Insect Management in Home Vegetable Gardens

Introduction

The pride gardeners feel from producing vegetables is enhanced by reduced food costs and the benefits of outdoor recreation. Louisiana, like many southern states, is blessed with long growing seasons which make year round gardening possible.

To be successful, however, you must have an insect management program. It should include frequent surveys of the garden (once or twice weekly) to detect problems early. You must know how to look for insects and their injury (something an insect has done to a plant, for example, chewed leaves, mined leaves, holes in fruit, etc.) and be able to identify those you find. Identification is the key. It tells if the insect is a beneficial or pest and helps you determine what to use if controls are necessary. Improper application of pesticides can waste time and money, release pest problems if beneficials are killed, result in resistance of the pest to the pesticide or injure the plants through phytotoxicity.

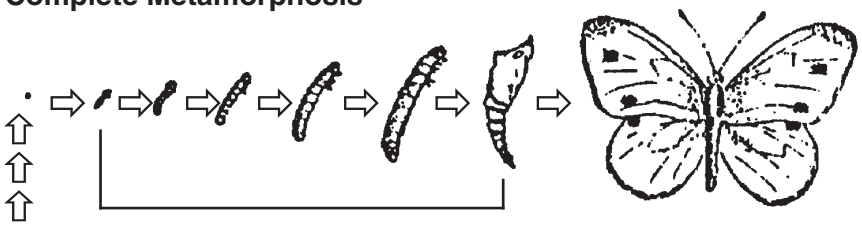
Louisiana has an estimated 337,106 home gardens with an estimated total cash value of nearly $88 million. The same conditions which let us produce vegetables year round, however, enable insects to reproduce and thrive year round. Many insect problems can affect vegetable plantings. Some occur seasonally, and others are sporadic. No one can tell from year to year what the problems will be. This information was compiled to help home gardeners manage and control insect pests.

Insects may attack all parts of a plant, from the seed to the fruit, at any point in the plant's development. Contact a county agent in your parish LSU AgCenter Extension office for help in identifying insects.

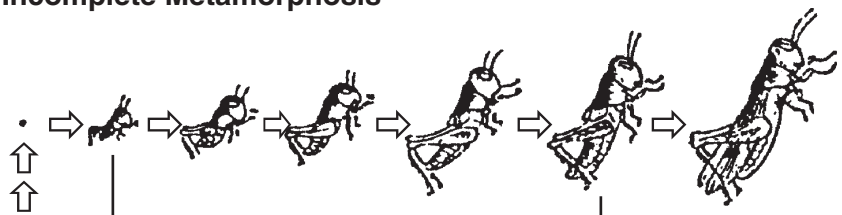
Types of Insects

Life Cycle - Complete and Incomplete Metamorphosis

Complete Metamorphosis



Incomplete Metamorphosis



Garden pests can be divided into four distinct groups according to the plant parts attacked.

Soil Insects:

Soil insects feed and establish infestations on grasses and weeds. Home gardens are planted in areas previously covered with grass, so it's important to plan early where you will plant your garden. This will give you time to till or spade the area thoroughly before planting so that the grass is removed or killed and the soil is free of grass and weeds for 30 days or more before you plant.

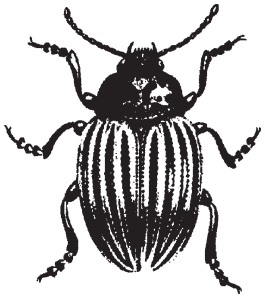
Several insects live in the soil and feed on the roots or tubers of vegetable crops. They are of particular importance when you grow carrots, potatoes, turnips or radishes, which have the edible parts below ground. When you remove the grass or weeds from the area after planting, you force these insects either to move or feed on the crops.

Soil insects will feed on the seeds at planting or on the young plants as they begin to grow. This group includes maggots (corn seed and cabbage), wireworms, grubs, mole crickets, slugs and cutworms.

Chewing Insects that Feed on Foliage and Stems:

Butterflies, moths and beetles are the primary pests in this group. The caterpillars (worm stage) of butterflies and moths are primarily foliage feeders, consuming large quantities of plant tissue once they are half grown. The adults do not feed on the plant. Caterpillars have three pairs of jointed legs just behind the head and a pair

of anal prolegs (fleshy legs that are not jointed) at the end of the body. They may have from one to four pairs of prolegs on the abdominal section. This group includes armyworms, hornworms, loopers, diamond-backed moths, leafrollers, leaf miners and others. In contrast to butterflies and moths, beetles may feed as adults on the foliage and on the roots (flea and cucumber beetles) as larvae, or both the adult and larvae may feed on the foliage (Mexican bean beetles, Colorado potato beetle and squash beetle). The greatest loss is caused by beetle larvae feeding on the roots. Only extremely high densities cause serious loss through foliage feeding alone. Some, like the cucumber beetle, also transmit diseases.



Colorado Potato Beetle

Piercing/Sucking Insects and Mites:

This group feeds through highly modified mouthparts that are developed for piercing and sucking. They insert their mouthparts into the plant tissue and suck out the plant juices. In short, their mouthparts function like hypodermic needles or like mosquitoes. Piercing/sucking insects may inject enzymes and toxins into the plant tissue as they feed, causing abnormal plant growth. They may also infect plants with various viruses or bacterial diseases. This large group includes aphids (plant lice), leafhoppers, stinkbugs, squash bugs, leaf footed plant bugs, thrips and mites.

Insects that Feed On Pods and Fruits:

This group is by far the most damaging. Plants with some root or foliage injury can overcome the injury and produce some part of a crop. Injury to the end products, the seeds and fruits, however, is more difficult to overcome. Increased monitoring of the garden at pod and fruit set is required for maximum protection from insects. These pests include the corn earworm, stink bugs, cowpea curculio, pickle worms, pinworms, wireworms, potato tuberworms and others.

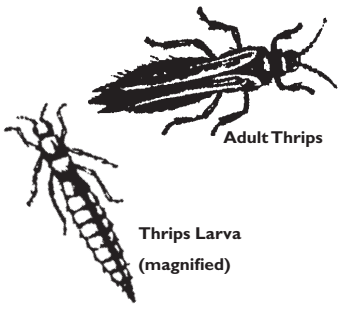
Alternatives to Pesticides

Cultural Techniques:

Several methods, other than insecticides, may be used for pest control. Depending on the pest, plant crops early or late in the growing season to allow time for the crop to grow and reach maturity before or after peak times for an individual pest. Rotate the crops from year to year and from location to location if the garden area is large enough. Good sanitation in and around the garden may reduce potential insects and disease pressure by 0% to 40%. Remove grass piles and growths along ditches and fences to help eliminate these problems. Immediate removal of crop residues or plants if killed by diseases or pests and periodic turning of the soil when the garden is not in production will eliminate soil pests and possible hosts for their development.

Spacing of plants and seed at planting will also help to reduce problems. Plants too close together don't grow properly and are usually stressed. This is an open invitation to pest problems. Properly spaced plants have good air passage, grow well and are more productive. If sprays are necessary and plants are thick, proper coverage may be impossible.

Mulches can assist in insect control but may also cause some problems. Plastic mulches sprayed with aluminum or silver paint, when used under peppers, tomatoes, squash and other vegetables, reflect light on the underside of the plants and help to repel aphids and other insects. This also helps to reduce some insect-borne disease problems, but, snails, slugs and ants like these mulches because they make good habitats for them. The use of other mulches will not have the repelling effect but can conserve moisture and help hold down weeds, but they are still ideal for increases in slug, snail and ant densities.



Adult Thrips

Thrips Larva (magnified)

Beneficial Insects:

It is sometimes said that the only good insect is a dead insect, but only about one in 50 in a vegetable garden is considered a pest. In nature there are NO pests. Insects are either consumers or recyclers. They are part of the ecosystem. A pest is an organism that competes with humans for a resource. This is why identification of an insect is so vital to growing a successful garden.

Many people are familiar with lady beetles or praying mantids, but many more insects are just as effective in helping to control pests. These include lacewings (both adult and larvae), lady beetle larvae, tiger beetles, some ground beetles, just about all wasps, ambush bugs, some stinkbugs, big-eyed bugs and robber flies.

Beneficial insects are sold through mail order houses but depend on pests for survival. These insects may be used effectively in the garden with proper management and control techniques. Many beneficials, especially the predators, do not discriminate between good and bad insects. They eat what they can catch when they can catch it. For example, lacewings lay eggs individually on the end of a silk stalk about 1/2 to 3/4 of an inch above the plant surface. If the eggs were laid in a cluster or individually on the plant surface, the first larva to hatch would eat the remaining eggs. The larvae can climb down the stalk after hatching, but not up. Praying mantids would eat each other, but the nymphs don't all hatch at the same time from the egg case.

Beneficials, if purchased, should be obtained in the immature stage because immatures will develop where they are placed. Adults have a tendency to fly off.

Chemical sprays are hard on beneficials. If misapplied, they may kill the beneficials and release a pest infestation the beneficials were controlling or maintaining below economic levels. Remember: Once you begin sprays, a regular program may be required to maintain low densities of pests.

Biological-control Agent:

Where caterpillars are the primary pest problem, an option to chemical control is available. *Bacillus thuringiensis*, a bacterium, is an excellent means of non-chemical caterpillar control. The bacteria produce a poison (delta-endotoxin) that is used to kill insects. The toxin, and not the bacteria, is in the pesticide. The toxin is harmless to warm-blooded animals and beneficial insects, but it kills caterpillars. *B.t.*, as it is called, is sold under the names Dipel, Bactur, Thuricide and Bitrol.

Natural Insecticides

At times, no matter what is done, applying pesticides is necessary. At these times, choose insecticides that have low mammalian toxicity, and follow label directions. By understanding pesticides, you can use these materials more effectively without harmful side effects. Many organic gardeners often use natural insecticides and homemade botanical sprays instead of today's synthetic organic chemicals. Some synthetic organic pesticides are less toxic to humans and more effective than some of the natural insecticides, however.

Biotanicals:

Pyrethrum is a slightly toxic insecticide derived from a species of chrysanthemum flower. It causes rapid paralysis of most insects, but they usually recover unless the pyrethrum is used in combination with a synergist or other poison.

Nicotine in its pure form is an extract from tobacco and is highly toxic to warm-blooded animals. Dusts can irritate the skin and are not normally used in gardens. It, like pyrethrum, degrades quickly, so it can be used on many food plants close to harvest.

Sabradilla is made from the seeds of a lily-like plant and acts as both a contact and stomach poison for insect pests. It is not very toxic to mammals but does cause eye and respiratory tract irritations. Wear a mask when using this material.

Rotenone is extracted from the roots of Derris plants. This general garden insecticide is highly toxic to fish and insects and moderately toxic to mammals. Wear a mask, because rotenone can irritate the respiratory tract. It acts slowly and is broken down in sunlight and air in about a week.

Soaps:

Soaps have been used since the 1800s for insect control. Whale oil soap and then fish oil soaps were used to control insects. It is not completely understood how soaps work. Some wash off the outer waxy layer of the insect's cuticle, causing the insect to dry up and die. Other soaps have insecticidal properties which affect the nervous system of plant-eating insects yet do not affect beneficials or honeybees. Several soaps have insecticidal properties, but only Safer's Insecticidal Soap is registered for use on garden crops.

Natural Spray Mixtures + Companion Planting

Spray mixtures have been made from natural chemicals in plants and diseased insects. Such mixtures have been applied to crops for years. These sprays are erratic and, in most cases, ineffective. Success is likely to be sporadic.

Companion planting or planting marigolds, nasturtiums or garlic between garden vegetables is not very effective. These plants have pest problems and may be a source of mites, aphids or whiteflies.

Home Garden Pesticides

What to Buy?

This can be a problem for those who go to purchase pesticides without knowing what they need. The materials on the shelves are endless, with all kinds of labels, names and formulations. There are three basic groups of pesticides: 1) insecticides—kill insects, 2) miticides—kill mites, 3) fungicides—control or prevent disease organisms. Determine what you need, and buy only enough so that it can be completely used during the growing season. This helps to control the pest problem and saves money. It's cheaper to buy additional materials than to waste money by over purchasing.

Buying only what you will use in a season removes the problem of disposing of last year's materials. It prevents you from trying to increase the dosage to try to use up the carryover materials. This could lead to phytotoxicity on the garden plants. Increased dosage increases the carrier, which is the primary cause of phytotoxicity.

When possible, buy a combination material (insecticide and fungicide). This gives fewer problems in mixing and storage and reduces the possibility of errors when spraying.

In buying pesticides for mixing, it's best to purchase the same formulations. If you buy an emulsifiable concentrate (EC) insecticide, buy the same formulation (EC) fungicide. Do the same if wettable powders or soluble powders are purchased. This prevents problems with the carriers and gives you a compatible solution for application.

Disposal of leftover pesticides and empty containers is important. The proper practices are described in Extension publication 2416-F, "Pesticide Container Disposal."

How to Spray

There are several types of sprayers on the market from hose applicators to 3-gallon pump sprayers. All will put the material out in a spray, but just spraying a material haphazardly is not completely effective. Sprays must be directed to where pests are feeding. Directed sprays are essential to control pests. Several factors affect the control obtained.

1. Did you identify the pest problem?
2. Do you have the right material?
3. Is your water pH within the correct range? Water pH in Louisiana ranges from 3.3 to 11.2. The optimum range for spraying pesticides is 5.5 to 6.5. If water pH is higher or lower than the optimum, it can break down the chemicals so that they may be only partially effective or completely ineffective. Where pH is a problem, additives (acids or bases) may be used to correct it.
4. Did you use the correct amount?
5. Is the sprayer functioning properly?
6. Is the spray directed against the pest?

Use Pesticides Safely

Pesticides are made to kill and, when used improperly, they can kill anything, including the applicator. When used correctly, however, they are miracles equivalent to medicines such as penicillin.

1. Before using any pesticide, always READ THE LABEL.
2. Do NOT smoke or eat while you are applying pesticides.
3. Avoid spilling material on yourself in the working area. If spills occur, WASH AREA IMMEDIATELY.
4. Wear long sleeves, gloves and a face mask when spraying.
5. Do not spray on windy days. Remember, YOU are responsible for spray drift.
6. Do NOT permit pesticide containers to lie around. Store them under LOCK AND KEY and AWAY from children and pets. Dispose of empty containers properly.
7. Keep children and pets AWAY from areas when mixing or spraying insecticides.
8. Wash hands and face, and change clothes after spraying. If sprays are blown back on you, shower with soap and water.
9. Allow proper time intervals between application and harvest.
10. When applying pesticides, remember the pollinators and apply the material in the late afternoon.
11. Allow proper time intervals before reentry.

Control Recommendations for Home Vegetable Gardens

t = teaspoon T=Tablespoon WP=Wettable Powder EC=Emulsifiable Concentrate D=Dust M=Miscible S=Sprayable

Crop	Pest	Insecticide & Formulation	Amount Per 1 Gal Water	Days Before Harvest	Application Procedure
Beans	Beetles	**Sevin 80%S or	2 T.	0	As needed. Weekly after pod set. Not more than 3 applications/ season.
	Leafhoppers	Thiodan 50% WP	3 T.	3	
		4% D.	1.5 oz./50 ft. row	3	
Beets	Webworms, Vegetable Weevils	Malathion 57% EC.	2 t	7	When insects appear.
Broccoli, Brussels Sprouts	Caterpillars	B.T.*			Use alone or in combination with Thiodan. Weekly, use wetting agent in sprays.
		Thiodan 50WP	3 T.	7	
Cabbage, Cauliflower, Collards	Aphids	Malathion 57% EC	2 t.	7	Use alone or in combination with Thiodan. Weekly, use wetting agent in sprays.
		or Thiodan 4% D.	1.5 oz./50 ft. row	0	
Cantaloupe	Aphids, Beetles, Caterpillars	Malathion 57% EC	2 t.	3	When insects appear. Do not use Sevin for aphid control.
		Thiodan EMS	3 T.	0	
		50% WP	3 T.	0	
		or Sevin 80% S.	2 T.		
		or Methoxychlor 50% WP	1 3/4 T.	1	
		25% EC	7 t.	1	
Carrots	Leafhoppers, Vegetable Weevils	Malathion 57% EC	2 t.	7	When insects appear.
Cucumbers	Beetles, Pickleworm	Thiodan 4% D.	1.5 oz./50 ft. row	0	Treat weekly when pickleworm is present.
		EMS	3 T.	1	
		50% WP	3 T.	1	
		or **Sevin 80% S.	2 T.	0	
	Aphids	Malathion 57%	2 t.	1	
Eggplant	Spider mites, Aphids	Vendex 50WP/4L	1-1 1/2 T./2-4 t.		When insects appear.
		Malathion 57% EC	2 t.	3	
		M-PEDE	3 T.	0	
	Caterpillars	**Sevin 80% S. B.T.*	2 T.	0	
	Flea Beetles	Thiodan 50% WP	2 T.	1	
		or Sevin 80% S.	2 T.	0	
	Whiteflies	Thiodan 3EC	1 1/2 T.	1	
		50% WP	2 T.	1	
English Peas	Aphids	Malathion 57% EC	2 t.	3	When insects appear.
Irish Potatoes	Aphids	Malathion 57% EC	2 t.	3	When insects appear.
	Leafhoppers	**Sevin 80% S.	2 T.	0	
	Beetles	Melathion 57% EC	2 t.	3	

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Crop	Pest	Insecticide & Formulation	Amount Per 1 Gal Water	Days Before Harvest	Application Procedure
Lettuce	Aphids	Malathion 57% EC	2 t.	14	When insects appear. Only 2 applications of Thiodan/year.
		or Thiodan 4 D	1.5 oz./50 ft. row	14	
		50% WP	3 T.	14	
	Caterpillars	B.T.*			
Mustard	Aphids	Malathion 57% EC	2 t.	7	When insects appear.
		Dimethoate 267 (Cygon)	2 T.	7	
	Vegetable Weevils	Malathion 57% EC	2 t.	3	
	Caterpillars	Malathion 57% EC	2 t.	7	
		or Sevin 5% D	0.75 lb./100 sq. ft.		
Okra	Aphids	Malathion 57% EC	2 t.	1	When insects appear.
	Stinkbugs, Earworms	**Sevin 80% S.	2 T.	0	
Onions, Shallots	Thrips	M-PEDE	3 T.	0	When insects appear.
		Malathion 57% EC	2 t.	3	
Parsley	Aphids	Malathion 57% EC	2 t.	21	When insects appear.
	Beetles, Caterpillars	** Sevin 80% S. B.T.*	2 T.	14	
Peppers	Aphids	Malathion 57% EC	2 t.	3	When insects appear.
		or Thiodan EMS 50% WP	1 1/2 T.	1	
	Pepper weevil, Vegetable weevils	**Sevin 80% S.	2 T.	1	
		Malathion 57% EC	2 t.	3	
	Beetles, Caterpillars	**Sevin 80% S.	2 T.	0	
Pumpkin	Aphids	Malathion 57% EC	2 t.	3	When insects appear.
	Squashbugs, Beetles, Vine Borer	**Sevin 80% S.	2 T.	0	
		or Methoxychlor 50% WP	1 3/4 T.	1	
		25% EC	7 t.	1	
Southern Peas	Aphids	Malathion 57% EC	2 t.	7	When insects appear.
	Curculio, Stink bugs, Earworm	**Sevin 80% S.	2 T.	0	
		M-PEDE	3 T.	0	
Spinach	Aphids, Caterpillars	Malathion 57% EC B.T.*	2 t.	7	When insects appear.
		M-PEDE	3 T.	0	
Squash	Aphids	Malathion 57% EC	2 t.	1	Weekly when beetles, pickle-worms or vine borers present.
	Pickleworm, Beetles, Vine Borer	**Sevin 80% S.	2 T.	0	
		or Methoxychlor 50% WP	1 3/4 T.	1	
		25% EC	7 t.	1	
Sweet Corn	Earworm, Fall Armyworm	**Sevin 80% S.	2 T.	0	Treat silks every other day for earworm.
Tomatoes	Aphids	Malathion 57% EC	2 t.	1	When insects appear.
	Fruitworm, Hornworm, Stink bugs	**Sevin 80% S.	2 T.	0	Weekly from bloom through harvest.
	Stink bugs, Whiteflies	Thiodan EMS	2 T.	1	
		or 50% WP	2 T.	1	

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Crop	Pest	Insecticide & Formulation	Amount Per 1 Gal Water	Days Before Harvest	Application Procedure
Turnips	Aphids	Malathion 57% EC	2 t.	7	When insects appear.
				7 (when tops used as food)	
	Beetles, Worms	**Sevin 80% S.	2 T.	3 (roots)	*Don't use Sevin for aphids.*
				14 (tops)	
Watermelon	Aphids, Beetles	Malathion 57% EC	2 t.	1	When insects appear.
		or Methoxychlor 50% WP	1 3/4 T.	1	
		25% EC	7 t.	1	
		or Thiodan 4 D	1.5 oz./50 ft. row	1	
		Thiodan EMS	3 T.	1	
		Thiodan 50% WP	3 T.	1	
		or **Sevin 80% S.	2 T.	0	*Don't use Sevin for aphids.*

General Pests

Pest	Crop	Insecticide	Rate	Limitations
Cutworms	Cabbage, Corn, Cantaloupe, Mustard, Pepper, Tomato, Watermelon	Carbaryl 80%S	2 T.	
Leafminers	Beans, Cantaloupe, Mustard, Pepper, Tomato, Watermelon	Dimethoate	1 1/2 t. per gal. of water	See label for waiting period between application and harvest.
Mites	Beans (Dry, green lima, snap)	Dimethoate 267	1 1/2 t. gal water	0
		Kelthane 35WP	1 1/2 t. gal water	7
		Kelthane 18.5 EC	1-1 1/2 t. gal water	7
	Cucumbers, Cantaloupe, Melons, Pumpkins, Squash	Kelthane 35WP	1 1/2 t. gal water	2
		Kelthane 18.5 EC	3/4-1 t. gal water	2
	Tomatoes, Peppers	Kelthane 35WP	1 1/2 t. gal water	2
		Kelthane 18.5 EC	3/4-1 t. gal water	2

*Follow label instructions; sold as Dipel, Bactur-W, Thuricide and bactospeine.
**Sevin can be purchased as a 5% or 10% dust.

This material is based upon work supported by the Cooperative State Research, Education and Extension Service, U.S. Department of Agriculture, under Award No. 2006-41210-03363. All opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U. S. Department of Agriculture.

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Pub. 2341 (8M) 2/07 Rev.
Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. The Louisiana Cooperative Extension Service provides equal opportunities in programs and employment.