

Organic Pest Control

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Organic gardening & production is a year-round activity:


1. Create and maintain a **biologically active soil** that is minerally balanced.
2. Keep animals, plants, insects, and microbes in **ecological harmony**.


Gardens are Ecosystems:

- Include herbs & flowers to attract beneficial insects.
- Plant in blocks rather than rows.
- Grow more than one cultivar.
- Visualize semi-permanent beds.
- Practice crop rotation.
- Protect the garden from animals.

Organic Pest Control Methods:

- 1. Grow resistant cultivars.**
- 2. Release beneficial insects.**
- 3. Grow flowers and herbs that support and attract beneficial insects.**

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- 4. Hand-pick & destroy.**
 - 5. Wash mites & aphids off with water.**
 - 6. Use natural repellents like garlic & hot pepper sprays, and insecticidal soaps.**

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- 7. Plant in blocks rather than in long rows.**
 - 8. Interplant with companion plants.**
 - 9. Plant trap crops.**

10. As a last resort, use NOP approved pest control materials:

Bacillus thuringiensis (Bt)
Azadirachtin and Neem oil
Pyrethrum
Spinosad
Horticultural oils
Diatomaceous earth

Characteristics of NOP Materials

- Short-residual activity.
- Sensitive to u.v. light and rainfall.
- Active on the young stages of insects and mite pests.
- Less harmful to natural enemies (parasitoids and predators).
- Low mammalian toxicity.
- May take longer to kill target insect and mite pests.

Aphids



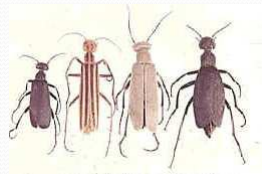
- Wash off with forceful streams of water 2-3x/week.
- Spray w/ Insecticidal soap, a neem-based horticultural oil, or pyrethrin.
- Purchase & release natural enemies like ladybugs, green lacewings, or parasitoids.
- Incorporate flowering plants into the garden to attract and retain natural enemies.

Asparagus Beetles



- Complete cleanup of ferns in fall.
- Harvest all spears during spring harvest
- Encourage birds & ladybugs
- Spray with pyrethrum, a neem-based horticultural oil, or spinosad.

Blister Beetles



- Will migrate into garden in July.
- Hand-pick adults wearing gloves.
- Incorporate flowering plants into garden that attract and retain natural enemies.
- Spray with pyrethrum.

Cabbage Loopers & Cabbageworm



CABBAGE LOOPER
Trichoplusia ni
ADULT MOTH



REPORTED CABBAGEWORM
PIERIS RAPAE
BUTTERFLY



Cabbage Loopers & Cabbageworm

- Use floating row cover all season.
- Handpick caterpillars.
- Apply *Bt* ssp. *kurstaki* (e.g. Dipel), spinosad, or Pyrethrin.

Carrot Weevil



- Use floating row cover all season.
- Cultivate garden in fall & rotate crops.
- Apply beneficial nematodes when plants are very small.
- Spray adults with pyrethrin.

Brightspot Garden

Carrots in 2001 treated with
beneficial nematode to control carrot
weevil.

2000 Season 16 % damage

2001 Season 4 % damage



Colorado Potato Beetle



- Use floating row cover during season.
- Plant potatoes as early as possible to allow sufficient growth to withstand attack.
- Handpick adults and larvae.
- Mulch with grass clippings rather than straw beginning at plot's edge.
- Allow guineas to roam through area.
- Spray larvae with spinosad, pyrethrin, or a neem-based horticultural oil.

Year / Mulch / Beetles

2000	grass clippings	none
2001	grass clippings	none
2002	grass clippings	none
2003	wheat straw	many
2004	grass clippings	a few
2005	grass clippings	a few

Corn Earworm and European Corn Borer



- Remove and destroy all plant debris in fall.
- Cultivate garden in fall to kill larvae.
- Avoid early planting, which are more susceptible to larvae attacks.
- Spray silks after turning brown with *Bacillus thuringiensis* spp. *kurstaki* (e.g., Dipel), spinosad, or pyrethrin.
- Hand-pick caterpillars from ears.

Cucumber Beetle



There are six species, each limited to a US region. The Spotted Cucumber Beetle in larval stage is known as the southern corn rootworm.

Use floating row covers until bees are needed to pollinate flowers.

Over-seed to compensate for a potential infestation.

Since the cucumber beetle has a broad plant host range, a general weekly spray of the whole garden is necessary for control.

Insecticidal soap, neem, pyrethrin, or spinosad sprays are effective.

Cutworm



Cutworm

- Plow mid- to late summer to prevent the laying of eggs.
- Plow in fall to expose the larvae or deeply bury the pupae.
- Cultivate fields in spring after vegetation has appeared and grown a few inches, then delay seeding to starve the cutworms.
- Cultivate frequently to injure and expose hiding cutworms to predators.
- Place foil or paper wraps or cardboard collars around transplants; extend a few inches into the soil and several inches up the stem.
- Place ½-gallon plastic milk cartons with bottoms removed over new transplants.
- Plant a thick “trap crop” of sunflower, a favored host, around perimeter of the garden; find and destroy attacking cutworms daily.
- Encourage birds and toads.
- Apply beneficial nematodes to soil.
- Placing a ring of moist wood ashes around the plants.

Flea Beetles



- Use floating row covers until bees are needed to pollinate flowers.
- Over-seed to compensate for a potential infestation.
- Plant trap-crops such as eggplant or radishes around the garden.
- Eliminate weeds from within and around the garden.
- Spray with spinosad or pyrethrin.

Grasshopper



- Use floating row cover until bees are needed to pollinate.
- Eliminate all weeds from within and around the garden.
- Apply *Nosema locustae*, (a protozoan). It must be applied in early spring and should be applied on the periphery of the garden.
- Spray with insecticidal soap or a neem-based horticultural oil.

Harlequin Bugs



Harlequin Bugs

- Only does damage some years, when climate is right for a population explosion.
- Mustard greens or turnips can be used as trap crops.
- Hand-pick adults.
- Spray with pyrethrin or with a neem-based horticultural oil.

Hornworms



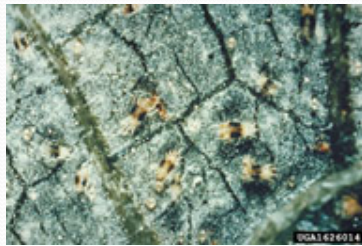
- Hand-pick caterpillars
- Till garden to kill overwintering pupae
- Spray with *Bacillus thuringiensis* spp. *kurstaki* (e.g. Dipel) or spinosad

Mexican Bean Beetle



- Use floating row covers until bees are needed to pollinate flowers.
- Spray with pyrethrin or spinosad

Mites



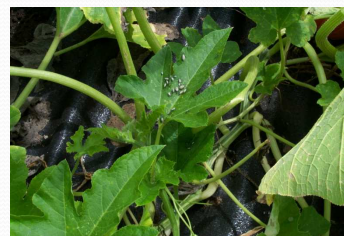
- Spray forceful jets of water to the underside of leaves 2-3 x per week.
- Eliminate all weeds from within and around the garden.
- Remove and dispose of all plant debris.
- Spray insecticidal soap at least 3x, every 5-7 days.
- Spray with a neem-based horticultural oil.
- Purchase and release predatory mites.

Nematodes

- Plant resistant varieties.
- Increase soil organic matter. Heavy mulch or compost are the best deterrents.
- Long crop rotations.
- Plant African marigolds between plants—roots exude compounds that repel nematodes



Squash Bugs



Squash Bugs

- Use floating row covers until bees are needed to pollinate flowers.
- Handpick adults and nymphs.
- Plant varieties that are more resistant. (Yellow zucchini/summer squash and pumpkins are very susceptible, also Hubbard winter squash.).
- Remove and dispose of all vegetation and left-over fruit.
- When nymphs are present, spray with an insecticidal soap, a neem-based horticultural oil, spinosad, or pyrethrin, and add ½ cup of canola oil per gallon of water.

Squash Vine Borer



1. Use floating row covers until bees are needed to pollinate flowers.
2. Plant resistant varieties.
3. Time planting to avoid periods when adults are active.
4. Dispose of old vines and infested plants .
5. Cultivate garden in fall to kill overwintering pupae.
6. When you see a small pile of "saw dust" at base of plant, split stem and remove white larvae. Stitch wound together with sewing thread, and cover wounded area with moist soil.
7. Plant a trap crop of a highly susceptible plant such as the winter squash variety Hubbard.
8. Spray base of plant with spinosad before larvae enter plant.

Cultivar Preference of Squash Vine Borer (www.attra.ncat.org)

Blue Hubbard	5	<i>C. maxima</i>
Boston Marrow	4	<i>C. maxima</i>
Gold Delicious	4	<i>C. maxima</i>
Conn. Field pumpkin	4	<i>C. pepo</i>
Small Sugar pumpkin	4	<i>C. pepo</i>
Zucchini	4	<i>C. pepo</i>
White Bush Scallop	3	<i>C. pepo</i>
Acorn	3	<i>C. pepo</i>
Summer crookneck	3	<i>C. pepo</i>
Dickenson pumpkin	2	<i>C. moschata</i>
Green striped cushaw	1	<i>C. mixta</i>
Butternut	1	<i>C. maschata</i>

ASKING NATURE FOR HELP







Use the garden or backyard to create habitat for beneficials

- Water source for what you want to attract.
- Food sources for what you want to attract.
- Place for reproduction of your garden guests.
 - Trees and shrubs
 - Herbs & flowers
- Decrease use of harmful pesticides.

A backyard water source

- A backyard garden pool
 - Attracts birds
 - Attracts frogs, turtles, & toads
 - Attracts damselflies (mosquito-eaters)
 - Can incorporate plants & fish
- A birdbath for birds, bees, & butterflies
 - Keep clean
 - Keep in shade to prevent overheating

Backyard food sources for butterflies & bees

- Flowers provide the nectar to sustain many bees, butterflies, and other insects.
- Bees and butterflies in turn help pollinate flowers to produce vegetables and fruits for human consumption.
- With major decline of honey bees due to Colony Collapse Disorder (CCD) encourage native, solitary bees.

Incomplete pollination



Attracting hummingbirds

- Consider planting these herbs:
 - Anise hyssop
 - Catmint
 - Comfrey
 - Hyssop
 - Rosemary
 - Salvia
 - Sage

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Shrubs with berries

- Shrubs that produce berries useful for bird food:
 - Elderberry
 - Holly
 - Hawthorn
 - Spicebush
 - Virginia creeper
 - Red cedar (female trees)
 - Pyracantha.

Features of a Butterfly Garden

- Provide a sunny spot.
- Provide some wind protection.
- Add height with hanging baskets, climbing vines & tall flowers.
- Shrubs & trees provide a nighttime retreat.
- Use perennials & massive plantings of annuals to provide a continuous source of flowers.
- Butterfly gardens also attract many beneficial insects.

Use Herbs to Create a Garden Insectary

- A butterfly garden attracts other beneficial insects that compete and destroy harmful garden pests.
- The garden insectary is a form of "companion planting,"
 - Herbs can deter pests with scents.
 - Herbs can attract natural predators.
 - An established garden insectary increases value through the years.

Cotton Square Borer



Pearl Crescent Butterfly



Black Swallowtail Larvae



Black Swallowtail, male





Use pesticides prudently!

Even organic pesticides
kill
beneficial insects.

Protect the native bee pollinators
and
honey bees.

Organic Gardening Helpers

- Snakes for rodent control.
- Toads & frogs for insect control.
- Birds for insect control.
- And other useful organisms.



Problem Animals

- Squirrels may rob bird feeders.
 - Purchase squirrel proof feeders.
- Rabbits may eat garden vegetables.
 - Use a rabbit fence.
- Snakes repel some people.
 - Will remain under the mulch.
- Raccoons may raid garbage cans and eat garden fruits.
 - Trap and relocate under Dept. of Wildlife supervision.



Problems Animals

Deer

Plant a row (hedge) of wormwood (*Artemisia absinthium*) about 2-3' from fence. The deer do not graze on wormwood and are spatially far enough away from the fence that they will not attempt to jump over it.

D i s e a s e s

Disease control:

- 1. Routinely remove all garden debris to a compost pile.**
- 2. Plant disease resistant cultivars.**
- 3. Rotate plantings annually.**

- 4. Space plants far enough apart to allow air movement.**
- 5. Water plants in a.m.**
- 6. Spray plants with compost or worm castings tea.**
- 7. Apply sulfur spray (Bordeaux mix) using a mined sulfur source.**





**Be a green garden
steward,

rather than an angry
garden warrior!**







