

Insect, Nematode, and Disease Control in Michigan Field Crops

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**This bulletin contains information on the management of field crops insects, nematodes, and diseases, including recommendations for pesticide use. Every attempt is made to verify product names, formulations, use rates, and other important information, but products and labels may change before the field season begins. Always read the label of a product to reconfirm rates, precautions, PPE, and other important information before use.

Small Grain insect pests

Aphids

Pest status: Common insect, occasional economic pest

Description: Small oval to pear shaped soft-bodied insects with cornicles (“tailpipes”) at the back of the body. Color varies from bright green to pink to brown, depending on species.

Life cycle: Aphids present during the field season are all female, and do not need to mate to reproduce; females give birth to live young. Multiple overlapping generations.

Type of Damage: Sucks plant sap from leaves and stems; heavy infestation may lead to yellowing/browning, stunting, curling of new leaves, and general weakening of plants. Aphids are also virus vectors.

Scouting: See MSU Bulletin E-2549, Insect Management in Wheat and Other Small Grains, for details on the presence/absence scouting method and decision table.

Management: Biological = natural enemies (ladybugs, lacewings, and wasps) and diseases generally keep populations in check.

Threshold: General guideline is 12 – 15 aphids per tiller during seedling to boot stage.

Note: Although grain aphids can transmit barley yellow dwarf virus (= red leaf in oats), this is generally not a problem in the fall in Michigan. Also, insecticides usually do not stop transmission of the virus. Aphids should be sprayed only when they are numerous enough to directly threaten yield in the spring and summer.

List of registered insecticides, *RUP (rate per acre):

Baythroid 2* (1.8 to 2.4 oz) *Wheat only.*

Cruiser 5FS (0.75 to 1.33 oz / CWT) *Wheat & Barley only*

Dimethoate 4 EC, 400 (0.5 to 0.75 pt) *Wheat only.*

Dimethoate 5lb (6.4 to 9.6 oz) *Wheat only*

Di-Syston 8EC* (0.5 to 1 pt) *Barley only*

Disyston 8EC* (4 to 12 fl oz) *Wheat only*

Endosulfan 3EC (1.32 to 2 pts)

Lannate LV* (0.75 to 1.5 pt) or SP* (0.25 to 0.5 lb)

Malathion 5EC (1.5 pt) or 57EC (1.5 to 2 pt)

Malathion 8 Aquamul (1.25 pt) or 8F (1 to 1.25 pts)

Mustang Max* (3.2 to 4 oz)

Pennac-M* (2 to 3 pt) *Wheat, oats, barley only*

Proaxis* (2.56 to 3.84 oz) *Wheat only*

Thionex 3EC (0.67 to 1 qt) or 50WSB (1 to 1.5 lbs)

Warrior* (2.56 to 3.84 oz) *Wheat only*

Armyworm

Pest status: Occasional, although there have been outbreaks in the last few years.

Description: Caterpillars variable in color (black/brown/green), up to 1 ½ inches long. Narrow light stripe across back and broad stripes running down sides of body.

Life cycle: Likely migrate to Michigan each spring. Eggs are laid on the surfaces of grasses, especially the headlands of small grains. Two to three generations per year, the first generation in late May to early June.

Type of damage: Defoliation by larvae, first generation most damaging. Larvae eat leaves, stems, and sometimes the heads of small grains.

Scouting: Mainly active at night and during overcast days. During the day, larvae can be found at the base of plants and under debris.

Threshold: Before heading, treat when there are four or more worms per square foot.

At heading (to prevent head clipping), treat when there are two or more worms per square foot

For more information: MSU CAT Alert articles from 2004

May 13 ‘Watch for cutworm and armyworm’ http://www.ipm.msu.edu/CAT04_fld/FC05-13-04.htm

June 17 ‘Armyworms abound’ http://www.ipm.msu.edu/CAT04_fld/FC06-17-04.htm

List of registered insecticides, *RUP (rate per acre):

Baythroid 2* (1.8 to 2.4 oz) *Wheat only*

Bt products (Biobit, Crymax, Dipel, Javelin, Lepinox)
- many products, see labels for specific rates

Endosulfan 3EC (1.32 pts)

Lannate LV* (0.75 to 1.5 pt) or SP* (0.25 to 0.5 lb)

Malathion 5 and 57EC (2 pt)

Malathion 8F (1.0 to 1.25 pts)

Mustang* (1.9 to 4.3 oz) or Max* (1.76 to 4 oz)

Pennac-M* (2 to 3 pt) *Do not apply to rye.*

Proaxis* (2.56 to 3.84 oz) *Wheat only*

Pyganic EC 1.4 II (16 to 64 oz) or 5.0 II (4.5 to 18 oz)

Sevin 4F or XLR Plus (1 to 1.5 qt) *Wheat only.*

Sevin 80S or 80WSP (1.25 to 1.875 lb) *Wheat only.*

Tracer (1.5 to 3 oz)

Warrior* (2.56 to 3.84 oz) *Wheat only*

Cereal Leaf Beetle

Pest status: Occasional economic pest

Description: Adult up to 1/4 inch long; black body, metallic blue wing covers, a red pronotum (neck), and orange-red legs with black tarsi (feet). Eggs- very tiny, oblong; yellow to brown. Larvae- Up to 1/4 inch long pale yellow to black, usually covered in fecal material to camouflage themselves.

Life cycle: Adults overwinter in plant stubble and in cracks and crevices such as under tree bark. Mating occurs during warm spring temperatures and eggs are laid on the upper surface of the grain leaves. Larvae feed for about two weeks and move to the soil to pupate. These adults emerge in late June and feed for about 3 weeks, then become sedentary. One generation per year.

Type of damage: Usually begins on field borders of winter grain, then goes to the preferred spring grain. Defoliation by chewing between leaf veins. Larvae feed on the surface of leaves, while adults feed on the whole leaf. This damage gives a “frosted” appearance to a severely infested field.

Scouting: Begin when temperatures reach 60 degrees. Check 20 stems in five areas of the field.

Management: Cultural- Hairy varieties are less likely to be infested. Biological- wasp parasitoids, lady beetles and various other natural enemies.

Threshold: Treat when there is a combination of 3 or more eggs and larvae per plant and the larvae are fairly visible on small plants. For larger plants treat when there is one or more larvae per flag leaf.

Note: First discovered in the U.S. in Berrien County Michigan, 1962.

List of registered insecticides, *RUP (rate per acre):

Baythroid 2* (1 to 1.8 oz) *Wheat only*

Endosulfan 3EC (0.66 to 1.32 pts)

Lannate LV* (0.75 to 1.5 pt) or SP* (0.25 to 0.5 lb)

Malathion 5 (1.0 to 1.5 pt) *Wheat, barley, oats and rye.*

Malathion ULV (4 to 8 fl oz) *Barley, oats, and wheat*

Mustang* (1.9 to 4.3 oz) and Max* (1.76 to 4 oz)

Proaxis* (2.56 to 3.84 oz) *Wheat only*

Sevin 4F and XLR Plus (1 qt) *Wheat only.*

Sevin 80S and 80WSP (1.25 lb) *Wheat only.*

Thionex 3EC (0.33 to 0.67 qt) or 50WSB (0.5 to 1 lbs)

Tracer (1 to 3 oz)

Warrior* (2.56 to 3.84 oz) *Wheat only*

Cutworms

Cutworm damage to small grains is rare.

Baythroid 2* (1 to 1.8 oz) and Mustang Max* (1.28 to 4 oz) *Wheat only*

Warrior (1.92 to 2.56 oz) for small grains

European Corn Borer

European corn borers are sometimes found in small grains tunneling in stems. The visible symptom of this damage is whitening (bleaching) of wheat heads. Generally this only occurs in years with heavy EBC populations, in scattered areas of the field.

Treatment is unlikely to be effective.

Grasshoppers

Pest status: Common insect, occasional outbreaks

Life cycle: Eggs overwinter in the soil, and nymphs hatch in June. Nymphs molt as they grow, and feeding increases with size. Females lay eggs in the soil in late summer.

Type of damage: Defoliation (chewing) by nymphs and adults.

Conditions favoring damage: Unplowed or fallow areas next to fields are preferred egg-laying sites, and may contribute to populations in a nearby field. Dry, warm weather often enhances survival of nymphs.

Management: Cultural- plowing and cultivation to destroy eggs. Biological – a fungal pathogen can kill many eggs and nymphs under wet spring conditions. Natural enemies include birds, rodents, amphibians, parasitic wasps, and ground beetles.

Threshold: Treat when there are eight grasshoppers or more per sq yd in small plants (less than 6 in tall), or 16 or more per sq yd in taller plants.

List of registered insecticides, *RUP (rate per acre):

SMALL GRAINS

Baythroid 2* (1.8 to 2.4 oz) <i>Wheat only</i> Dimethoate 4 EC, 400 (0.75 pt) <i>Wheat only</i> Dimethoate 4E (0.75 pts) or 267 (1.125 pts) Dimethoate 5 lb (9.6 oz) <i>Wheat only</i> Furadan 4F* (0.25 to 0.5 pt) Malathion 5 (1.5 to 2 pt) Malathion 8F (1 to 1.25 pts) or 8 Aquamul (1.25)	Mustang* (3.4 to 4.3 oz) and Max* (3.2 to 4 oz) PennCap-M* (2 to 3 pt) <i>Do not apply to rye.</i> Proaxis* (2.56 to 3.84 oz) <i>Wheat only</i> Sevin 4F or XLR Plus (0.5 to 1.5 qt) <i>Wheat only</i> Sevin 80W or 80WSP (0.66 to 1.87 lb) <i>Wheat only</i> Warrior* (2.56 to 3.84 oz) <i>Wheat only</i>
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Hessian Fly

Hessian fly is controlled without insecticides by planting winter wheat after adult flies are dead late summer or early fall. The “fly-free dates” are given below for each county (all dates are in September). For additional information, see Extension Bulletin E-2549, *Insect Management in Wheat and Other Small Grains*, available at county Extension offices.

County	Earliest seeding date (Sept)	County	Earliest seeding date (Sept)	County	Earliest seeding date (Sept)
Alcona	6	Hillsdale	19	Montmorency	7
Allegan	20	Huron	13	Muskegon	18
Alpena	9	Ingham	17	Newaygo	15
Antrim	4	Ionia	16	Oakland	16
Arenac	13	Iosco	7	Oceana	16
Barry	18	Isabella	11	Ogemaw	10
Bay	14	Jackson	16	Osceola	10
Benzie	16	Kalamazoo	20	Oscoda	7
Berrien	23	Kalkaska	5	Otsego	6
Branch	19	Kent	18	Ottawa	19
Calhoun	19	Lake	13	Presque Isle	8
Cass	22	Lapeer	15	Roscommon	7
Charlevoix	3	Leelanau	8	Saginaw	16
Cheboygan	4	Lenawee	25	Sanilac	15
Claire	12	Livingston	16	St. Clair	16
Clinton	17	Macomb	18	St. Joseph	23
Crawford	6	Manistee	13	Shiawassee	16
Eaton	16	Mason	13	Tuscola	15
Emmet	4	Mecosta	12	Van Buren	22
Genesee	17	Midland	15	Washtenaw	18
Gladwin	12	Missaukee	9	Wayne	18
Grand Traverse	8	Monroe	21	Wexford	9
Gratiot	15	Montcalm	15		

Slugs

Pest status: Common, occasionally an economic pest

Type of damage: May damage seedlings by feeding on stems, cotyledons, and leaves; up to 40% defoliation can be tolerated in pre-bloom plants, but if growing point is killed, stands can be significantly reduced to the point where replanting is necessary.

Conditions favoring damage: Planting into wheat stubble or other heavy crop residue; fields with a recent history of slug damage; aerial-seeded wheat exposed on the soil surface; cool, wet conditions favor slug survival and damage.

Sampling/ scouting: Methods not established.

Threshold: No established threshold; consider treating if slug damage threatens to reduce stand density below an acceptable level

List of registered insecticides (rate per acre):

Deadline MP 4 % Bait (10 to 20 lb)

Snail and Slug Pellets 3.5% Bait (various products and rates)

Thrips

Pest status: Common insect, rarely a pest.

Description: Adult – small, slender, brown and white banded abdomen, narrow fringed wings; larva – wingless, yellow/orange

Life cycle: Adults move into fields in spring. Females insert eggs in plant tissue. Adults and larvae both feed on plants.

Type of damage: Most obvious early in season; adult & nymph rasping/sucking mouthparts scrape cells on leaf underside, leaving silvery scratches which may turn leaves brown; young leaves may appear crinkled. Young plants can generally outgrow feeding injury

Conditions favoring damage: Hot dry weather coupled with large thrips populations

Management: Biological – natural enemies (minute pirate bugs, predacious thrips and mites)

Threshold: Rough guideline – treat when 30% of plants have thrips and some drying of leaves is observed.

Notes: Damage may be confused with some types of herbicide injury

List of registered insecticides, *RUP (rate per acre):

DiSyston 8* (0.5 to 1 pt) or 15G* (6.7 lb) *Barley only.* Pyganic EC 1.4 II (16 to 64 oz) or 5.0 II (4.5 to 18 oz)

White Grubs

White grubs build up in undisturbed soil and are damaging to crops planted in fields broken from sod. Preliminary data from MSU field trials suggests that a grub density of 4 per square foot can reduce stand, tillering, and yield of winter wheat. No insecticides are labeled for white grub control in small grains. Fall and spring plowing of old pasture or other established grasses with a season of clean fallow before a crop is planted is recommended.

Wireworms

Pest status: Common insect, rare economic pest.

Description: Slender, shiny, brown caterpillar with wiry segmented body, up to 1.5 inches long.

Life cycle: Immature form of click beetle; found in grasslands, sod, or fallow fields. Wireworms can spend several years in the immature stage during which they feed on newly-planted seeds as well as roots.

Type of damage: Feeds on germinating seed.

Sampling/ scouting: Scout for wireworms with a bait trap (http://www.ipm.msu.edu/CAT02_fld/FC5-16-02.htm) at least one week before planting.

Management: Cultural – spring and fall plowing of established sod is recommended before crop planted, where practical.

Threshold: One or more wireworm per bait trap.

List of registered insecticides, *RUP (rate per acre): [insecticide should be added to seed in the seed box]

Cruiser 5FS (0.75 to 1.33 oz / 100 pounds) *Wheat, barley only*

Gaucha 480 (1 to 3 oz per 100 lb seed as slurry treatment)

Insecticides Registered for Small Grains

Trade name	Common name	Class	Recommended for:	PHI days	REI hrs	Precautions and Remarks
Bt [Biobit, Dipel Crymax, Javelin, Lepinox]	<i>Bacillus thuringiensis</i>	Bio	armyworm	0	4	Do Not Apply to rye. Effective only on small (1 st -2 nd stage) larvae, and with moderate populations. Full coverage is required.
Cruiser 5FS	thiamethoxam	Nic	aphids, wireworms	--	--	Seed treatment, wheat and barley
Deadline MP 4 % Bait	metaldehyde	Other	slugs, snails	--	12	Broadcast by ground or air every 3 to 4 weeks during season as needed. For best results apply in the evening, preferably after a rain or irrigation. May be fatal to dogs - use caution around pets.
Dimethoate 4EC, 267, 4E, 400, 51b	dimethoate	OP	aphids, grasshoppers	35	48	Use in wheat and sorghum only. Maximum of two applications per season. Full coverage not required.
DiSyston (RUP) 8EC , 15G	disulfoton	OP	aphids, thrips	30	48	Use only on barley and wheat. For barley, maximum of 2 pints per acre per season. For wheat, maximum of 2 fall and 2 spring applications per season. Do not graze or cut forage.
Endosulfan 3EC	endosulfan	CCD	aphids, armyworm, cereal leaf beetle	--	24	Do not feed treated forage to livestock.
Furadan 4F (RUP)	carbofuran	carb	grasshoppers	--	48	Do not apply to rye. Apply before boot stage. Maximum of 2 applications per season. Do not feed/ graze forage.
Gaucho	imidachloprid	nic	wireworm	--	12 - 24	
Lannate (RUP) LV, SP	methomyl	carb	aphids, armyworm, Cereal leaf beetle	7	48	Maximum of 4 applications per season.
Malathion 5, 57 EC, 8F,8 Aqua	malathion	OP	aphids, armyworm, cereal leaf beetle, grasshoppers	7	12	
Methyl parathion 4 EC (RUP)	methyl parathion	OP	grasshoppers , thrips	15	96	Do Not Apply to rye.
Mustang and Mustang Max (RUP)	zeta-cypermethrin	Pyr	cereal leaf beetle, grasshoppers	14	12	
Penncap-M (RUP)	methyl parathion	OP	aphids, armyworm, grasshoppers	15	96	Do Not Apply to rye.
Proaxis (RUP)	gamma cyhalothrin	Pyr	aphids, armyworm, cereal leaf beetle, grasshoppers	30	24	Do not apply more than 0.48 pints per acre per season. Use on wheat only.
Pyganic EC	pyrethrins	Bio	armyworm, thrips	0	12	Listed by the Organic Materials Review Institute (OMRI) for use in organic production.
Sevin 4F, XLR Plus, 50W, 80S, 80WSP	carbaryl	Carb	armyworm, cereal leaf beetle, grasshoppers	21	7	Use only on wheat. Maximum of 2 applications per season.

SMALL GRAINS

Trade name	Common name	Class	Recommended for:	PHI days	REI hrs	Precautions and Remarks
Snail and Slug Pellets 3.5% Bait	metaldehyde	Other	slugs, snails	--	12	Apply every 2 weeks or as needed. Broadcast pellets and wet the soil before or after application. Do not allow pellets to contact edible portion of plant. Keep children, pets and poultry away from treated area.
Thionex 3EC, 50WSB	endosulfan	OCl	aphids, cereal leaf beetle	--	24	Do not feed treated forage to livestock.
Tracer	spinosad	Other	armyworm, cereal leaf beetle	21	4	
Warrior (RUP)	lambda-cyhalothrin	Pyr	aphids, armyworm, cereal leaf beetle, grasshoppers	30	24	Do not apply more than 0.48 pints per acre per season. Use on wheat only.