

Garden Pests and Integrated Pest Management

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Topics to be Covered

- Principles of Integrated Pest Management
- Prevention Techniques
- Pest Control Methods
 - Physical, Biological, Chemical, Organic
- Identifying Common Insect Pests
- Small Animals and Wildlife



Integrated Pest Management (IPM)

Integrated pest management (IPM) is an ecosystem-based *strategy that focuses on long-term prevention* of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials should be selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.



Principles of IPM

“An ounce of prevention is worth a pound of cure”

1. Identify Pest Species
2. Determine Damage Threshold
3. Employ Prevention Measures
4. Employ Control Options
5. Monitor for Effectiveness



Why Use Pesticides

- When non-chemical management methods fail to control a significant pest
- When situations warrant pesticide use, control methods also should include non-chemical strategies
- Pest eradication is impossible, but pest management is feasible



What are Pesticides

- **Pesticides** kill substances of any pest including arthropods, vertebrates, and plants (“cide” means kill)
- Some pesticide examples include:
 - Cockroach sprays and baits
 - Insect repellents for personal use
 - Rat and other rodent poisons
 - Flea and tick sprays, powders, and pet collars
 - Household disinfectants and sanitizers
 - Products that kill mold and mildew
 - Lawn and garden products, such as weed killers



Pesticides: Home vs Professional

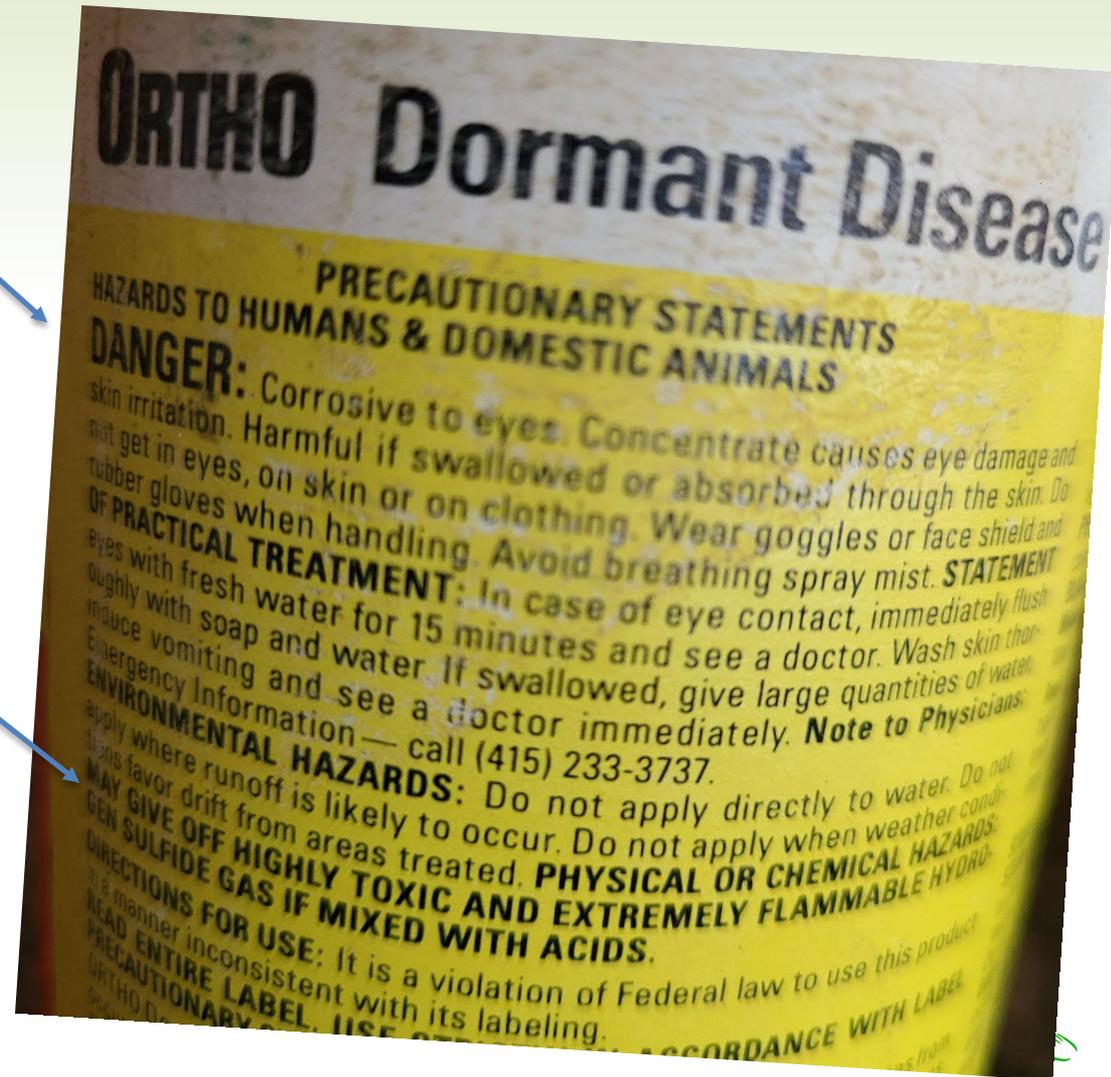
- General Use Pesticides
 - These pesticides are not likely to harm the environment when used according to label directions. Anyone can use a general use pesticide.
- Restricted Use Pesticides
 - Classified by the EPA because they can cause harm to human health or the environment even when applied according to the label
 - Training and testing are required to purchase and apply restricted use pesticides (i.e. Certified Applicators).



Pesticide Labeling

Signal Word Examples

❖ **Danger** –
Nicotine
Sulfate,
Temik, Aldrin,
Carbon
Polysulfide



Pesticide Labeling

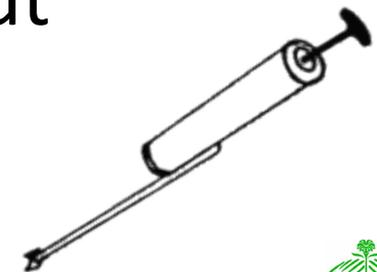
Signal Word Examples

- ❖ **Warning** – DDT, rotenone, pyrethrum, Lorsban, Dursban
- ❖ **Caution** – Neem Oil, Insecticidal Soaps, Malathion, Diazinon, Sevin Dust



Application Equipment

- Proportioner (hose-end sprayer)
 - Not recommended for most situations
- Compressed Air Sprayer
 - Best choice for small jobs
- Hand Duster
 - Old fashioned, not accurate but work for some materials



Personal Protective Equipment

- Long sleeve shirt and long pants (always)
- Impervious boots (always)
- Hat and Gloves (recommended)
- Eye/face protection (as per label)
- Respirator (as per label)
- Disposable protective clothing such as Tyvek (as per label)



Cleaning Clothes

- Change clothing every day and change immediately if they become contaminated
- Store removed clothing in a plastic bag until it can be washed
- Wash clothes with maximum amount of detergent
- Presoak these clothes and wash separately from other clothes
- After washing clothes, run washer empty to clean
- Hang clothes outside to dry – do not put in dryer!



Prevention Techniques

- Grow healthy plants
- Practice good sanitation
- Grow disease-resistant varieties
- Practice crop rotation & companion planting
- Encourage beneficial insects— not all bugs are bad
- Check plants regularly for insect damage
- Rule out other causes for garden problems such as overwatering



Pest Control Methods

- Physical Controls
 - Handpicking, strong stream of water, clippers, netting, floating row covers, plant collars, shiny objects, chicken wire cages





Plant or Row Covers



Traps

Other Control Methods

- Biological Controls
 - Beneficial Insects – Lady Beetle, Lace Wing, Hover Fly, Ground Beetle
 - B.t. (*Bacillus thuringiensis*),
 - Companion planting
 - Crop rotation
- Chemical Controls
 - Pesticides – last resort!



Organic Methods

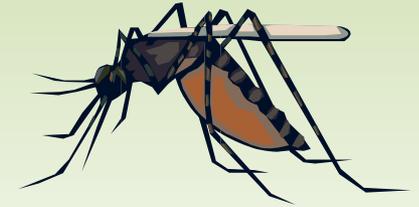
Least toxic:

- Neem Oil
- Insecticidal soap
- Iron phosphate granules

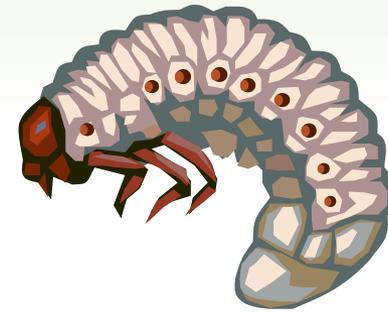


Insecticides

Insecticides specifically kill substances of insects.



- Stomach poisons
- Contact insecticides
- Systemic insecticides
- Growth regulators
- Dessicants



Fungicides

- Fungi are often difficult to control
- Cultural practices are usually key – sanitation, irrigation, etc.
- Fungicides are often only effective prior to infection – creating a barrier to infection



Major Points

- Not all organisms that damage plants need be controlled
- Identify thresholds to determine when to begin pesticide application
- Identification of the pest organism is crucial to effective control
- When applying a pesticide, **always** read the label before buying, before mixing, before application, after application (for cleanup)
- Buy pesticides in appropriate-sized containers to avoid having to store them for long periods
- Most pesticides are hazardous waste and need to be disposed of accordingly



Common Yard Pests

Aphids

- Cabbage and turnip aphids are green; give birth to live aphids; love tender leaves; population declines with heat (predators more numerous)
- Symptoms: Sticky substance (honeydew); ants; black sooty mold
- Controls: Lacewing; Lady beetle; syrphid fly; high pressure hose; insecticidal soap; home remedy

Cabbage, collard, kale, turnip, mustard, broccoli, cauliflower, Brussel sprout, radish, rose buds

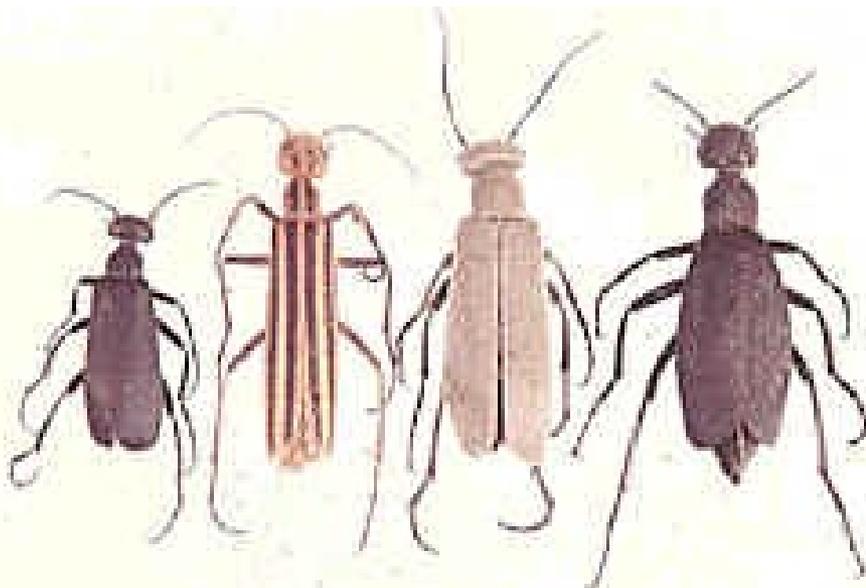


Blister Beetle

Bean, beet, carrot, cabbage, Chinese cabbage, corn, eggplant, melon, mustard, pea, pepper, potato, radish, spinach, squash, sweet potato, tomato, turnip



- Natural Enemies
None (but they eat grasshopper eggs)
- Cultural Control
Physical barriers
- Chemical Control
Carbaryl, malathion, stomach poisons



Flea Beetle

Eggplant, tomato, potato

Natural Enemies

- Parasitic wasps

Cultural Control

- Control weeds
- Row covers on vegetables

Chemical Control

- Carbaryl
- Malathion
- Acephate



Grasshopper



Natural Enemies

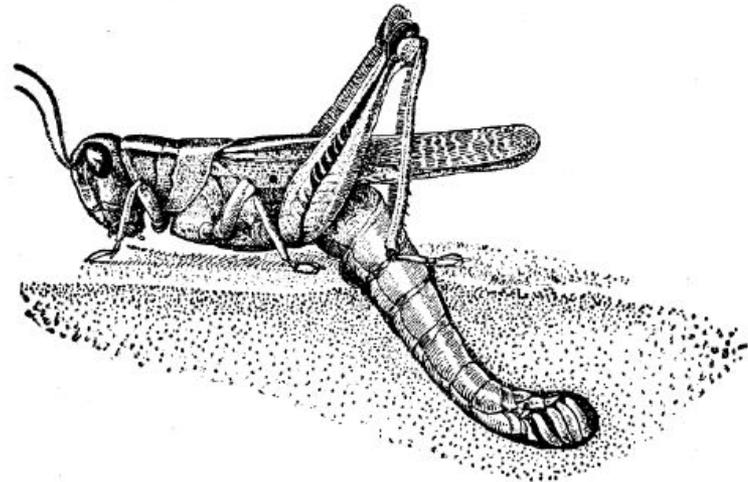
- Poultry

Cultural Control

- Maintain green border
- Physical barriers – floating cover

Chemical Control

- Garlic sprays are
Sevin baits



Beet Leaf Hoppers

Tomato, beet, pepper, squash, bean, squash, melon, cucumber, spinach, potato

- Cultural Control – Plant after end of June; manage weeds; protect young plants with row cover; remove infected plants



- Suck undersides of leaves which become mottled looking; transmits curly top virus
- Symptoms of curly top virus: Leaves puckered & stunted; tomato leaves curl & roll upward and main petiole curves downward; leaves become leathery & turn yellowish

Slugs



- Attracted to moist soil, only feed at temperatures over 50° F
- Natural Enemies -Birds
- Cultural Control – Hand pick, trap boards, beer traps, plant marigolds
- Chemical Control – Iron phosphate granuals – (does not kill eggs so will need to repeat

Spider Mite

*Melon, raspberry,
eggplant, bean*



UC Statewide IPM Project
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- Natural Enemies -Predatory thrips & mites, minute pirate bugs, lacewings, bigeyed bugs, lady beetles
- Cultural Control - Avoid dust build up with high pressure hose
- Chemical Control - Soaps/oils, miticides in extreme cases
- Symptoms: Webbing; white or yellow speckles on leaves; leaf drop if high populations

Thrips

Bean, garlic, onion, pepper, pumpkin, squash, cucumber,



- Symptoms: Edges of leaves curled; discolored or distorted plant tissue; black specks of excrement around stippled leaf surfaces

- Natural Enemies - Minute Pirate Bug, Lady Beetle, predaceous mites
- Cultural Control - Remove old flowers, control weeds, high pressure hose, row covers, reflective mulch, be patient
- Chemical Control - Neem, systemics (Orthene, Merit) on non-edible crops

Tomato Hornworm

Tomato, eggplant, pepper, potato

- Sphinx moth deposits eggs on upper and lower leaf surface in spring; look for dark green or black excrement from larva (tomato hornworm)



- Symptoms: Chewed leaves and stems; excrement
- Controls: Hand pick; lady beetles & lacewings eat eggs; Bt; carbaryl; tilling soil after harvest causes up to 90% mortality



Whiteflies

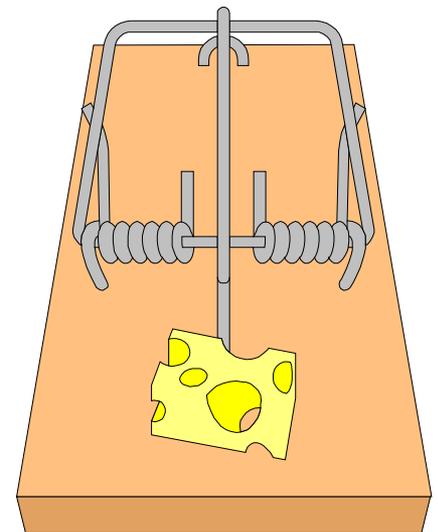
Tomatoes, eggplant, cabbage family, peppers, sweet potatoes, citrus trees, roses and ornamental flowers with smooth leaves (prefer new growth)



- Natural Enemies -Lacewing, Lady Beetle
- Cultural Control - high pressure hose, companion plant onions, leeks & garlic
- Chemical Control – insecticidal soap (Orthene, Merit) on non-edible crops

Small Animals & Wildlife

- Use Integrated Pest Management (IPM)
 1. Correctly identify the pest
 2. Employ prevention options
 3. Select a population control strategy
 4. Monitor for reinfestation



Small Animals & Wildlife

- In Arizona, most wildlife species are protected
- Some are not, these include:
 - Wood rats (Pack rats)
 - Norway rats
 - House mice
 - Ground squirrels
 - Pocket gophers
 - Rock doves (Pigeons)
 - Starlings
 - English sparrows (House sparrows)



Prevention Measures

- Habitat modification
 - Remove food, shelter & access
- Exclusion
- Frightening
 - Sight or sound
- Repellents
 - Odor, taste or touch

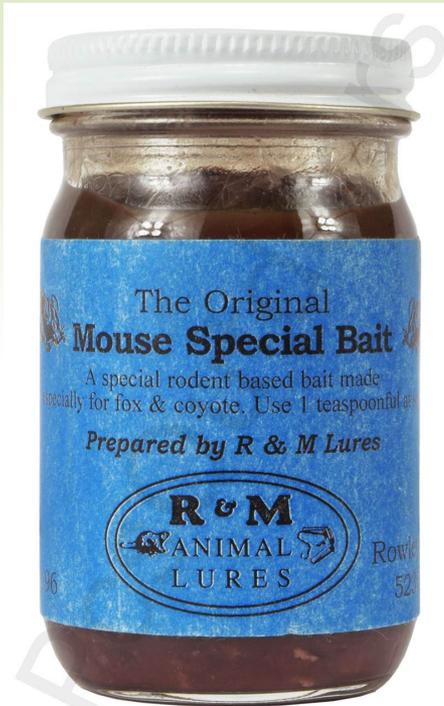


Prevention is Long Term
Control is Short Term

Prevention Measures

Repellants:

- Odor
- Taste
- Touch



All repellants work some of the time
No repellants work all of the time

Rock Squirrels

- Fumigants
- Trapping
- Toxicants
- Eliminate brush and rock piles, other habitat features
- Flood irrigation



Woodrat

- Exclusion from structures
- Trapping
- Anticoagulants
- Destruction of Dens



Rabbit

- Exclusion (chicken wire, 2 ft above and 1 ft below)
- Resistant Plants
- Trapping
- Biocontrol
- Habitat



Javelina

- Sturdy metal Fencing – min 3ft high
- Remove Attractant
- Electric Fence



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