

# Understanding Vegetable Garden Insects



**Roy Beckford**  
**Ag/Natural Resources Agent**  
**UF/IFAS Lee County Extension**  
[fbeckford@leegov.com](mailto:fbeckford@leegov.com)  
**239-533-7512**

# There are lots of pests out there...are there?



Variiegated cutworm damage on tomato  
[ Picture by Purdue University ]



# Integrated Pest Management

- IPM involves using multiple tactics to keep pest populations low enough that damage is tolerable
- Effective IPM depends on knowing your pests and their life histories
- Scouting (regularly examining your plants for insects, feeding damage, and diseases) is essential

# Identification



- Find a good identification guide--pictures and drawings can be better than photos
- Get a hand lens (magnifier), 5x or 10x
- Look underneath leaves
- Go out at night with a flashlight to look for nocturnal insects

# Identification



Adult yellow-margined leaf beetle



Larval stage of same beetle

- Learn life histories of your pests and beneficial insects
- Keep records, take pictures
- Visit your county extension office

# Scouting

- Once or twice a week, walk through the vegetable garden, early in the day, if possible.
- Stop and examine as many plants as you have time for--more for larger gardens.
- Record the type of vegetable, the plant part examined (leaves, fruit, stems) and what you found.
- If you find disease, many pest insects or more damage than you can tolerate, you need to decide what to do about it.

# Principal Pests of Tomato in SW Florida



Silverleaf whitefly/TYLCV



Southern Armyworm



Vegetable leafminer



Tomato Pinworm

# Occasional Tomato Pests in SW Florida



**Aphids**



**Stinkbugs: Various**



***Tetranychus spp***

# Principal Pests of Pepper in SW Florida



**Pepper weevil**



**Melon thrips**



**Beet  
Armyworm**



**Broadmite**



**Aphids/potyvirus**

# Principal Pests of Cucurbit Crops in SW Florida



**Silverleaf whitefly**



**Aphids/potyvirus**



**Twospot**

**Pickelworm**



**Melonworm**



# Principal Pests of Eggplant in SW Florida



**Silverleaf whitefly**

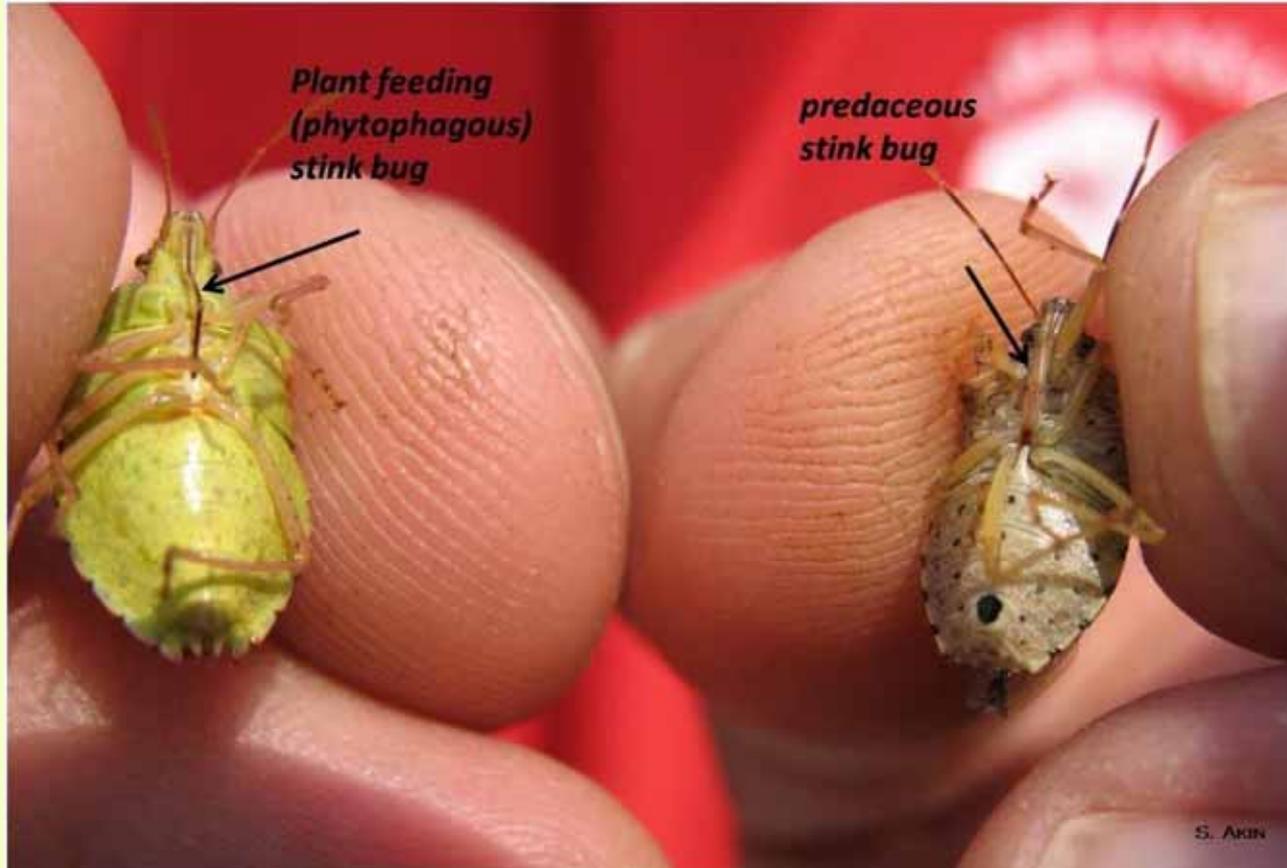


**Broadmite**



**Melon thrips**

# Less than 1% of Insects in Your Yard are True Pests



**Spined Soldier Bug**

# Managing Insects

- Cultural controls
  - Crop rotation
  - Soil preparation
  - Barriers
  - Physical controls
- Biological control
- Chemical control--a last resort
- Tolerate some damage

# Cultural Control

- Soil preparation well in advance of planting (several weeks to months)
- Especially important if the garden area was recently in grass
- Turning soil will bring grubs and wireworms to the surface where birds can eat them

# Crop Rotation

- Learn which plants are related and don't plant them in the same location in the garden
- Keep records and plant crops in a different place each year
- Crop rotation will help manage both insects and diseases

# Reduce Plant Stress

- Fertilize properly--too much nitrogen makes plants more attractive to aphids and whiteflies
- Water carefully
- Remove overripe fruit and diseased plants
- Manage weeds that can be a source of pests and diseases

# Barriers



- Cutworm collars prevent cutworms from cutting off small seedlings
- They can be made from many materials
- Press the “collar” one or two inches deep in soil

# Barriers



- Lightweight floating row covers keep insects off plants (remove for pollination)
- Rain and sunlight pass through
- Available from garden supply companies
- Not the same as frost protection covers

# Physical Controls



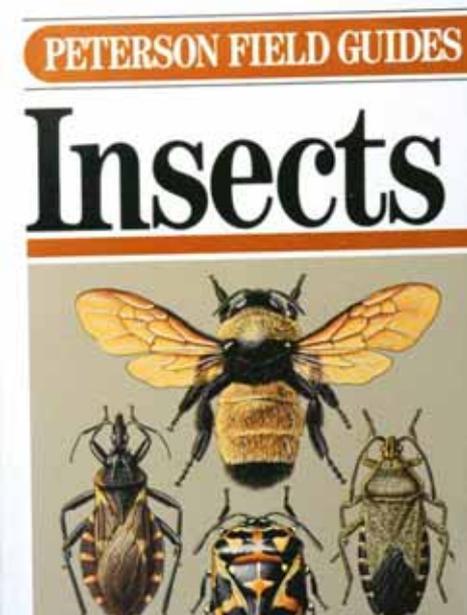
Young cross-striped cabbageworms

- Use transplants that are free of insects and obvious disease.
- During the growing season, hand-pick larger insects and drown in soapy water.

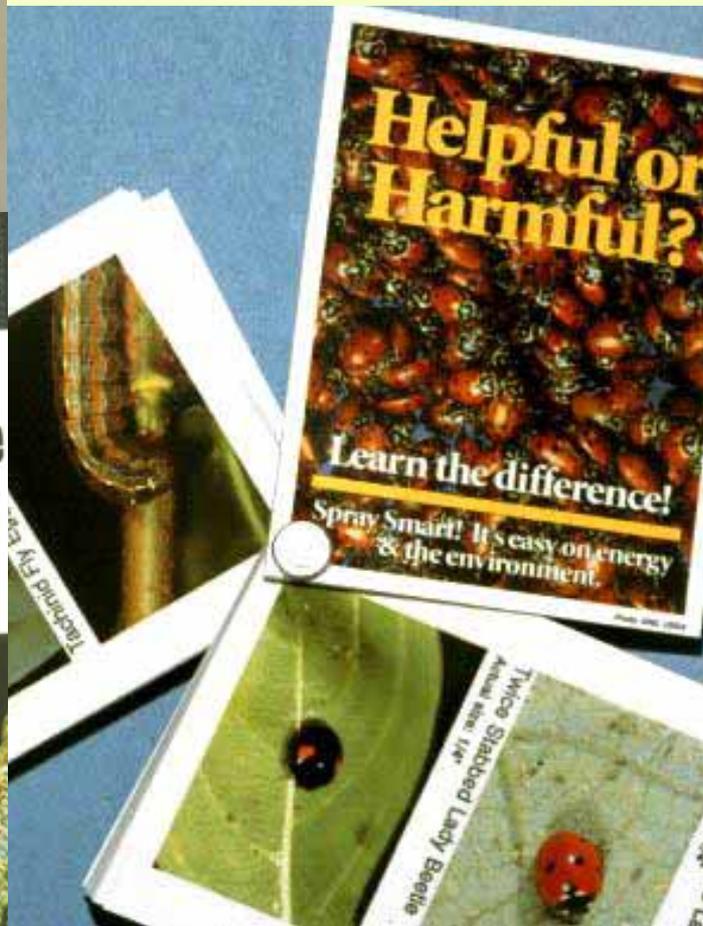
# Biological Control

- Avoiding pesticides will help preserve the good insects
- Plant flowering plants to provide nectar and pollen for parasitoids and predators
- Some can be purchased - lacewing larvae or eggs
- Lady beetles will fly away!

# Useful Publications For Identifying Beneficial Insects



**The Audubon  
Society Field Guide  
to North American  
Insects & Spiders**



IPAS THE UNIVERSITY OF FLORIDA • Institute of Food and Agricultural Sciences  
Department of Entomology and Nematology

ENY-503

## Beneficial Insects Sheet II'



Sevenspotted lady beetle



Twice stabbed lady beetle



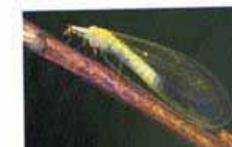
Lady beetle larva



Lady beetle larva



Preying mantid



Green lacewing



Lacewing larva



Predaceous stink bug nymph

# Univ. Florida Extension Publications on the Internet

- *<http://edis.ifas.ufl.edu>*
  - Database of all current cooperative extension publications that are searchable and free for hard copy printing
- *<http://ifasbooks.ufl.edu>*
  - Extension bookstore - online catalog of resource publications covering all areas of extension research (1-800-226-1764)
- *<http://creatures.ifas.ufl.edu>*
  - In depth profiles of insects and other organisms

# Insects and Spiders that Eat other Insects

Jumping spider



Lacewing adult



Lacewing larva

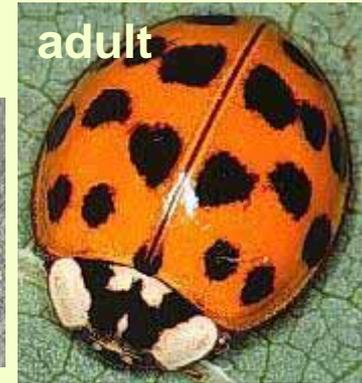


Lacewing eggs

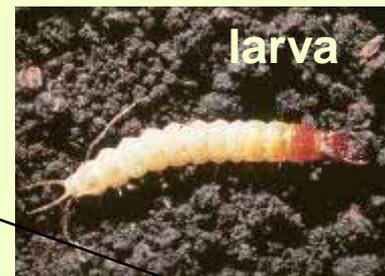


# Predatory Beetles

- Lady beetles



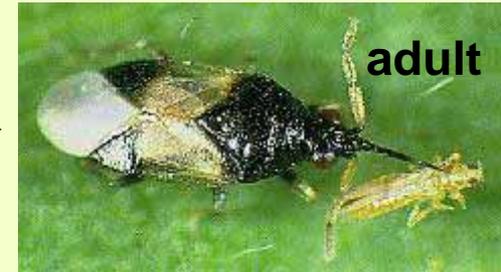
- Ground beetles



Courtesy of Celeste Welty, OSU

# Predatory Bugs

- Stink bugs
  - Spined soldier bug
  - Twospotted stink bug
- Flower bugs
  - Minute pirate bug
  - Insidious flower bug
- Damself bugs
- Assassin bugs



Courtesy of Celeste Welty, OSU

# Predatory Bugs



**Leaf footed bug**



**Big eyed bug**

# Spined Soldier Bug versus Army Worm



# Predatory Flies



- Hover flies (flower flies)



- Aphid midges



- Robber flies



Courtesy of Celeste Welty, OSU

# Other Predators

- Wasps:
  - Yellowjackets
- Thrips:
  - Black hunter thrips
- Mites:
  - Phytoseiid mites



Courtesy of Celeste Welty, OSU

# Parasitoids

- Some wasps
  - Braconid wasps
    - On hornworm
    - On imported cabbageworm
    - On aphids
  - Ichneumonid wasps
    - On diamondback
  - Other wasps
    - On whiteflies
    - On caterpillar eggs



Courtesy of Celeste Welty, OSU

# Beneficial Insects At Work - Mealybug Infestation on Grapefruit

**Sweet feeding ants  
tending citrus  
mealybugs -**

**Collecting honey-  
dew and spreading  
mealybugs  
around**



# Honeydew Is An Important Source Of Carbohydrates (Sugar) For Ants



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# Mealybugs Have Spread Over A Large Surface Area Of The Grapefruit



# Tiny Encyrtid Wasps Begin Showing Up Parasitizing The Mealybugs



# Mealybug Parasitic Wasp Introduced Into the U.S.

*Leptomastix dactylopii*  
Introduced from Brazil

Can search out very  
small  
mealybug populations

Wasps can be  
purchased  
from biological control  
suppliers



# Mealybug Destroyer Lady Bug Larvae Show up After the Wasps



**Lady bug species that specializes in mealybugs**

# Adult Mealybug Destroyer Ladybug Also Feeds On Mealybugs

**Introduced into U.S. to prey on mealybugs-  
eating what wasps missed**



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# In the End, The Grapefruit Survived— Saved by Beneficials

It was not necessary  
To spray

Spraying would have  
killed beneficial  
insects

100s or more wasps  
and ladybug beetles  
have reproduced to  
search for more  
mealy-bugs



**AFTER**

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**before**



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**before**



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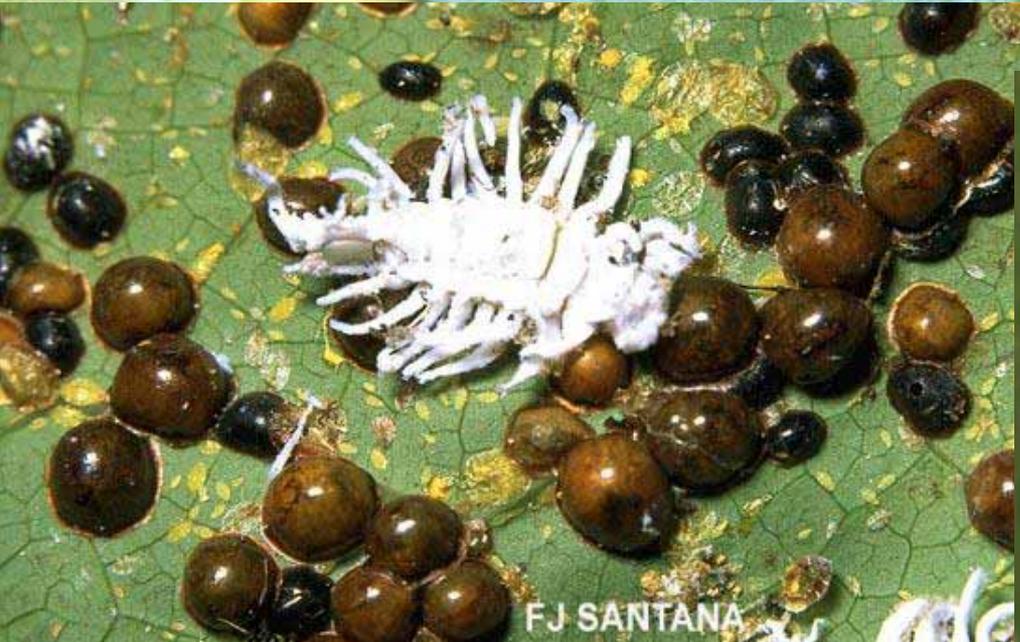
# Lady Beetle Larvae Have Many Shapes and Forms



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# Plant Refuge for Natural Enemies

Adult insect predators need pollen; parasitoids need nectar



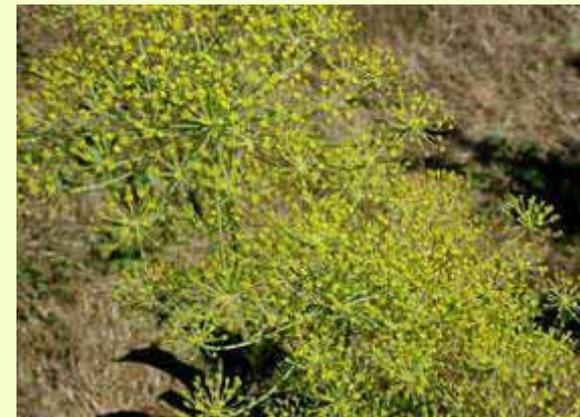
sweet alyssum



cilantro



nasturtium



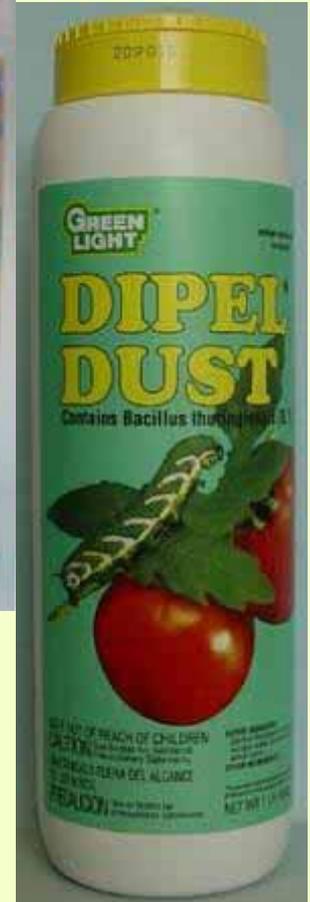
dill

# Last Resort... Chemical Control

- Try to use the least harmful first
- Products containing *Bacillus thuringiensis* (Bt) will control caterpillars and will not harm beneficial insects
- Soaps and oils (don't use if weather is hot) for soft-bodied insects like aphids
- A few drops of mineral oil on new corn silks will kill corn earworm eggs
- Products containing spinosad
- Repellents, neem oil (botanicals)

# B.t. products

- Bacillus thuringiensis
  - Bacteria are dead--a toxin in them paralyzes insect gut
- Sprayable or dusts for caterpillars
- Best if:
  - Target young larvae
  - Apply at 3-4 day intervals
  - Get thorough coverage (lot of water)



# Smothering Agents



- Petroleum oil
- Soap (potassium salts of fatty acids)



# Effect of Soap on Aphids



**Clumps and overturns aphids,  
suffocating them in sticky masses**



By the way...you can start with a water spray (aphids)



**Neem:  
azadirachtin**

**& neem seed  
oil  
(several brands)**



# Spinosad: for caterpillars, some beetles, thrips

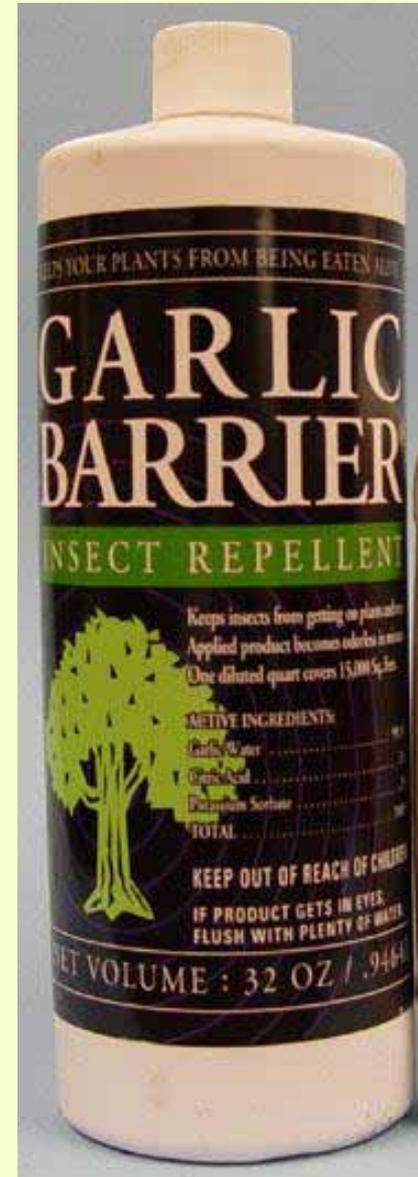
Some brands:

- **GreenLight:** Lawn & Garden Spray Spinosad Concentrate
- **Monterey:** Garden Insect Spray
- **Gardens Alive:** Bulls-Eye Bioinsecticide



# Repellents from plants:

capsaicin  
& garlic

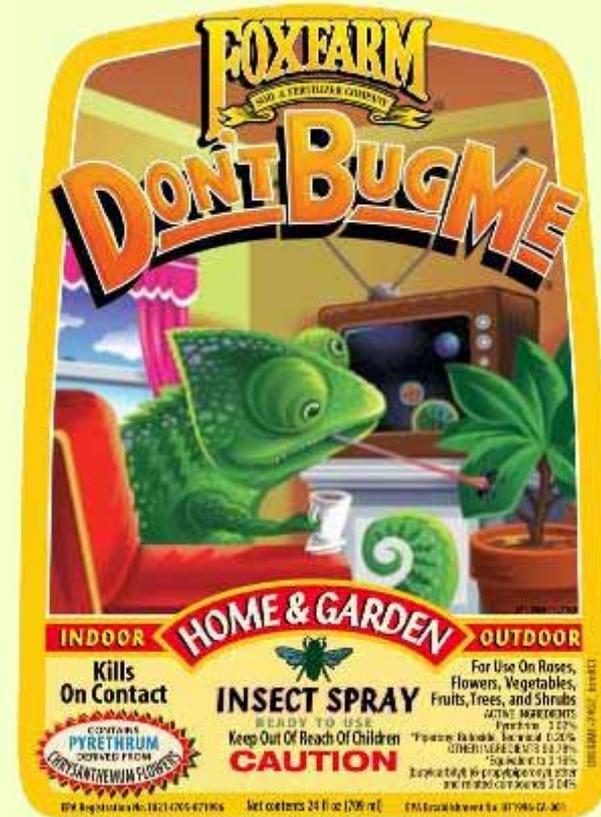
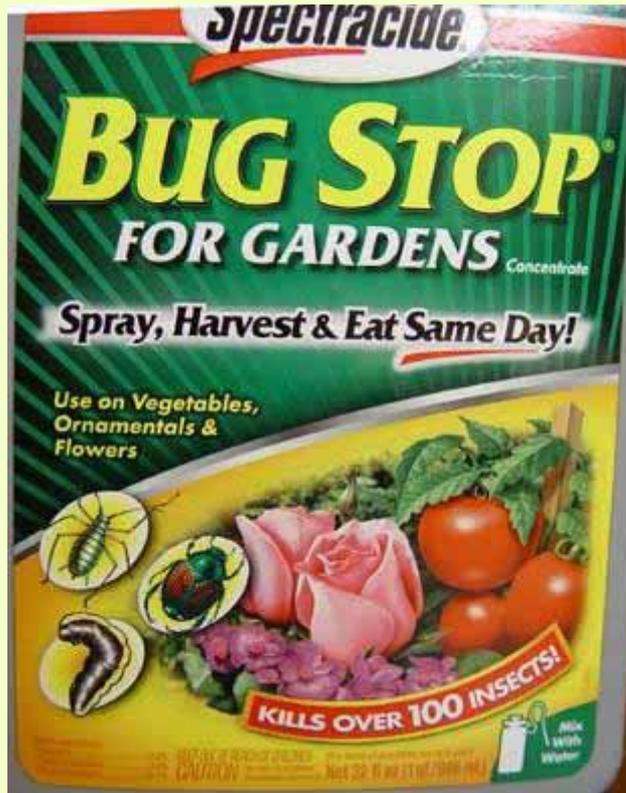


# Chemical Controls

- Broad spectrum pesticides will kill good insects as well as pests, so use only if necessary.
- Pyrethrins and pyrethroids act quickly
- Pyrethrins alone not very effective
- Carbaryl
- Malathion

# Pyrethrins + PBO\*

\*PBO=  
piperonyl butoxide  
(a synergist)



Courtesy of Celeste Welty, OSU

# Iron Phosphate: Slug bait



# Use Pesticides Safely

- Read the label completely
- Follow safety requirements
- Use only pesticides labeled for home vegetable gardens--some are for specific vegetables
- Pay attention to pre-harvest intervals--how long to wait after treatment before harvesting
- Keep pets and children away from treated areas

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