

IPM in Horticulture

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So Why IPM for Landscapes and Gardens?

- Because homeowners and landscapers:
 - Use more pesticides than farmers per acre
 - Often have less training than farmers with pests, pesticides, and safety
 - Have fewer reasons to use pesticides

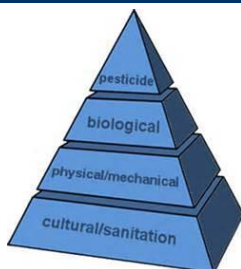
What is IPM?

- Integrated Pest Management
- Combining many types of control systems to manage pests in crops and landscapes

IPM

- IPM is a method of pest management that combines cultural, physical, biological, and chemical controls.
- The goal of IPM in horticulture is to maintain pest populations below damage threshold levels while minimizing the impact to human health and the environment.

IPM Pyramid



Types of Thresholds

- Economic field crops,vegetables, fruits
- Aesthetic ornamentals and landscapes
- Nuisance parks and recreational
- Safety roadsides
- Health vectors of human disease

Acceptable Injury Level



For gardeners, this will differ between individuals.

Essence of IPM

- Decision making process
- Decide **if, when, where** and **what** mix of control methods are needed
- Diverse IPM strategies help to control pest
- Concepts to understand with IPM, **resistance, resurgence** and **replacement**

Resistance

- Genetically inherited ability of an organism to evolve or select strains that can survive exposure to pesticides formerly lethal to earlier generations.
- Caused by repeated use of the same chemical on the same crop
- (Benlate, Captan for brown rot on peaches)

Resurgence

- Insecticide application initially reduces an infestation, but soon afterward the pest rebounds to higher levels than before the treatment.
- (Often occurs with pear psylla or mites) if you are controlling with o.p.'s

Replacement

- Is often a secondary pest outbreak, a resurgence of a non-target pest.
- We create a problem where none existed before by killing off natural checks on a given population.
- (o.p.'s for codling moth lead to western tentiform leafminer or pear psylla)

A Few IPM Principles

- **There is no silver bullet**
- Use several complimentary control practices to increase the long term stability of disease control
- Apple Scab on Flowering Crab, use good pruning, leaf cleanup, and fungicide

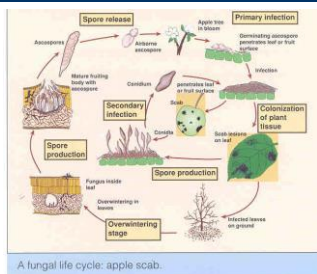
IPM Principle

- Tolerate low numbers of pests
- Low levels of pests helps to maintain predators populations
- Learn threshold levels for each situation
- Lawn and Crane fly larvae, no need to use insecticide application every year

IPM Principle

- Treat the causes of pest outbreaks, not the symptoms
- Detailed knowledge of a pest is necessary to tip the scale against the pest without disturbing the ecosystem of your field
- Over fertilization = lush growth = aphids

Know the Pest for Effective Control



IPM Principle

- If you kill the natural enemies of a pest you inherit their job.
- Naturally occurring predators, parasites, pathogens, and competitors keep many pest populations in check. Enhance environment for beneficial insects
- Stop using broad-spectrum chemicals, they kill predatory insects which provide natural controls

IPM Principle

- Pesticides are not a substitute for good gardening practices.
- A healthy plant will defend itself better than a stressed plant, create good soil
- Protecting the plant is the goal not killing pests.
- (Serenade Bac subtilis, Sonata Bac pumilis)

Factors to Consider Before Applying Controls

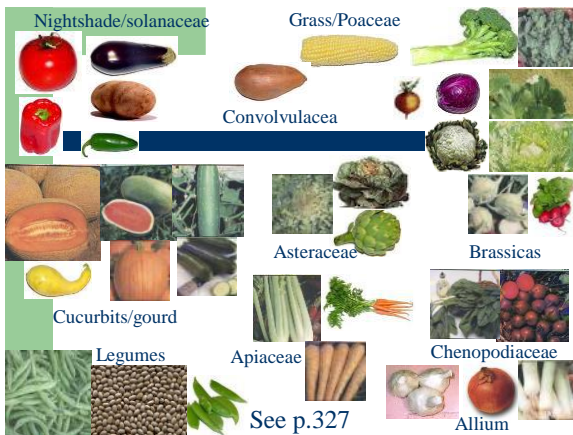
- Choose plant resistance over other methods
- Biological controls over pesticides
- Cultural controls over pesticides
- Selective over broad spectrum pesticides
- Favor tactics that are compatible with other controls not stand alone
- Consider environ. impacts(water, wildlife)

IPM Practices

- Use cultural, biological and other alternative controls first then chemicals
- Use quantifiable scouting information, pest forecasting and tolerance thresholds
- Select pesticides that work, are cost effective and least likely to disrupt natural controls. Minimize risk to water.

Cultural Controls

- Tillage, Mowing, Vacuuming, Burning
- Destroy over wintering sites of pests
- Resistant varieties, enhancing plant vigor
- Manage fertilizer and irrigation cycles
- Sanitation of equipment and crop areas
- Cover crops, trap crops
- Plants in the right place to promote health



Intercropping



Trap Crop or Cover Crop



Resistant Varieties



Select Resistant Varieties



'Gravenstein': Not scab resistant



'Liberty': Scab resistant

Irrigate Properly



Intercropping with Insectary Plants



Sanitation



Dispose of Crop Refuse/Compost



Physical Methods of Control

- Row covers, woven fabrics
- Weed fabrics
- Hanging traps, sticky or pheromone
- Barriers around raised beds, or trees
- In-ground traps, with beer or water
- Sticky collars around trees, plant collars

Physical Methods



Vacuuming
Rototilling
Trapping



Beer Traps for Slugs

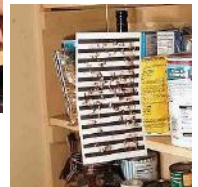


Using barriers

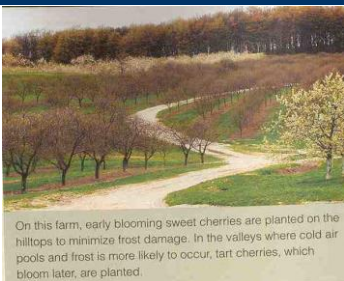
- Row covers
- Plant collars
- Sticky barriers



Trapping Insects Indoors

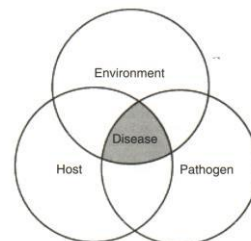


Proper Site



On this farm, early blooming sweet cherries are planted on the hilltops to minimize frost damage. In the valleys where cold air pools and frost is more likely to occur, tart cherries, which bloom later, are planted.

Plant Disease Triangle



Using the Disease Triangle to Fight Disease

- Brown rot: Get rid of the inoculum, prune out dried fruit in tree and shred mow or disc
- Bacterial blight: Prune cherries in early fall to allow wood to callous w/o rain
- Mummy berry: Cultivation in fall before leaf fall, bury mummies 1" or deeper prevents sporulation

Biological Controls

- Know the difference between the good guys and the bad guys.
- ID insects and disease correctly for control
- Know the stages of pests
- Monitor pest populations regularly and keep a year to year record

Biological Methods of Insect Control

Beneficial Organisms

- Pollinators
- Predators
- Parasitoids
- Microbials
 - Bt
 - Beneficial nematodes



Common Predators in Southern Oregon

- **Beetles**- Lady, Soldier
- **True Flies**-Hover, Robber
- **Lace Wings**- Green, Brown
- **Ants, Spiders**
- **True Bugs**- Damsel, Assassin
- **Others**- Mites, Thrips, Yellow Jackets

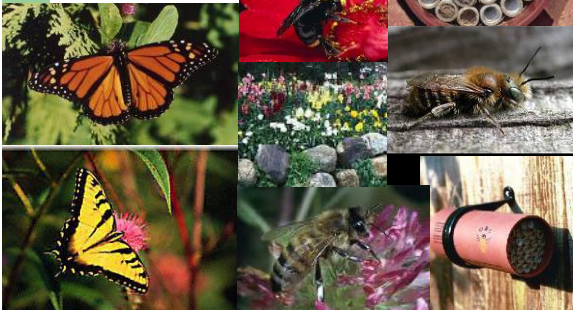
Know the Good Guys



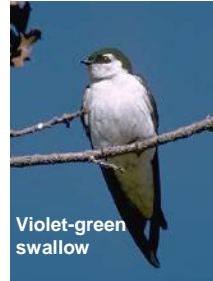
Scouting to ID insects



Pollinators



Attract Insect Eating Birds



Violet-green swallow



Yellow Warblers

All Bat Species in Oregon are Insectivores



Reptiles are Insect Eaters

Common Garter Snake



Pacific Chorus Frog



Toad



Spiders are the Best Insect Eaters



University of Nebraska
Department of Entomology

Parasitoids

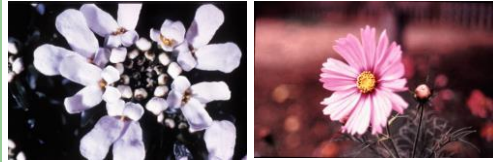


University of Nebraska
Department of Entomology

Purchasing and Releasing Beneficials



Enhancing habitat for beneficial Insects



- Provide diversity of plants
- Provide insectary plants with small flowers
- Provide adequate water

Fennel



Buckwheat



Alyssum



Fiddleneck
(*Phacelia*)

B.t. kurstaki and caterpillars



B.t. israelensis and Mosquitos

Dunk



B.t. israelensis and fungus gnats



Beneficial Nematodes



Control Root Weevil with Nematodes

Infected root weevil pupa



Infected root weevil adult



- Very low mammalian toxicity
- Soil must remain moist
- Soil must be greater than 55 degrees F.

Pest Monitoring

- Scouting or monitoring allows you to make controls early
- All crops should be monitored, recorded
- Pest monitoring to follow plant dev.
- Scouting should be random but quantifiable
- Controls applied when pest levels reach ET keep damage below EIL

Monitor plants

- Look for damage on a regular basis
 - Different times of the day
 - Collect samples of damage
- Keep a record of your observations



Pheromone Traps



Biological Control Examples

- Use flowering cover crops to attract parasitic wasps into orchard, alyssum
- Use of Pheromones to attract pests to traps
- Mating disruption with codling moth
- Fertilizer mgt to reduce vigor, pear psylla
- Using Bt on peach twig borer

Insects have 3 basic needs



Water, Food, & Shelter

Mating Disruption, Puffer and Lure



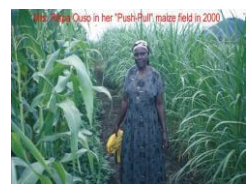
IPM Push-Pull Methods

Corn crop
weeds-stem borers

Desmodium cover crop
Napier Grass trap crop



Mrs. Rispa Ouso in her Maize field destroyed by stemborer and striga in 1998



Mrs. Rispa Ouso in her "Push-Pull" maize field in 2000

Chemical Controls

- Know products well, appropriate use, effect on target and off target
- Alternate products to prevent resistance
- Right product for the situation, pest specific
- Stop using broad spectrum chemicals
- Use the right rates and calibrate sprayers
- Spot treat areas, borders

Organic Chemical Methods

- Insecticidal soap
- Horticultural oils
- Botanical insecticides
- Molluscicides



Chemical Controls

- Compatible w/ IPM
- Hort Oils, Soaps, Bt
- Most fungicide, sulfur
- Kaolin clay
- Growth regulators
- Light use pyrethrins
- Spinosad, Cyd-X
- Sonata, Serenade
- Minimize Use
- Broad spectrum OP's

Botanical insecticide: Neem

- From seeds of the neem tree
- Broad spectrum against many pests
- Must be ingested to be toxic
- Low mammalian toxicity
- May require repeat applications



Homemade Solutions are Not the Best Recommendations



Sulfur

- Use dust mask with dust product
- Broad spectrum miticide and fungicide
- Low mammalian toxicity
- Do not use within two weeks of an oil spray
- Some plants sensitive to sulfur



Other options:Kaolin clay

- Naturally occurring mineral
- Film acts as a barrier between pest and fruit
- Irritates and repels insect feeding and egg-laying



Implementing an IPM Program in Your Landscape

- Design systems in harmony with the local environment, don't try to isolate your yard
- Increase biodiversity, improves habitat for predators, use rotations, soil mgt.
- Keep building your knowledge base

Implementing an IPM Program in Your Landscape

- **Practical Steps**
- Good plant nutrition
- Efficient irrigation
- Good weed mgt.
- Soft chemicals
- Proper calibration
- Better record keeping
- **Challenging Steps**
- Monitor pests
- Complex with many crops
- Keep building your knowledge level

Pear Crops

- Dormant oil spray January, for pear psylla
- Mating disruption for codling moth control 200 DD from Jan set pheromone dispenser
- 1% oil sprays 200,400,600 DD for psylla, two spotted mites and codling moth.
- 1,250 DD can use Spinosad if codling moth traps show second generation surge

Grapevines

- Plan your grape trellis system to have an open canopy, prevents disease, aids spray
- Shoot thinning, shoot positioning, hedging, leaf pulling
- Use phylloxera resistant rootstocks
- Rotate among fungicide chemistry, stylet oil, sulfur, Immunox

IPM Now and in the Future

- Behavioral modifying compounds
- Compounds that enhance plant resistance
- Trick insects to lay eggs on wrong plants
- Glandular secretions inhibit insects
- Plant structures inhibit insects
- Improve pollen and nectar supplies to keep beneficial insects around crops longer
- Enhanced pest models

IPM in the Future Help Plants Combat Pests

- Modifying tastes of plants
- Enhance shapes and thickness of leaves
- Develop hairs or sticky surface on leaves
- Identify more plant pesticides
- Plants attract more predators or parasites
- Develop greater tolerance

IPM in the Future

- Scientists discover aphid borne virus uses a effector protein to attract insect vectors through odor
- The insect then feeds on the plant and spreads the virus
- Strategy to control virus is to block the effector protein or the host plant hormone that attracts the insect