



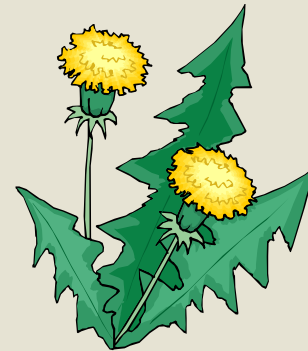
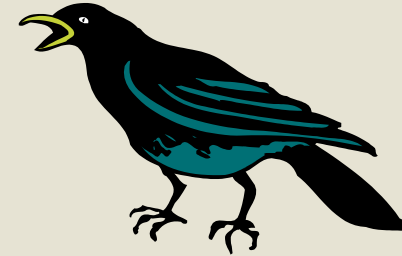
# A brief introduction to pests and pest management

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# What is a pest?

- Any organism that is detrimental to humans
  - destroys crops & structures
  - poses threats to human health and livestock
  - reduces aesthetic and recreational value





# Main categories of pests

insects and mites- Invertebrates (no backbone)





## Several common insect pests of grapes

- Grape berry moth
- Potato leafhoppers
- Japanese beetle





# Main categories of pests

- diseases- caused by Pathogens – living agents
  - Fungi
  - Bacteria
  - Viruses
  - Nematodes
  - Phytoplasmas
- Disorders-Non-living agents:
  - cold, heat, pollutants, chemical injury





## Main categories of pests

- Vertebrates (with a backbone)
  - Birds
  - Deer
  - Raccoons



netting to reduce bird damage



## Main categories of pests

- Weeds – “unwanted plants”
- Grasses
- Broadleaf
- Perennial
- Annual/ biennial





## How to manage?

- Integrated Pest Management (IPM)
- Uses multiple strategies to manage pests and pest damage
- Examples will be given later





## Steps in IPM

- ✓ Identify the pest and know its biology
- Monitor and survey for pests
- Set IPM goal: prevent, suppress
- Implement-select control strategies, timing,
- Economics
- Environmental impacts
- Evaluate



## Steps in pest management

- is it really a pest or:
- Just there?
- A beneficial insect?



Gerald J. Lenhard, Louisiana State University, Bugwood.org



Texas Forest Service Archive, Texas Forest Service, Bugwood.org



## Steps in pest management

- Identify the pest and pest damage- critical
- Learn key pests
- Identify lifecycle stages
- Overwintering stage
- Stages causing damage
- Stages that can be controlled



## examples

- Japanese beetle
- Adult is damaging stage on grapes
- Larvae feed underground on roots of grasses





## examples

- Black rot is a fungus
- Overwinters on mummified fruit
- Spores produced in mummies lands on leaves
- Spores produced on leaves land on fruit

mummified fruit containing fruiting bodies (perithecia and pycnidia) overwinter on ground and vines

mummified fruit with perithecia

perithecia containing ascospores

ascospores are ejected into air during spring rain

ascospores

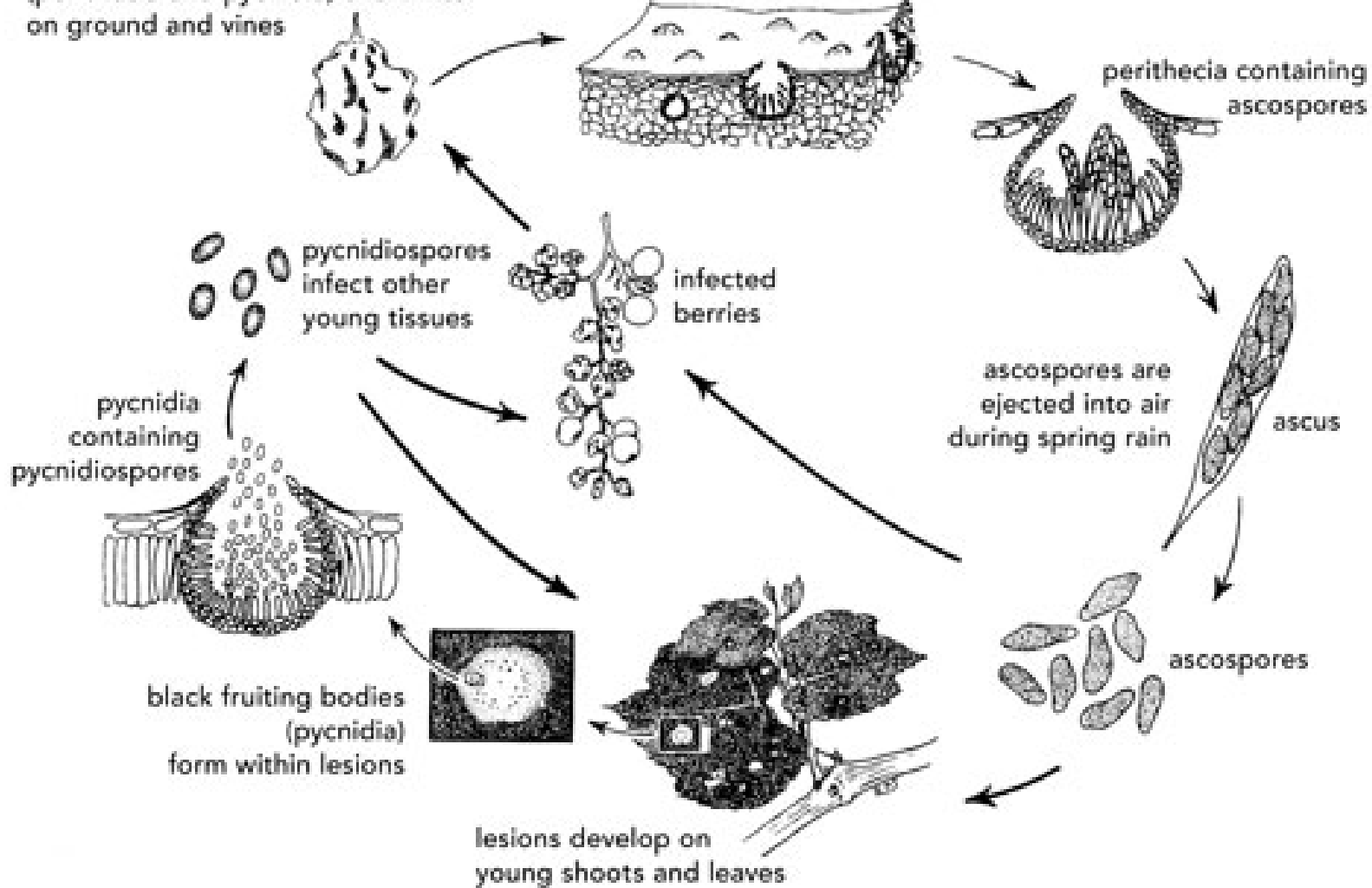
infected berries

pycnidiospores infect other young tissues

pycnidia containing pycnidiospores

black fruiting bodies (pycnidia) form within lesions

lesions develop on young shoots and leaves

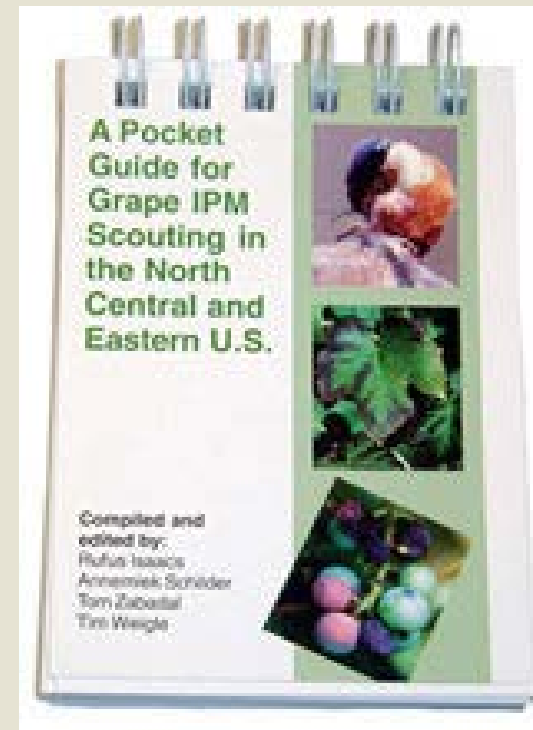






# Pest Identification is Critical

- Use books, extension bulletins, field guides, Web, etc.
- Have pests examined by specialists
  - Handle samples carefully







## Steps in IPM

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## Steps in pest management

### Monitoring

- when is the pest likely to appear?
- May be tied to particular stage of plant development
- May be related to weather or environment



## Monitor the Pest

- Use scouting, trapping, weather data, models
- Enviroweather website-  
<http://www.enviroweather.msu.edu/>





## Steps in IPM

- Identify the pest and know its biology
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## What is your goal for integrated pest management?

- Prevent
- Suppress



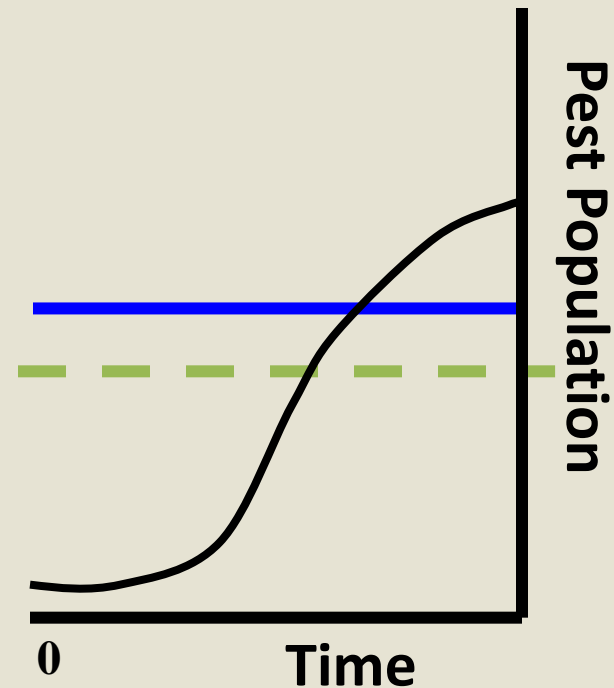
## Components of IPM-Monitor the Pest

- Action threshold: unacceptable pest level – do something
- Sometimes the action threshold may be zero!
- Action thresholds vary by pest, site, and season

# Michigan wine grape vineyard establishment conference



- **Economic Threshold- control needed to prevent economic injury**
- **Economic Injury Level**
  - \$ of losses =  
\$ of control measures
  - Apply control measure **prior** to reaching economic injury level





## Develop the IPM Goal

- Prevention: examples, resistant plants, sanitation, exclusion, pesticide treatments
- Suppression=reduction: cultivation, biological control, pesticides





## Steps in IPM

- Identify the pest and know its biology
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- ✓ Implement
  - Select control strategies
  - Timing
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## Implement the IPM Program

- Make sure you have taken initial steps
  - Identification and monitoring
  - Set action thresholds
  - Know what control strategies will work
- Select effective and least harmful methods



## pest management tactics

- Mechanical: Cultivation
- Disrupt soil conditions for weeds and insects
  - Hoes, Plows, Disks
- Control growth or destroy plants
  - Mowers





## Mechanical: Trapping

- Use of mechanical or sticky device
- Captures pests in a holding device
- Restrains or kills the pest





## Mechanical: Exclusion

- Netting to exclude birds
- Fencing to keep out deer





## Physical controls- alter the environment

### Examples for black rot

- Open canopies to reduce humidity and leaf wetness
- Plant rows in direction of prevailing winds



## Cultural control: sanitation

- Sanitation: eliminate food, water, and shelter
- destroy infected crop residues or infected plant materials
- Destroy weeds to reduce pest refuges



## Cultural controls- alter conditions or pest behavior

- Examples for black rot
- Plant resistant or less susceptible varieties
- Prune out dead canes and mummies
- Remove fruit mummies from the ground





# Biological controls

- Natural enemies
- Any organism that reduces the numbers of another.



Texas Forest Service Archive, Texas Forest Service, Bugwood.org

Lacewing larva



## Biological Control in the vineyard



Conservation and Enhancement

Manipulating habitat and resources to conserve or enhance NE numbers.

- Augmentation-Releasing NE's to boost population.

# Predators and Parasitoids

- Predators

Mainly insects

Kill and consume prey

- Parasitoids

Live in/on host

Kill host



Russ Ottens, University of Georgia, [bugwood.org](http://bugwood.org)



Winston Beck, Iowa State University, [bugwood.org](http://bugwood.org)



## Pathogens

- Bacteria, fungi, protozoa, nematodes and viruses- naturally occurring or commercial
- *B.t.- Bacillus thuriengensis*, a biological insecticide used to kill moth larvae
- Grandevo, a microbial insecticide
- *Beauvaria bassiana* (fungus)- Naturalis, Botanigard



## Summary

- Biological Control can be effective.
- BUT-Requires careful planning and knowledge.
- **MONITORING!**
- Integrating pest management methods to reduce chemical use and conserve natural enemies.



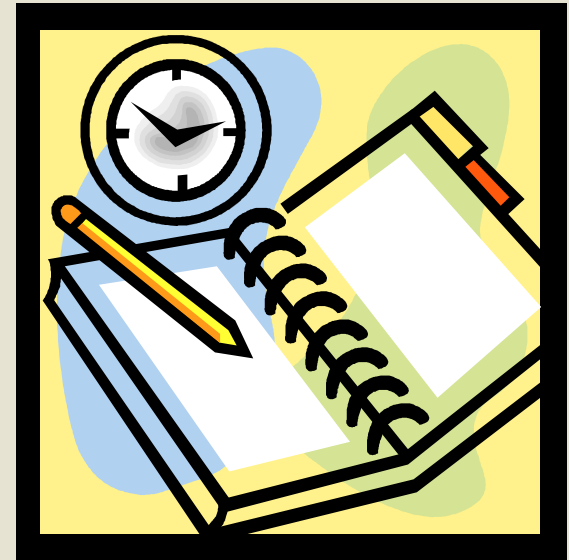
## Chemical controls

- Pesticide
- any material that is applied to kill, attract, repel, or regulate pests



# Considerations for Pesticide Use

- Identify the pest and select the appropriate product
- Avoid developing resistant pest populations
- If using pesticides, use the correct application rate and timing





# Pesticide Classification

- **General Use**
  - normally lower toxicity
  - no special certification or permits required
- **Restricted Use (RUP):**
  - may cause adverse effects to human health or the environment
  - sold only to certified applicators





## “The label is the law”

- The site must be stated on the label
- The target pest does not need to be listed
- Any application method may be used, unless prohibited by the label



## “The label is the law”

- Applications may be made at a rate less than that stated on the label, not more!
- Tank mixtures are OK, unless the label says otherwise

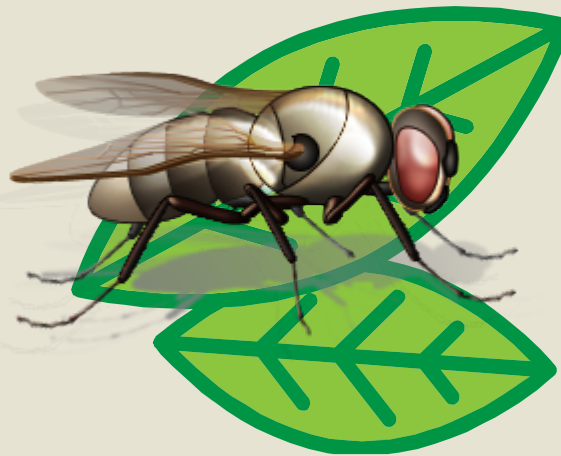


## Pesticide terms

- Mode of action: how it works to control the pest
- Systemic pesticides-absorbed through tissues and transported elsewhere where the pest encounters it
- Contact pesticides must come in direct contact with the target pest



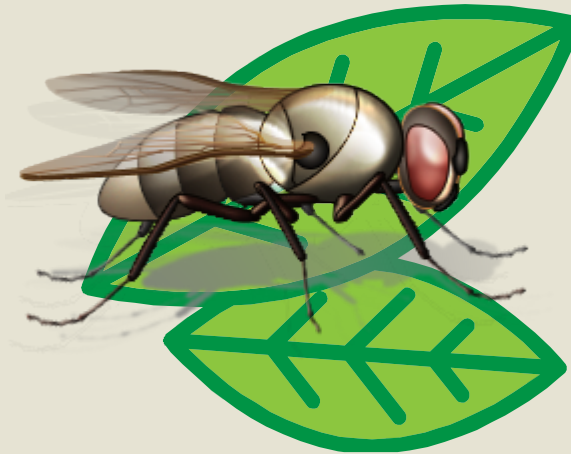
**Pesticide Resistance:**  
the ability of a pest to tolerate a  
pesticide that once controlled it





## Pesticide Resistance:

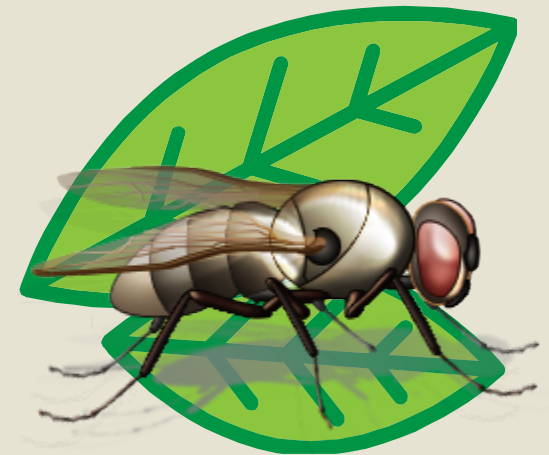
Intensive pesticide use- kills susceptible pests in a population, leaves resistant ones to reproduce





# Pesticide Resistance:

- Use of similar modes of action
- Frequency of applications
- Persistence of the chemical
- Pest rate of reproduction & offspring numbers





## Pesticides vary by selectivity

- Non-selective – kills all related pests – for example some herbicides kill all green plants that gets a sufficient dose
- Selective – kills only certain weeds, insects, plant pathogens – for example other herbicides only kill broadleaf weeds not grasses



## Pesticides vary by persistence:

- how long they remain active in the environment
- Residual pesticides – remain active for weeks, months, years
- Non-residual – inactivated immediately or within a few days



# Considerations for integrating chemical and biological control

- Use selective insecticides
- Low residual toxicity
- Biopesticides
- Application Timings
- Natural enemy refuges





## IPM in the vineyard

- Regardless of the methods chosen, remember:
- Identify the pest and know its biology
- Monitor and survey for pests
- Set IPM goal: prevent, suppress



## IPM in the vineyard

- Consider the economics- action thresholds
- Environmental impacts- what else are you impacting



## Record and Evaluate Results

- what worked; what did not
- May take time to see results
- Might be ineffective or damaging to target crop, beneficial insects, etc.
- Use what you learned for future pest management planning

