days) (RUP)
  - Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or *Warrior* with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)
- or

Methomyl

- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (1 day) (RUP)
  - Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (1 day) (RUP)
- or
- Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)

**ARMYWORM:**Carbaryl

- Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- or

Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

or

Diazinon AG 500, 0.75 to 1 pt. (1 day) (RUP)

or

Endosulfan

- Endosulfan 3 EC, 1.33 qt. (2 days) (RUP)
- Thionex 3EC, 1.33 qt. (4 days) (RUP)

or

Entrust, 1.25 to 2.5 oz. (1 day)

or

Lambda-cyhalothrin

- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

or

Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)

or

Radiant SC, 5 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.

or

Voliam Flexi, 4 to 7 oz. (1 day)

**MITES**

Usually two-spotted. May become a problem in hot, dry weather.

Agri-Mek 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)

or

Danitol 2.4 EC, 10 2/3 fl oz. (3 days) (RUP)

or

Fenpyroximate

- Portal, 2.0 pt. (1 day) Do not make more than 2 applications per season; do not apply more than 4 pt. per season.

or

Hero, 10.3 oz. (1 day) (RUP)

or

Kelthane MF, 3/4 to 1 1/2 pt. (2 days) Limited to 2 applications per season.

or

Oberon 2 SC, 7 to 8.5 fl oz. (7 days)

**SLUGS**

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb)

Apply between rows. Avoid contact to edible product.

**DISEASES****SEED TREATMENT:**

**DAMPING OFF, PRE-EMERGENCE (*Pythium* spp., *Rhizoctonia solani*, *Phytophthora* spp.):**

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 seed (*Pythium*).

or

Captan

- Captan 30-DD, 2 1/3 oz/100 lb seed.
- Captan 400, 2 1/2 to 3 oz/100 lb seed.

or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 6 oz/100 lb seed. Apply to seed before planting.

**GREENHOUSE SOIL DRENCH:**

**ROOT/STEM ROT (*Rhizoctonia solani*):**

PCNB

- Terraclor 400, see label for rates specific to soil depth.

**PREPLANT SOIL FUMIGATION:**

**FUSARIUM WILT (*Fusarium oxysporum*), VERTICILLIUM WILT (*Verticillium albo-atrum*):** Apply to production fields in the spring before planting. Note: Most fumigants applied in the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

1,3 Dichloropropene/chloropicrin

- Telone C35, 13-35 gal. (RUP)

or

Metam Sodium

- Sectagon 42, Vapam HL, 37.5-75 gal.

or

Potassium N-methylidithiocarbamate

- Sectagon-K54, 30-60 gal.

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required.

Additional information about the requirements can be obtained at epa.gov/fumiganttoolbox. Michigan soil fumigant distributors can provide e-templates for the management plans.

**GREENHOUSE PREPLANT INCORPORATION:**

**DAMPING OFF (*Pythium* spp.), ROOT ROT (*Rhizoctonia* spp.):**

Gliocladium virens GL-21

- SoilGard 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

**PREPLANT INCORPORATED:**

**DAMPING OFF (*Pythium* spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold GR, 20 lb.
- Ridomil Gold SL, 1 pt. (7 days)
- Ultra Flourish, 2 to 4 pt.

## Tomatoes

### ROOT and FRUIT ROT (*Pythium* spp., *Phytophthora* spp.):

Mefenoxam. Apply Ridomil 4 to 6 weeks after planting as a surface application or a soil surface spray under vines followed by 1/2 to 1 in. of water or injected based on a 7 in. band. A second application before the last irrigation may be made up to 4 weeks before harvest.

- *Ridomil* Gold GR, 20 lb (4 weeks). (4 weeks) A third application can be made 4 weeks before harvest.
- *Ridomil* Gold SL, 1 pt. (7 days)
- *Ultra Flourish*, 2 to 4 pt (4 weeks). (4 weeks) Note: Observe limit of active ingredient/crop on label.  
or  
Mono-, dibasic sodium, potassium and ammonium phosphites
- *Phostrol*, 2.5 to 5 pt every 7 - 14 days. (0 days)

### GREENHOUSE TREATMENT:

**BACTERIAL CANKER (*Clavibacter michiganensis* subsp. *michiganensis*), BACTERIAL SPOT (*Xanthomonas vesicatoria*), BACTERIAL SPECK (*Pseudomonas tomato*):** Apply every 7 to 10 days after disease appearance.

Acibenzolar-S-methyl

- *Actigard*, 1/3 to 3/4 oz per 100 gal of water. (14 days) Do not apply more than 6 oz of Actugaard per acre per season.

or

Copper Ammonium Carbonate

- *Copper Count N*, 4 tablespoons (speck) or 4 to 8 tablespoons (spot) per 1000 sq ft.

or

Copper Hydroxide

- *Champ DP*, *Champ Formula 2 F*, *Kocide 2000*, 1 1/2 to 2 1/4 tablespoons per 1000 sq ft (speck and spot).
- *Champion WP*, 4 tablespoons (speck) or 4 to 8 tablespoons (spot) per 1000 sq ft.
- *Kocide 3000*, 0.5-1.5 tbl / 1000 ft. (0 day)

or

Mancozeb

- *Dithane DF Rainshield*, *Dithane M-45*, 1 1/2 to 3 lb. (5 days) Tank mix 1/2 to full rate of Dithane with a full rate of fixed copper fungicide, and apply at intervals recommended by the copper fungicide label (speck and spot).
- *Dithane F-45 Rainshield*, 1.2 to 2.4 qt. Tank mix 1/2 to full rate of Dithane with a full rate of fixed copper fungicide, and apply at intervals recommended by the copper fungicide label (speck and spot)

**Note:** Most fungicides that protect against bacterial speck and/or spot may provide protection against bacterial canker.

### DRIP APPLICATION:

**LATE BLIGHT (*Phytophthora infestans*), PHYTOPHTHORA BLIGHT (*Phytophthora capsici*):**

\* Fluopicolide

- *Presidio*, 3-4 fl oz. (2 days)

### FOLIAR TREATMENT:

#### ROOT ROT (*Phytophthora* spp.), DAMPING OFF (*Pythium* spp.):

Fosetyl-Aluminum

- *Aliette WDG*, 2.5 to 5 lb, 7- to 14-day intervals. (14 days) Note: Do not tank mix with copper products.

**LEAF MOLD (*Cladosporium fulvum*), WHITE MOLD (*Sclerotinia sclerotiorum*), GRAY MOLD (*Botrytis cinerea*):** Apply weekly as a foliar spray. May have reduced efficacy against Boitrytis gray mold as a result of resistant strains of *B. cinerea*.

\* Chlorothalonil

- *Bravo Ultrex*, 1.3 to 1.8 lb. (0 days)

- *Bravo Weather Stik*, *Equus 720 SST*, 1 3/8 to 2 pt; 2 to 3 pt (*Botrytis*). (0 days)

- *Echo 720*, 2 to 3 pt (*Botrytis*). (0 days)

- *Echo 90 DF*, 1.2 to 1.7 lb; 1.7 to 2.3 lb (*Botrytis*). (0 days)

- *Equus DF*, 1.3 to 2.6 lb (*Botrytis*). (0 days)

or

\* Mancozeb

- *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 1 1/2 to 3 lb. (5 days)

- *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)

- *Manzate Pro-Stick*, 1 1/2 to 3 lb, 7- to 10-day intervals. (5 days)

- *Penncozeb 75 DF* (3/4 to 3 lb (*Cladosporium*)) or *Penncozeb 80 WP* (3/4 to 3 lb (*Cladosporium*)) (5 days)

or

\* Maneb

- *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 3 lb. (5 days)

- *Manex*, 1 1/5 to 2 2/5 qt. (5 days)

or

Famoxadone/Cymoxanil

- *Tanos*, 8 oz. (3 days)

or

Neem Oil

- *Trilogy*, 2 pt. (0 days)

or

Potassium Bicarbonate

- *Armicarb 100*, 2.5 to 5 lb (*Botrytis*). (0 days)

or

Pyrimethanil

- *Scala*, 7 fl oz. (1 day)

**BACTERIAL CANKER (*Clavibacter michiganensis* subsp. *michiganensis*), BACTERIAL SPOT (*Xanthomonas vesicatoria*), BACTERIAL SPECK (*Pseudomonas tomato*):**

Bacillus subtilis

- *Serenade*, 4 to 8 lb every 7 days. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.
- *Serenade Max*, 1 - 3 lb every 7 to 10 days. (0 days)

or

Copper Ammonium Carbonate

- *Copper Count N*, 1 to 3 qt (speck, spot). (0 days)

or

Copper Hydroxide

- *Champ DP*, 1 1/3 lb 10 to 30 day intervals (speck) or 1 1/3 to 2 2/3 lb (spot), 7-to 10-day intervals. (0 days)

- *Champ Formula 2 F*, 1 1/3 pt (speck), 1 1/3 to 2 2/3 pt (spot). (0 days)

- *Champion WP*, 2 to 4 lb (spot) or 2 lb (speck). (0 days)

- *Kocide 2000*, 1 1/2 to 3 lb. (0 days)

- *Kocide 3000*, 0.75-1.5 lb. (0 day)

- *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt, 10- to 30-day intervals (speck) or 1 1/3 to 5 1/3 pt, 7- to 10-day intervals (spot). (0 days)

- *Nu-Cop 50 DF*, 2 to 3 lb (speck) or 2 to 4 lb (spot), 7- to 10-day intervals. (0 days)

or

Copper Oxychloride / Copper Sulfate

- *C-O-C-S WDG*, 2 to 6 lb every 7 days. (0 days)

or

Copper Resinate

- *Tenn-Cop 5 E*, 3 pt (speck, spot).

or

Copper Sulfate

- *Basic Copper 53*, *Basicop*, 2 to 4 lb (canker, spot). (0 days) May be used through irrigation equipment.

- *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)

or

Famoxadone/Cymoxanil

- Tanos, 8 oz. (3 days)

or

Mancozeb/Copper Hydroxide

- ManKocide, 2.5 to 5 lb (speck, spot). (5 days)

**Note:** Fungicides that protect against bacterial speck and/or spot may provide protection against bacterial canker.

**EARLY BLIGHT (*Alternaria solani*):**\* Azoxystrobin

- Amistar, 1.6 to 2.0 oz every 7 - 21 days. (0 days)
- Quadris, 5 to 6.2 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 pt every 7 - 21 days. (0 days)

or

\* Azoxystrobin/Difenoconazole

- Quadris Top, 8 fl oz. (1 day) One application before alternating with another chemical.

or

\* Boscalid

- Endura, 2.5 to 3.5 oz. (0 days)

or

\* Chlorothalonil

- Bravo Ultrex, 1.3 to 1.8 lb (foliage) or 1.8 to 2.7 (fruit) every 7 - 14 days. (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 1 3/8 to 2 pt (foliage) or 2 to 2.75 pt (fruit). (0 days)

- Echo 90 DF, 1.2 to 1.7 lb. (0 days)

- Equus DF, 1.3 to 2.6 lb. (0 days)

or

\* Difenoconazole/Cyprodinil

- Inspire Super, 16 to 20 fl oz. (0 days)

or

\* Mancozeb

- Dithane DF Rainshield, Dithane M-45, Dithane WSP, 1 1/2 to 3 lb. (5 days)

- Dithane F-45 Rainshield, 1 1/5 to 2 2/5 qt. (5 days)

- Manzate 80 WP, Manzate Pro-Stick, 1 1/2 to 3 lb. (5 days)

- Penncozeb 4 F, 0.6 to 2.4 qt. (5 days)

- Penncozeb 75 DF, Penncozeb 80 WP, 1 1/2 to 3 lb. (5 days)

or

\* Maneb

- Maneb 75 DF, or Maneb 80 WP (1 1/2 to 3 lb) or Manex (1 1/5 to 2 2/5 qt) (5 days)

or

\* Pyraclostrobin

- Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

or

\* Trifloxystrobin

- Flint, 2 to 3 oz. (3 days)

or

\* Ziram

- Ziram 76 DF, 3 to 4 lb, 7- to 14-day intervals. (7 days) Do not use on cherry tomatoes.

or

Bacillus subtilis

- Serenade, 4 to 8 lb every 7 days. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

or

Copper Ammonium Carbonate

- Copper Count N, 3 qt. (0 days)

or

Copper Hydroxide

- Champ DP, 1 1/3 to 2 lb. (0 days)
- Champ Formula 2 F, 1 1/3 to 2 pt. (0 days)
- Champion WP, 2 to 4 lb. (0 days)
- Kocide 2000, 1 1/2 to 3 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 4 pt. (0 days)
- Nu-Cop 50 DF, 2 to 3 lb. (0 days)

or

Copper Resinate

- Tenn-Cop 5 E, 3 pt. (0 days)

or

Copper Sulfate

- Basic Copper 53, Basicop, 2 to 4 lb. (0 days)
- Cuprofix Ultra, 1.25 to 3 lb. (0 days)

or

Famoxadone/Cymoxanil

- Tanos, 8 oz. (3 days)

or

Fenamidone

- Reason 500 SC, 5.5 to 8.2 fl oz every 5 to 10 days. (14 days)

or

Fenamidone

- Reason 500 SC, 5.5 - 8.2 fl oz. (14 days) No more than 1 application before alternating.

or

Mancozeb/Copper Hydroxide

- ManKocide, 2.5 to 5 lb. (5 days)

or

Mancozeb/Copper Sulfate

- Cuprofix MZ Disperss, 1.75 - 7.25 lb. (5 days)

or

Mandipropamid/Difenoconazole

- Revus Top, 5.5-7 fl oz. (1 day)

or

Neem Oil

- Trilogy, 2 pt. (0 days)

or

Potassium Bicarbonate

- Armicarb 100, 2.5 to 5 lb. (0 days)

or

Potassium phosphite/chlorothalonil

- Catamaran, 5-7 pt. (0 days)

or

Pyrimethanil

- Scala, 7 fl oz. (1 day)

**LATE BLIGHT (*Phytophthora infestans*):**\* Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 pt every 7 - 21 days. (0 days)

or

\* Chlorothalonil

- Bravo Ultrex, 1.3 to 1.8 lb (foliage) or 1.8 to 2.6 lb (fruit). (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 1 3/8 to 2 pt (foliage) or 2 to 2.75 pt (fruit). (0 days)

- Echo 90 DF, 1.2 to 1.7 lb. (0 days)

- Equus DF, 1.3 to 2.6 lb.

or

\* Cyazofamid

- Ranman, 2.1 to 2.75 fl oz every 7 to 10 days. (5 days)

or

\* Cymoxanil

- Curzate 60 DF, 3.2 to 5 oz every 5 - 7 days. (3 days)

or

\* Dimethomorph

- Forum, 6 fl oz. (4 days)

or

## Tomatoes

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- \* Fenamidone
  - *Reason* 500 SC, 5.5 to 8.2 fl oz every 5 to 10 days. (14 days)  
or
- \* Mancozeb/Zoxamide
  - *Gavel* 75 DF, 1.5-2.0 lb. (5 days)  
or
- \* Mandipropamid
  - *Revus*, 8 fl oz. (1 day) No more than 2 consecutive applications.  
or
- \* Mefenoxam/Chlorothalonil
  - *Ridomil Gold Bravo*, 2 lb, 14-day intervals. (14 days) Maximum 3 applications.  
or
- \* Mefenoxam/Copper Hydroxide
  - *Ridomil Gold Copper*, 2 lb, 14-day intervals. (14 days) Maximum 3 applications.  
or
- \* Mefenoxam/Mancozeb
  - *Ridomil Gold MZ*, 2.5 lb, 14-day intervals. (14 days) Maximum 3 applications.  
or
- \* Pyraclostrobin
  - *Cabrio*, 8-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.  
or
- Azoxystrobin
  - *Amistar*, 1.6 to 2.0 oz every 5 - 7 days. (0 days)
  - *Quadris*, 5 to 6.2 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action  
or
- Bacillus subtilis
  - *Serenade*, 4 to 8 lb. (0 days) Provides suppression. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.  
or
- Copper Ammonium Carbonate
  - *Copper Count N*, 1 to 3 qt. (0 days)  
or
- Copper Hydroxide
  - *Champ DP*, 1 1/3 to 2 lb. (0 days)
  - *Champ Formula 2 F*, 1 1/3 to 2 pt. (0 days)
  - *Champion WP*, 2 to 4 lb. (0 days)
  - *Kocide 2000*, 1 1/2 to 3 lb. (0 days)
  - *Kocide 3000*, 0.75-1.5 lb. (0 day)
  - *Nu-Cop 3 L*, 1 1/3 to 5 1/3 pt, 7- to 10-day intervals. (0 days)  
or
- Copper Sulfate
  - *Basic Copper 53*, *Basicop*, 2 to 4 lb. (0 days)
  - *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)  
or
- Famoxadone/Cymoxanil
  - *Tanos*, 8 oz. (3 days)  
or
- Fenamidone
  - *Reason* 500 SC, 5.5 - 8.2 fl oz. (14 days) 12 hr REI.  
or
- Fluopicolide
  - *Presidio*, 3-4 fl oz. (2 days)  
or
- Mancozeb
  - *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 1 1/2 to 3 lb. (5 days)
  - *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)
- *Manzate Pro-Stick*, 1 1/2 to 3 lb. Maximum 22.4 lb/season. (5 days)
- *Penncozeb 4 F*, 0.6 to 2.4 qt. (5 days)
- *Penncozeb 75 DF*, *Penncozeb 80 WP*, 1 1/2 to 3 lb. (5 days)  
or
- Mancozeb/Copper Hydroxide
  - *ManKocide*, 2.5 to 5 lb. (5 days)  
or
- Mancozeb/Copper Sulfate
  - *Cuprofix MZ Disperss*, 1.75 - 7.25 lb. (5 days)  
or
- Mandipropamid/Difenconazole
  - *Revus Top*, 5.5-7 fl oz. (1 day)  
or
- Maneb
  - *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 3 lb, 7- to 10-day intervals. (5 days)
  - *Manex*, 1 1/5 to 2 2/5 qt. (0 days)  
or
- Mono-, dibasic sodium salts of phosphorous acid
  - *Fosphite*, 3 to 5 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)  
or
- Neem Oil
  - *Trilogy*, 2 pt. (0 days)  
or
- Potassium Bicarbonate
  - *Armicarb 100*, 2.5 to 5 lb. (0 days)  
or
- Potassium phosphite/chlorothalonil
  - *Catamaran*, 5-7 pt. (0 days)  
or
- Propamocarb
  - *Previcur Flex*, 0.7 to 1.5 pt every 7 to 10 days. (5 days)  
or
- Trifloxystrobin
  - *Flint*, 4 oz. (3 days) Tank mix only with protectant. 12 hr REI.  
or
  - *Flint*, 4 oz. (3 days)

**Note:** Most fungicides that protect against early blight also provide limited late blight protection.

### SEPTORIA LEAF SPOT (*Septoria lycopersici*):

- \* Azoxystrobin
  - *Amistar*, 1.6 to 2.0 oz every 7 - 21 days.
  - *Quadris*, 5 to 6.2 fl oz.

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.  
or
- \* Azoxystrobin/Chlorothalonil
  - *Quadris Opti*, 1.6 pt every 7 - 21 days. (0 days)  
or
- \* Chlorothalonil
  - *Bravo Ultrex*, 1.3 to 1.8 lb. (0 days)
  - *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1 3/8 to 2 pt. (0 days)
  - *Echo 90 DF*, 1.2 to 1.7 lb. (0 days)
  - *Equus DF*, 1.3 to 2.6 lb. (0 days)  
or
- \* Mancozeb
  - *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 1 1/2 to 3 lb. (5 days)
  - *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)

- *Manzate Pro-Stick*, 1 1/2 to 3 lb. Maximum 22.4 lb/season. (5 days)
- *Penncozeb 75 DF*, *Penncozeb 80 WP*, 1 1/2 to 3 lb. (5 days)
  - or
  - \* *Maneb*
  - *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 3 lb. (5 days)
  - *Manex*, 1 1/5 to 2 2/5 qt. (5 days)
    - or
- \* *Pyraclostrobin*
  - *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
    - or
  - \* *Trifloxystrobin*
    - *Flint*, 3 to 4 oz suppressed. (3 days)
      - or
  - \* *Ziram*
    - *Ziram 76 DF*, 3 to 4 lb, 7- to 14-day intervals. (7 days) Do not use on cherry tomatoes.
      - or
- Copper Hydroxide*
  - *Champ DP*, 1 1/3 to 2 2/3 lb. (0 days)
  - *Champ Formula 2 F*, 1 1/3 to 2 2/3 pt, 7- to 10-day intervals. (0 days)
  - *Champion WP*, 2 to 4 lb, 7- to 10-day intervals. (0 days)
  - *Kocide 2000*, 1 1/2 to 3 lb. (0 days)
  - *Kocide 3000*, 0.75-1.5 lb. (0 day)
    - or
- Copper Resinate*
  - *Tenn-Cop 5 E*, 3 pt. (0 days)
    - or
- Copper Sulfate*
  - *Basic Copper 53*, *Basicop*, 2 to 4 lb. (0 days)
  - *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)
    - or
- Difenoconazole/Cyprodnil*
  - *Inspire Super*, 16 to 20 fl oz. (0 days)
    - or
- Fenamidone*
  - *Reason 500 SC*, 5.5 to 8.2 fl oz every 5 to 10 days. (14 days) Suppression. 12 hr REI.
    - or
- Mancozeb/Copper Hydroxide*
  - *ManKocide*, 2.5 to 5 lb. (5 days)
    - or
- Mancozeb/Copper Sulfate*
  - *Cuprofix MZ Disperss*, 1.75 - 7.25 lb. (5 days)
    - or
- Mandipropamid/Difenoconazole*
  - *Revus Top*, 5.5-7 fl oz. (1 day)
- ANTHRACNOSE (*Colletotrichum coccodes*):**
  - \* *Azoxystrobin*
    - *Amistar*, 1.6 to 2.0 oz every 7 - 21 days. (0 days)
    - *Quadris*, 5 to 6.2 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

    - or
  - \* *Azoxystrobin/Difenoconazole*
    - *Quadris Top*, 8 fl oz. (1 day) One application before alternating with another chemical.
      - or
  - \* *Chlorothalonil*
    - *Bravo Ultrex*, 1.8 to 2.6 lb. (0 days)
    - *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 2 to 2.75 pt. (0 days)
    - *Echo 90 DF*, 1.7 to 2.3 lb. (0 days)
    - *Equus DF*, 1.3 to 2.6 lb. (0 days)
      - or
- \* *Mancozeb*
  - *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 1 1/2 to 3 lb. (5 days)
  - *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)
  - *Manzate Pro-Stick*, 1 1/2 to 3 lb. Maximum 22.4 lb/season. (5 days)
  - *Penncozeb 4 F*, 0.6 to 2.4 qt. (5 days)
  - *Penncozeb 75 DF*, *Penncozeb 80 WP*, 1 1/2 to 3 lb. (5 days)
    - or
    - \* *Maneb*
      - *Maneb 75 DF*, *Maneb 80 WP*, 1 1/2 to 3 lb. (5 days)
      - *Manex 4 F*, 1 1/5 to 2 2/5 qt. Maximum of 16.8 qt/season. (5 days)
        - or
  - \* *Pyraclostrobin*
    - *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
      - or
      - \* *Ziram*
        - *Ziram 76 DF*, 3 to 4 lb, 7- to 14-day intervals. (7 days) Do not use on cherry tomatoes.
          - or
    - Copper Hydroxide*
      - *Champ DP*, 1 1/3 to 2 2/3 lb. (0 days)
      - *Champ Formula 2 F*, 1 1/3 to 2 2/3 pt, 7- to 10-day intervals. (0 days)
      - *Champion WP*, 2 to 4 lb, 7- to 10-day intervals. (0 days)
      - *Kocide 2000*, 1 1/2 to 3 lb. (0 days)
      - *Kocide 3000*, 0.75-1.5 lb. (0 day)
        - or
      - *Nu-Cop 3 L*, 1 1/3 to 5 1/3 pt, 7- to 10-day intervals. (0 days)
      - *Nu-Cop 50 DF*, 2 to 3 lb, 7- to 10-day intervals. (0 days)
        - or
    - Copper Resinate*
      - *Tenn-Cop 5 E*, 3 pt. (0 days)
        - or
    - Copper Sulfate*
      - *Basic Copper 53*, *Basicop*, 2 to 4 lb. (0 days)
      - *Cuprofix Ultra*, 1.25 to 3 lb. (0 days)
        - or
    - Difenoconazole/Cyprodnil*
      - *Inspire Super*, 16 to 20 fl oz. (0 days)
        - or
    - Famoxadone/Cymoxanil*
      - *Tanos*, 8 oz. (3 days)
        - or
    - Mancozeb/Copper Hydroxide*
      - *ManKocide*, 2.5 to 5 lb. (5 days)
        - or
    - Mancozeb/Copper Sulfate*
      - *Cuprofix MZ Disperss*, 1.75 - 7.25 lb. (0 days)
        - or
    - Mandipropamid/Difenoconazole*
      - *Revus Top*, 5.5-7 fl oz. (1 day)
        - or
    - Neem Oil*
      - *Trilogy*, 2 pt. (0 days)
        - or
    - Potassium Bicarbonate*
      - *Armicarb 100*, 2.5 to 5 lb. (0 days)

**BUCKEYE FRUIT ROT (*Phytophthora parasitica*):**

- \* *Mefenoxam/Chlorothalonil*
  - *Flouronil*, 2 lb, 14-day intervals. (14 days) Maximum 3 applications.
  - *Ridomil Gold Bravo*, 2 lb, 14-day intervals. (14 days) 3 applications maximum.
    - or

## Turnips

\* Mefenoxam/Copper Hydroxide

- Ridomil Gold Copper, 2 lb, 14-day intervals. (14 days) Maximum 3 applications.

or

\* Trifloxystrobin

- Flint, 3 to 4 oz suppressed. (3 days) Suppressed.

or

Azoxystrobin

- Amistar, 1.6 to 2.0 oz every 7 - 21 days. (0 days)

- Quadris, 5 to 6.2 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Azoxystrobin/Chlorothalonil

- Quadris Opti, 1.6 pt every 7 - 21 days. (0 days)

or

Fluopicolide

- Presidio, 3-4 fl oz. (2 days)

### GRAY MOLD (*Botrytis cinerea*):

Pyrimethanil

- Scala, 7 fl oz. (1 day) 12 hr REI.

### LEAF MOLD (*Cladosporium fulvum*):

\* Azoxystrobin/Difenoconazole

- Quadris Top, 8 fl oz. (1 day) One application before alternating with another chemical.

or

Difenoconazole/Cyprodnil

- Inspire Super, 16 to 20 fl oz. (0 days)

### GRAY MOLD (*Botrytis cinerea*):

Boscalid

- Endura, 9 to 12.5 oz. (0 days)

## Turnips

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

## INSECTS

### SOIL TREATMENT:

#### CABBAGE MAGGOT:

Chlorpyrifos

- Lorsban 15 G (4.6 to 9.2 oz/1,000 ft of row) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 ft of row) Apply in a 4-inch band over row at time of seeding. (RUP)

#### APHIDS, FLEA BEETLE: See label for application methods.

Imidacloprid

- Admire Pro, 4.4 - 10.5 fl oz. (21 days) See label for application methods.
- Nuprid 2 F, 10 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.

or

Platinum, 5 to 12 fl oz. (30 days) See label for application methods.

#### FOLIAR TREATMENT:

##### FLEA BEETLE: Apply if foliar injury is observed to prevent larval injury to roots.

Actara, 1.5 to 3 oz. (7 days)

or

Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

or

Bifenthrin

- Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Brigade 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)

- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

Carbaryl

- Carbaryl 4L, 0.5 to 1 qt. (7 days)

- Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (7 days)

or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)

- S-FenvatoStar, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

Imidacloprid

- Admire Pro, 1.2 fl oz. (7 days)

- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

### CABBAGE "WORM": Apply if needed.

Bacillus thuringiensis

- Agree, Biobit, Dipel, Javelin, Xentari, . (0 days)

or

Bifenthrin

- Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Brigade 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)

- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

Confirm 2F, 6 to 8 fl oz. (7 days)

or

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)

- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)

- S-FenvatoStar, 5.8 to 9.6 fl oz. (7 days) (RUP)

or

Malathion 57 EC, 2 pt. (7 days)

or

Perm-UP 3.2 EC, 2 to 4 oz. (1 day) (RUP)

### APHIDS: Apply as needed to prevent population buildup.

Actara, 1.5 to 3 oz. (7 days)

or

Bifenthrin

- Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Brigade 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)

- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

or

Dimethoate

- Dimethoate 2.67 EC (0.75 pt.) or Dimethoate 4 EC (0.5 pt.) (14 days)

or

Imidacloprid

- Admire Pro, 1.2 fl oz. (7 days)

- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

or

Malathion 57 EC, 2 pt. (3 days)

## DISEASES

### SEED TREATMENT:

**DAMPING OFF (*Pythium* spp., *Rhizoctonia solani*):** Apply treatment as dust or slurry.

Bacillus subtilis GB03

- Kodiak, 0.1 to 0.5 oz/100 lb seed (*Pythium*).  
or

Captan

- Captan 30-DD, 1 1/4 oz/100 lb seed.
- Captan 400, 1 to 2 oz/100 lb seed.  
or

Fludioxinil

- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (*Rhizoctonia*).  
Commercial seed treatment plants only.  
or

Thiram

- 42-S Thiram, Thiram 50 WP Dyed, 8 oz/100 lb seed.

### PREPLANT INCORPORATED:

**DAMPING OFF (*Pythium* and *Phytophthora* spp.):**

Fluopicolide

- Presidio, 3-4 fl oz. (7 days) Must be mixed with another fungicide active on pathogen.

or

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7" band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1" of sprinkler irrigation.

- Ridomil Gold SL, 1-2 pt.

### FOLIAR TREATMENT:

**ALTERNARIA LEAF SPOT (*Alternaria* spp.), DOWNTY MILDEW (*Peronospora parasitica*):**

Acibenzolar-S-methyl

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.

or

Azoxystrobin. *Alternaria* only.

- Amistar (2 to 5 oz (*Alternaria*)) or Quadris (6.2 to 15.4 fl oz (*Alternaria*)) (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

or

Trifloxystrobin

- Flint, 2 to 3 oz. (7 days) Maximum 12 oz/year. 12 hr REI.

**CERCOSPORA LEAF SPOT (*Cercospora* spp.):**

Tebuconazole

- Folicur 3.6F, 4-7.2 fl oz. (7 days) Maximum 28.8 fl oz/acre/season. 12 hr REI.

or

Trifloxystrobin

- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/season. 12 hr REI.

**POWDERY MILDEW, RUST:**

Trifloxystrobin

- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/year. 12 hr REI.

**ALTERNARIA BLIGHT (*Alternaria* spp.):**

\* Trifloxystrobin

- Gem 500, 1.9 to 2.9 fl oz. (7 days)

**ALTERNARIA LEAF SPOT (*Alternaria* spp.):**

Pyraclostrobin

- Cabrio, 8 to 12 oz. (0 days)

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## APPENDIX A

### Seedbed Preparation

#### SEEDBED PREPARATION

Clean soil is necessary for good seedbed production. Organisms that cause damage to vegetable seedlings may be present in any soil or growing mixture. Soils may be sterilized by a number of chemical or physical techniques, such as steam or dry heat.

**Warnings:** All the listed fumigants may be used both in the seedbeds and to treat soils in which vegetables are grown to maturity, with the following exceptions: 1) METHYL BROMIDE and FORMALDEHYDE can be used only for seedbeds. 2) None of the materials can be used where living plants are growing. Carefully read the directions in the table below, and especially those of manufacturers, to avoid danger and to obtain successful results.

#### SEED TREATMENT

Dust method—place the seed and suggested wettable powders in a closed container and agitate vigorously for several minutes or until seed is coated with dust. For best results, use a container with twice the capacity of the seed treated.

Slurry method—to suggested wettable powders, add enough water to make a sloppy paste or slurry. Treat by stirring or swirling seed in the slurry until thoroughly coated. Dry the seed before planting. Slurries are preferred to dusts because they adhere to the seed better and are less irritating to use.

#### CHEMICALS SUGGESTED FOR SEEDBED STERILIZATION

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at [epa.gov/fumiganttoolbox](http://epa.gov/fumiganttoolbox). Michigan's soil fumigant distributors can provide e-templates for the management plans.

CHLOROPICRIN  
(E.G. CHLOR-O-PIC, PICFUME)

**Warnings:** Fumes are very irritating to eyes and are poisonous to growing plants. Wear full coverage protective clothing and a MSHA/ NIOSH-approved respirator with the proper carbon filter.

##### Rate and Method of Application

Inject 1.6 to 2.3 cc of material 6 inches deep and at 8-inch intervals using a hand operated fumigation gun.

Treat only when soil temperature 6 inches deep is above 65°F. Pack treated soil and apply water seal (wet to a depth of several inches) or cover with plastic for 48 hours. Cultivate to speed aeration and avoid planting for 2 weeks, or until odor of fumigant is no longer detectable.

#### FORMALDEHYDE

**NOTE:** Not effective for nematodes. Especially suited for cabbage and cauliflower.

**Warnings:** Fumes are irritating to eyes and nasal passages and poisonous to growing plants. Avoid prolonged contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter. Ventilate when treating a confined area. Rate of Method of Application

Mix 1 pt (37% to 40% strength) with 5 gallons of water and apply with a sprinkling can at the rate of 1/2 gal/sq ft of soil surface. Treat only if soil temperature 6 inches deep is above 60°F. Cover treated soil with a plastic cover. Leave undisturbed for 48 hours, then cultivate one or more times. Avoid planting for 2 weeks or until odor of fumigant is no longer detectable. Do not use near living plants. As a disinfectant for equipment and storage interiors or greenhouses, spray surfaces with a mixture of 1 pt (37% to 40% strength) in 5 gallons of water. Cover equipment with plastic and keep storage or greenhouse closed for 24 to 48 hours after treatment, then air out well before planting.

1,3-D (DICHLOROPROPENE; TELONE II)

**Warnings:** Fumes are irritating to eyes and nasal passages. Prolonged inhalation is dangerous; poisonous to growing plants. Avoid contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter.

##### Rate and Method of Application

Apply as a preplant broadcast treatment at least 14 to 21 days prior to planting. Late summer or early autumn is usually best for applying fumigants in Michigan. Inject at 8 inches deep with chisels spaced 10 to 12 inches apart when soil temperature is between 50° and 80°F. Seal immediately after application. If soil is waterlogged or

temperature is below 60°F, allow additional time before planting. Use only on crops listed on the respective label.

#### 1,3-D AND CHLOROPICRIN (E.G., TELONE C-17)

**Warnings:** Fumes are irritating to eyes and nasal passages. Prolonged inhalation is dangerous; poisonous to growing plants. Avoid contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter.

#### Rate and Method of Application

Apply as a preplant broadcast treatment at least 14 to 21 days prior to planting. Late summer or early autumn is usually best for applying soil fumigants in Michigan. Inject 8 inches deep with chisels spaced 10 to 12 inches apart when soil temperature is between 50° and 80°F. Seal immediately after application. If soil is waterlogged or temperature is below 60°F, allow additional time before planting. Use only on crops listed on the respective label.

#### SODIUM METHYLDITHIOCARBAMATE (METHAM) (E.G., VAPAM OR VAPAM HL)

**Warnings:** Avoid breathing vapor or spray mist. Do not get in eyes, on skin, or clothing. Causes skin irritation. May be fatal if absorbed through skin. Wash with soap and water. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator to reduce exposure.

#### Rate and Method of Application

With a sprinkling can, fill with 1 to 1 1/2 pt metham and water and sprinkle uniformly over 50 sq ft of well-prepared soil. Sprinkle immediately with water until soil is sealed, or tarp for 48 hours. Seven days after treatment cultivate area to a depth of 2 inches to aerate soil. Do not seed earlier than 21 days after application if tarp is used. For soil injection, space injectors 5 inches apart and inject metham 4 inches into well-prepared soil. Follow immediately with a roller to smooth and compact the soil surface. Light watering or a tarp after rolling helps to prevent gas escape. For seedbeds, 75 to 100 gal/A (1 1/2 pt to 2 pt per 100 sq ft) is recommended.

## APPENDIX B Nematodes and Michigan Vegetable Production

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Nematodes are believed to be the most common animals on our planet. They inhabit most soil, fresh water and marine environments. At least 12 types of nematodes are known to parasitize or cause infectious diseases of Michigan vegetable crops. Hundreds of other species are involved in making nutrients available for plant growth. The objectives of this article are to: 1) provide an overview of the nematode problems associated with vegetable production in Michigan, 2) discuss the management options for plant-parasitic nematodes, 3) describe how nematodes are involved in nitrogen mineralization and 4) provide some recommendations on how to enhance the role of nematodes in making nutrients available for plant growth.

The 12 types of plant parasitic nematodes that feed on vegetable crops in Michigan cause diverse symptoms, attack a wide variety of crops and have different behaviors.

### ROOT-KNOT NEMATODES

Only one species, the Northern Root-Knot Nematode is known to over-winter under Michigan conditions. Other

species can be brought into the state on transplants produced in the south.

**Crop Symptoms** -Root galls, yellowing, wilting, stunted top growth, stunted root growth, low crop yield and poor crop quality.

**Crops Attacked** -Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Cucumber, Eggplant, Garlic, Leeks, Lettuce, Melons, Onions, Parsnips, Peppers, Potatoes, Pumpkins, Squash, Tomatoes.

**Nematode Behavior** -Second-stage juveniles invade root tissue a short distance behind the root tip. They migrate towards the root tip, stop, turn and then migrate to where the vascular cylinder is being formed. Here, the plant forms nurse cells for use by the nematodes for their growth and development. The plant also forms root galls for protection of the hundreds of eggs in each egg mass. Extensive amounts of plant matter and energy are used in this process, resulting in unsatisfactory crop growth and development. A close relative, the False Root-Knot Nematode, has been found associated with sugar beets in Michigan and has the potential to feed on beets and potato.

This species, however, has not been detected in Michigan during the last 25 years.

## CYST NEMATODES

Michigan is the home to nine different species of cyst nematodes. Three of them, Carrot Cyst Nematode, Soybean Cyst Nematode and Sugar Beet Cyst Nematode can be serious problems in Michigan vegetable production.

**Crop Symptoms** -Yellowing, stunted top growth, stunted root growth, poor nodulation, pinhead size white females on root tissue, poor crop yield and poor crop quality.

**Crops Attacked** -Carrot Cyst Nematode (carrots), Soybean Cyst Nematode (Snap Beans, Peas) and Sugar Beet Cyst Nematode (Beets, Broccoli, Brussels Sprouts, Cabbage).

**Nematode Behavior** -Second-stage juveniles invade root tissue about one half of an inch behind the root tip. They burrow to where the vascular cylinder is being formed and induce the plant to form nurse cells for nematode feeding. The female swells and breaks through the root tissue. When she has filled her body with eggs, she dies and drops from the root. Her body hardens to become a protective cyst that can survive in soil in the absence of a host for up to 12 years. Extensive amounts of plant matter and energy are used in this process, resulting in poor crop growth and development.

## ROOT-LESION NEMATODES

The Penetrans Root-Lesion Nematode is the most common plant parasitic nematode in Michigan and feeds on the root systems of many crops. A second nematode, the False Root-Lesion Nematode causes damage to mint grown in muck soil.

**Crop Symptoms** -Yellowing, stunted top growth, stunted root growth, root lesions, poor crop yield and poor crop quality.

**Crops Attacked** -Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Corn, Cucumber, Eggplant, Garlic, Leeks, Lettuce, Melons, Mint, Onions, Parsnips, Peppers, Potatoes, Pumpkins, Squash, and Tomatoes.

**Nematode Behavior** -All stages of root-lesion nematodes are mobile and penetrate root tissue as endoparasites. After root penetration, the nematodes migrate throughout the root cortex, where females deposit their eggs. This migration, combined with chemical exudates, results in reduced uptake and transport of water and nutrients throughout the plant. Root-lesion nematodes are known to interact with soil-borne fungi to cause disease complexes. The best known of these is the Potato Early-Die Disease Complex.

## NEEDLE NEMATODES

There are two types of Needle Nematodes in Michigan, the Common Needle Nematode and the Corn Needle Nematode. They can exist in both muck and mineral soil.

**Crop Symptoms** -Greatly stunted top growth, barren areas, swollen root-tips, reduced crop yield and poor crop quality.

**Crops Attacked** -Celery, Corn, Garlic, Onions.

**Nematode Behavior** -Needle nematodes are large ectoparasites and only the nematodes' stylets penetrate root tissue. The Corn Needle Nematode feeds early in the growing season and then migrates deep into the soil. Its distribution is limited to very coarse textured sandy soils. The Corn Needle Nematode has a narrow host range and can easily be managed through crop rotation. Needle nematodes have the ability to vector viruses.

## BULB AND STEM NEMATODES

Bulb and Stem Nematodes feed on shoot and not root tissue. There are two very different species associated with Michigan vegetable production systems. One attacks onion and celery, and the other feeds in potato tubers. Both are rarely detected in vegetable fields in Michigan.

**Crop Symptoms** -Yellowing, stunted top growth, a highly characteristic odor, bloated leaves and bulbs or tuber rot, reduced yields and unsatisfactory crop quality.

**Crops Attacked** -Onions, Garlic and Potato.

**Nematode Behavior** -The Bulb and Stem Nematode is a migratory endoparasite of shoot tissue. Fourth-stage juveniles penetrate onion tissue at the junction of the root and shoot system. They migrate through leaf and bulb tissue resulting in greatly deformed growth.

## PIN NEMATODES

There are two types of Pin Nematodes associated with Michigan vegetable production, one limited to muck vegetable production and the other associated with mineral soil production systems. **Crop Symptoms** -Stunted top growth, no feeder roots (witches-broom), reduced yield.

**Crops Attacked** -Carrots, Celery and Corn.

**Nematode Behavior** -Pin Nematodes are small ectoparasites that feed only from the outside of root tissue. These nematodes have a long stylet that can be inserted into the central vascular system of roots.

## STUBBY-ROOT NEMATODES

Although several species of Stubby-Root Nematodes are known to exist in Michigan, they have not been detected as often recently as in the past. **Crop Symptoms** - Yellowing, stunted tops, stubby roots and poor yields.

**Crops Attacked** -Corn and Onions. **Nematode Behavior** -

Stubby-Root Nematodes are small ectoparasites. They feed close to the root-tip and prevent cell division and root elongation.

## MANAGEMENT OF PLANT PARASITIC NEMATODES IN MICHIGAN VEGETABLE PRODUCTION

The first part of any pest management program is proper identification of the problem. While the cause of some nematode problems can be confirmed under field conditions, a laboratory analysis is usually needed. Michigan growers are encouraged to submit soil and plant tissue samples to MSU Diagnostic Services for confirmation of the cause of an existing problem or information for use in problem avoidance. MSU has two Nematode Diagnosticians responsible for nematode analyses. Additional details about this service can be obtained by contacting [www.cips.msu.edu/diagnostics](http://www.cips.msu.edu/diagnostics) or the County Office of MSU Extension.

As with all pest issues, problem avoidance is always the first-line defense and best strategy. This can be achieved by growing or purchasing high-quality nematode-free transplants or propagation material. Most of the other tactics related to problem avoidance or exclusion are based on common sense. For example, a field with a documented nematode infestation should not be worked immediately before moving equipment to a high quality nematode-free site. With proper planning, it is often possible to isolate or contain a nematode problem to a single field without infesting the rest of the farm. When this fails, control or nematode population reduction is usually required. In many cases this is expensive and results in a significant reduction in potential profits.

Once a Michigan vegetable production site is infested, crop rotation is the first control tactic that should be considered. For example, corn and wheat are not hosts for the Northern Root-Knot Nematode and can be used to reduce population densities of this species below its damage threshold. Crop rotation with agronomic crops is the main reason that current Michigan mineral soil carrot producers have very few nematode problems. In general, muck soil carrot growers have not had this option and have had to contend with serious nematode problems. Although the only known host in Michigan for the Carrot Cyst Nematode is carrots, this species can survive for up to a decade in the absence of a host, making the use of crop rotation impractical. Corn Needle Nematode problems can be resolved with a year or two of a non-host crop. Cover, trap and green manure crops that produce decomposition chemicals with nematicidal properties have been used in Michigan vegetable production. Cover crops, however, are variety specific in relation to their suitability for use in nematode management systems. For example,

Adagio or Colonel oil seed radish are excellent trap crops for control of the sugar beet cyst nematode, but are good hosts of the Northern Root-Knot and Root-Lesion nematodes. Because of this complexity, it is often necessary to interact with a consultant or MSU Diagnostic Services for assistance in designing of the best possible nematode management program.

Nematode population reduction can also be achieved through the use of nematicides. There are basically two types, fumigant and non-fumigant nematicides. Telone II and metham are the most commonly used soil fumigants in Michigan vegetable production. Telone II must be injected into the soil; whereas, metham (Vapam and others) can be injected or applied as a chemigant in irrigation water. Methyl bromide, Telone C-17, Telone C-35 and chloropicrin can also be used under special circumstances. The non-fumigant options are organophosphates or organocarbamates. Vydate, Nemacur, Mocap, Counter and Furadan are the most commonly used non-fumigant nematicides. These materials are all very different in relation to the best methods of application and suitability for specific nematode species. Information about the use of nematicides is present in this MSU Extension Bulletin (E-312).

## ROLE OF NEMATODES IN NITROGEN MINERALIZATION

Plants take-up inorganic forms of nitrogen from soil for use in their growth and development. While we often think that the fertilizers applied serve this role, the situation is often more indirect and complex. Fertilizers often feed microbes and subsequently the microbes feed the plants. Bacterial and fungal feeding nematodes play important roles in this process. For example, plant root-exudates or decomposing organic matter serve as food for bacteria. The bacteria serve as food for bacterial feeding nematodes which receive excess organic nitrogen from this process. The excess nitrogen is transformed into an inorganic form and excreted from the nematode into the area immediately adjacent to the root surface when it is taken-up by the plant for use in the growth and development process. It is important to maintain high population densities of bacterial and fungal feeding nematodes. Most of these species have relatively short life cycles (72 hours); whereas, life cycles of plant-parasitic nematode range from 30 days to two years, with the exception of the cysts which may remain viable in the absence of a host for up to 12 years.

## NEMATODES AND SOIL QUALITY

Soil quality can be defined as the ability of a soil to resist degradation and respond to management. Soils with nematode problems are not high quality soils. Anything that can be done to increase quality soil organic matter

(SOM) will decrease risk to plant parasitic nematodes and enhance soil quality. What is quality organic matter? Quality SOM is composed of active soil carbon and active soil nitrogen. The term active refers to the ability of the SOM to mineralize soil carbon and soil nitrogen, respectively. Much of this is done by microbes and soil fauna such as bacterial and fungal feeding nematodes. The best way to create an appropriate environment for these organisms and their essential functions is to maintain a diversity of plants and organic amendments in the system. Mixtures of

grass and legume cover crops supplemented with manure or compost can be used to create a biologically active soil that is highly productive and devoid of problems caused by plant parasitic nematodes. Do not hesitate to contact me at birdg@msu.edu or (517) 353-3890 if you have any questions about nematodes and their relationship to soil quality. The MSU Nematode Diagnosticians, Fred Warner (517-432-1333) and Angela Tenney (517-353-8563) are available to provide information about management of plant-parasitic nematodes.

## Appendix C Detecting and Avoiding Nematode Problems

Plant-parasitic nematodes are microscopic round-worms that live in soil and feed on roots or foliage of economically important plants. Nematode feeding can result in diseased plants with symptoms such as stunting, yellowing, wilting, yield reduction, root galling and the formation of root lesions. Although damage from plant parasitic nematodes costs Michigan vegetable growers millions of dollars annually, many of these losses are never correctly diagnosed. This appendix provides instructions for the nematode detection methods necessary to avoid or diagnose nematode problems.

A laboratory analysis of soil and root or shoot system tissue is usually necessary for diagnosis or long-term avoidance of plant-parasitic nematode problems. In Michigan, this service is provided by the Michigan State University Nematode Laboratory within Diagnostic Services. There are also private sector laboratories that provide nematode detection services. A \$25 fee is charged by MSU for analyzing each combined soil and root sample.

Samples for nematode analysis should be forwarded to:

Diagnostic Services  
101 CIPS  
Michigan State University  
East Lansing, MI 48824-1311

Samples taken directly to MSU should be delivered to Room 101 in the Center for Integrated Plant Systems (formerly the Pesticide Research Center). All samples must be submitted with a completed sample information form. These forms are available at county MSU Extension offices or can be downloaded from the Diagnostic Services web site at [www.pestid.msu.edu](http://www.pestid.msu.edu).

### Sample objective

The results from the samples are used to decide how to deal with nematode problems and how to avoid problems.

### Diagnosing problems

When plants exhibit symptoms such as stunting, yellowing, wilting, early-die, yield reduction, root-galling, root-lesions or plant mortality that cannot be attributed to other causes, take samples of appropriate soil, root system, or shoot systems, and submit them for nematode analysis.

### Avoiding nematode problems

Generally soil from Michigan agricultural sites should be analyzed for nematodes every 3-5 years at the minimum. If nematodes are a major limiting factor in the production of particular crops (e.g. northern root-knot nematodes on carrot), sites should be sampled every fall or spring prior to the growing of these crops. The test results are used to make decisions for avoiding nematode problems.

### When to sample

Generally, soil and root samples can be taken, submitted and reliably processed whenever the soil is not frozen. For the best possible results, however, do not take samples until 45 days after annual root growth, and not after the soil is frozen in late fall or winter. When considering fall soil fumigation, collect and submit samples between August and November. To determine if non-fumigant nematicide use is warranted, sample between March and May.

## How to sample

**Sampling instrument:** Take samples with a soil sampling tube, trowel, or narrow-bladed shovel at a 2-to 12-inch depth. Include as many feeder roots as possible.

Feeder roots or shoot tissue must always be included for samples submitted for best assessing the population densities of endoparasitic nematodes.

**Sample size:** Each sample should consist of a pint to a quart of soil taken from a larger sample composed of 10 or more subsamples. The number of samples needed depends on the size, history, and uniform soil texture of the area being investigated.

- Small area (less than 5,000 sq. ft.), take at least 10 subsamples (soil cores or borings).
- Medium area (5,000 sq. ft. to 1 acre), take at least 25 subsamples.
- Large area (1 to 80 acres), take at least 50 subsamples. In Michigan, no one sample should represent more than 80 acres, and each sample should be from an area of uniform soil texture.

The sampling pattern depends on the commodity and field history. Mix subsamples in a clean pail or a plastic bag and submit one pint to a quart for nematode analysis.

Subsamples from problem area: Plant-parasitic nematodes feed only on living tissues and are rarely found in dead roots. Therefore, take samples from the margin of the problem areas where the plants are still living.

**Sampling container:** A plastic bag can be used for nematode samples. Place samples in plastic bags as soon as possible. Nematodes will be killed if the sample is allowed to dry, and it is important that nematodes are living when the sample arrives at the laboratory.

**Sample storage:** Soil and root samples should be regarded as perishable. Handle accordingly, and process as quickly as possible. Ideally, they should be stored at 10-15C (50-58F). Do not expose them to direct sunlight or store them in hot areas, such as the trunk of your car. Temperatures greater than 40C (100F) will kill nematodes.

## How to submit samples

Samples are usually submitted to the MSU Nematode Laboratory through the local extension office, accompanied by a completed form. The information required on the form is essential for diagnosing nematode problems and proper recommendations for nematode population management.

It generally takes two weeks from the time a sample is taken until the results are returned to the grower. The results may be returned through the local extension agent, a private consultant, or directly. The rapid root and soil assays used for mineral soils, however, are not always satisfactory for analysis of organic soils. In a few cases, a bioassay that requires a 45-day incubation period is used to analyze organic soils. When this procedure is recommended, the grower will be immediately notified of the delay and will receive the results within two months after the sample was received.

## Results and recommendations

The types and numbers of nematodes will be recorded on the assay form along with an indication of whether or not nematodes are a problem. If nematodes appear to be a problem, you will be occasionally referred to an appropriate extension bulletin for a recommendation. The recommendation should be discussed in detail with the local extension agent or private consultant.