



INSECT MANAGEMENT IN THE HOME VEGETABLE GARDEN

Insects are part of any garden and many insects are beneficial. They may pollinate plants, destroy pests, or improve the soil by scavenging and burrowing. It is important to recognize commonly encountered insects. If an insect is identified as a destructive species, determine whether it is causing serious damage to the crop before deciding to apply an insecticide or management practice. Chemical control can cause additional problems by killing natural enemies of many pests. Try to use the least disruptive methods of pest control. Most garden plants can tolerate some insect feeding, and pests can often be washed off after harvest. There are a number of options for reducing pests in the garden without resorting to pesticides. These mechanical or cultural methods may modify the conditions in the garden to be unattractive to the insect, disrupt the insect's life cycle, or destroy insects directly.

Sanitation – Many insects overwinter in weeds or plant debris in or near the garden. Remove and compost weeds and debris, or spade them under as soon as harvest is completed. Incorporate compost. Look under mulch material regularly for a buildup of slugs, snails, and millipedes. Check transplants before buying or planting – do not use infested plants. Bury garden debris in the fall.

Rotation – Do not grow the same crop in the same area in consecutive seasons. This helps to reduce the buildup of soil insects such as grubs, wireworms, and maggots. Eggs and pupae of most insects overwinter in the soil or attached to a host plant.

Avoid planting crops susceptible to grubs where grass grew the previous year. If Japanese beetles are a problem, avoid growing roses and grapes near the garden area, as these plants are particularly attractive to the beetles.

Planting – Healthy, vigorously growing crops usually can tolerate some insect damage. Therefore, provide the best possible growing conditions. Check the fertility and pH (acidity) of the soil regularly and make appropriate adjustments. Use mulch (hay, leafmold, etc.) or cultivate the soil to kill weeds which harbor pests.

Handpicking – Many pests are effectively controlled by picking them off the foliage and destroying them. With perseverance, this works against Japanese beetles, Mexican bean beetles and Colorado potato beetles.

PHYSICAL BARRIERS – Barriers placed around some plants control some insects.

Collars – Newly planted peppers and tomatoes can be protected from cutworms by placing a collar around each plant made from cardboard, paper or plastic cup or milk carton with the bottoms cut off. The collar should be at least 3” tall and pushed 1-2” into the soil. The collar acts as a barrier, keeping them from reaching and damaging the stems of plants.

Shields – A 6” collar (3” radius) made from carpet or tar paper, laid flat on the ground and fit snugly around individual transplants will prevent the adult cabbage root maggot fly from laying eggs at the base of the plants.



Row Covers – Lightweight, floating row covers are an excellent barrier to some early pests such as cabbage root maggot fly, flea beetles, spinach leaf miner, striped cucumber beetles, European corn borers, aphids and Colorado potato beetles. Row covers prevent pests from feeding on plants as long as the insect did not over-winter in the same location that is being covered. A pest that emerges near its target plant under the protection of a row cover may damage plants even faster than usual! Rotation should be considered with the use of row covers to avoid emergence of pests from beneath the row cover.

Row covers are made of lightweight fabric that can be laid directly over plants, leaving enough excess fabric so plants can grow under it. The fabric needs to be secured to keep pests out. This can be accomplished using rocks, burying the fabric edges with soil down each side of the row, or by using metal staples made for this purpose. Row covers can also be supported with hoops. The fabric allows water and light to pass through and protects young plants from wind. Row covers should be removed from vine crops such as cucumbers when flowers appear because vine crops need bees for pollination. Covers should also be removed when temperatures regularly reach the high 80's for four or more hours per day.

TRAPS AND LURES – Traps may attract insects by visual or chemical cues. Visual traps such as yellow, sticky boards are generally used to monitor insect populations. Lure traps, such as Japanese beetle traps, contain chemical attractants. These traps can lure increased numbers of pests – keep them at least 30 feet away from the garden. Electronic and ultraviolet traps are not recommended.

BIOLOGICAL CONTROL – Biological control is the use of beneficial insects, mites, nematodes and diseases to control garden pests. One way to do this is by preserving naturally occurring beneficial insects and mites by avoiding unnecessary use of all insecticides and miticides. Gardeners can also purchase commercially available beneficial organisms. One of the more common materials is *Bacillus thuringiensis* (B.t.), a bacterium which is used to control caterpillars. Beneficial insects, mites and nematodes are sold in quantities based on the area they will cover, such as one package per 1,000 square feet of garden space. Beneficial insects and mites are living organisms and need to be released as soon as possible. Beneficials are available from some garden centers and through mail-order and on-line companies that specialize in them. Some organisms, such as beneficial nematodes, need refrigeration, while others need to be stored in a cool, dry place.

Releasing Biological Control Agents

How to apply biological control agents depends on the type you plan to use. Follow the specific directions that come with them. In general, release them in a protected location out of direct sunlight such as early in the morning or on an overcast day. Natural enemies work slowly over a period of time and may require multiple applications.

Released in cases, on cards or on tape: Praying mantis, Trichogramma wasps

Sprinkled: Some arrive as active mobile immature insects or adults ready for immediate release such as aphid parasites, green lace wings, lady beetles, leafminer parasites

Broadcast granulated materials: Some arrive in small containers mixed with a material like rice hulls, bran hulls, or vermiculite to help disperse them evenly such as aphid predators, green lacewing eggs and predatory mites. Sprinkle a small amount of the mixture onto infested plants, distributing them evenly over the targeted garden space.

Spray: Some beneficials such as beneficial nematodes and B.t. come in a powder or liquid form that needs to be mixed with water and applied with a watering can, hose or sprayer.

PESTICIDES – Pesticides should be used as a supplement to the methods described above, not as a first line of defense. Pesticides vary in their toxicity and in their potential ecological impact. Pest control materials for organic gardens include botanicals, microbials, minerals and synthetic materials. Accurate identification of the pest is necessary before deciding what to use. Always check the label to be sure the insect and crop are listed. Avoid blanket applications – spray only where pests occur.

COMMON PESTS AND ORGANIC MANAGEMENT STRATEGIES

Aphids: Lady beetles, braconid wasps, green lacewings are natural enemies. Use slow-release nitrogen and avoid applying in excess to minimize succulent growth. Repel with reflective plastic mulch, especially under crops affected by aphid-carried diseases such as mosaic. Spray with strong stream of water to temporarily remove from plants. Use spray of insecticidal soap.

Beetles (General): Many beetles such as lady beetles, ground beetles and rove beetles are predators of other insects, so learn to recognize and encourage these. Handpick adults into soapy water. Colorado potato beetle: Protect young seedlings by using row covers. Remove before flowering. Use *Bacillus thuringiensis* 'san diego' or 'tenebrionis' (biological control).

Flea beetle: Dust plants with mild alkali such as wood ash or lime. Protect young seedling by using row covers.

Japanese beetle: Control grubs in turf with parasitic nematodes. Handpick adults into soapy water. Mexican bean beetle: Monitor plants for clusters of orange eggs found on undersides of leaves and destroy when found. Handpick adults and larvae. Plant early and use quick-maturing varieties.

Caterpillars (Cabbage looper, Cabbage worm): Monitor plants and handpick eggs, caterpillars and pupae. Use *Bacillus thuringiensis* (biological control) on young caterpillars.

European corn borer: Clean garden at end of growing season. Winter sanitation is essential to kill pupae overwintering in stalks. Monitor plants for white egg masses in late May and early June and destroy when found. Plant corn late (late June through early July).

Squash vine borer: Use row covers and remove when plants begin to flower to allow for pollination. Monitor for egg clusters along stems and destroy when found. Monitor stems for frass (debris left by insect) which is a sign of borer infestation. Cut out larvae with a lengthwise slash. Cover slash with soil. Encourage rooting by covering nodes with soil. Butternut squash is resistant.

Tomato hornworm: Handpick unless there are white "eggs" on the back of the hornworm which indicates it is being parasitized by a beneficial wasp. Leave hornworms that are parasitized to encourage populations of beneficial wasps. Use *Bacillus thuringiensis* (biological control) on young caterpillars.

Cutworm: Use 3"-4" vertical collars such as a paper cup with bottom removed around each transplant (tomatoes, peppers). Set 1"-2" into the soil.

Leaf Miners: Use row covers over beets, spinach and swiss chard. Remove and destroy infested weeds such as lamb quarters.

Root maggots: Use row covers over radishes and scallions. Place 6"-8" (3"-4" radius) barrier mat snugly on soil around young seedlings to prevent adult flies from laying eggs at the base of the plants.

Slugs and Snails: (Feed in the evening), Use pans of beer or yeast dissolved in water set into the soil as death traps. Place boards in the garden; mid-day remove the slugs which hide there. Use commercial product containing iron phosphate bait.

RESPONSIBLE PESTICIDE USE

Here is some of the terminology used on pesticide labels that is useful to know.

Active Ingredient -This is the chemical component of a pesticide formulation that is toxic to the pest. Become familiar with the active ingredients. "Other" or "Inert Ingredients" are carriers which may or may not be toxic to the target pest.

Pesticide products generally are recognized by their advertised brand names. Pesticides with different trade names can have the same active ingredient.

Chemical Formulations - The formulation of a chemical refers to the form in which a pesticide is prepared for sale. Some of the more common formulations that the gardener may encounter include “ready to use” (RTU), “emulsifiable concentrate” (EC), “flowable” (F), “granules” (G), “dust” (D), and “wettable powder” (WP). The same pesticide may be available in more than one formulation. Different formulations of the same pesticide may be more effective in certain circumstances and may be registered for different uses. It is important that the user read the label to be sure that the correct material is being selected for the job.

Days to Harvest - Some pesticides require a period of time for residues to dissipate before treated produce can be safely used. This information is found on the LABEL of the pesticide.

Disclaimer -The most reliable information was included that was available at the time this information was compiled. Due to constantly changing laws and regulations, UMass Extension can assume no liability for recommendations. The pesticide user is always responsible for the effects of pesticide residues on their own crops, as well as problems caused by drift from their property to other properties or crops. Always read and follow all instructions on the label.

Partial List of Pesticides by Active Ingredient for Vegetable Gardens

WARNING! PESTICIDES CAN BE DANGEROUS. Read and follow all directions and safety precautions on container labels. Handle carefully, and store in original containers with complete labels, out of reach of children, pets, and livestock.

References:

Caldwell B., Brown Rosen E., Sidera E. Shelton A. and C. Smart. 2005. Resource Guide for Organic Insect and Disease Management.

<http://www.nysaes.cornell.edu/pp/resourceguide/>

Colorado State University Cooperative Extension Home Use Pesticide Database.

<http://wsprod.colostate.edu/cwis487/hup/Default.aspx>

New England Vegetable Management Guide

<http://www.nevegetable.org/>

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