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Pest Control Alternatives

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Pest Control Alternatives

A practical guide to the control of garden pests through sound management and alternative pesticides

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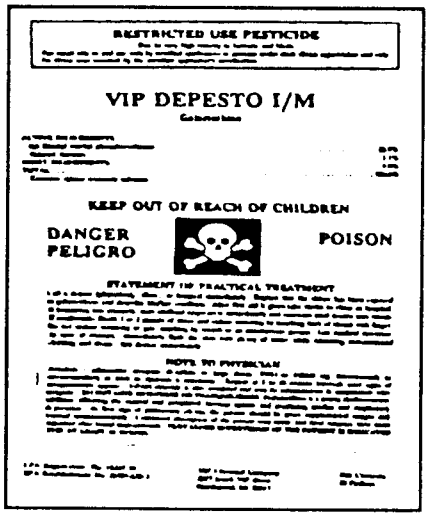
Pest Control Measures

Lawn and garden pests can be controlled using several different methods. Some individuals choose to use natural or botanical pesticides because they feel they are safe. Although this is normally true, few natural pesticides have undergone the stringent toxicological tests required for synthetic pesticides. Plants themselves manufacture natural pesticides to resist pests; however, natural does not always mean safe. In fact, some of the most toxic chemicals known to man occur naturally in plants. Most pesticides, both natural and synthetic, normally occur in very small amounts in plants. Humans usually eat a variety of foods, so the risk we face from pesticides is very small. However, the risk from improperly or carelessly applied pesticides can be substantial!

Not all pesticides, either organic or chemical, are created equal. Some pesticides are very toxic to insects and humans while others, relatively safe and innocuous to humans, are effective insecticides or fungicides.

One way to assess the human toxicity of a pesticide is the LD-50. The lower the LD-50 rating of a pesticide, the more toxic it is to humans. Another more obvious rating is the signal word on the pesticide label. Pesticides with the word **CAUTION** on the label have a LD-50 rating of 501 to 5000. A signal word of **WARNING** is used for pesticides with a LD-50 rating of 51 to 500, while **DANGER** denotes a pesticide with a LD-50 of 0 to 50. Consequently, pesticides labeled with **CAUTION** are less dangerous to use than pesticides labeled with **WARNING** and less dangerous than pesticides labeled with **DANGER**.



Although many organic types of pesticides are seldom labeled with signal words, do not assume they are safer than chemical pesticides. Nicotine, for example, is a very toxic poison. Horticultural oils and insecticidal soaps can be very effective pesticides yet they are extremely safe to use.

Use caution when using pesticides. Be careful when handling any type of pesticide, and always follow label directions closely. If synthetic or botanical pesticides are used, follow label directions regarding amounts to use, harvest interval (or waiting period) before using the food, and other safety precautions listed on the label.

When botanical or synthetic pesticides are used according to label directions, they should be safe to use and treated produce will be safe to eat. However, as a standard precaution, it is always a good idea to give fresh vegetables and fruit a thorough rinsing with plain water before preparing or eating them. This rinsing will not only remove any pesticide residue but will decrease the number of bacteria, fungi and other organisms on the produce that may be harmful to you or may decrease produce storage life.

Control Through Management

Poorly managed crops are more prone to attack by insects and diseases than are healthy plants. One of the primary goals in crop management is to provide for the cultural requirements of the plant. Plant stress results when these requirements are not met. Extremes or deficiencies in heat, water, drainage, aeration, or nutrients as well as competition from weeds are primary sources of plant stress. Plants that are not severely stressed can cope with small infestations of insects or disease. Healthy plants seldom attract insects and disease pathogens. Try to plant healthy, pest- and disease-free plants and then strive to keep them healthy.

Crop rotation -- This is the practice of planting particular crops in a different location from one year to the next. Insect, weed, and disease pests of a crop often become more numerous when the same plant or crop is planted in the same area of a garden year after year. Rotating the crops you plant each year will prevent these pests from becoming established. Remember that the pests of a particular crop will probably attack other crops in the same family. For example, tomatoes, peppers, eggplant, and potatoes are in the same family while cucumbers, melons, pumpkins, and squash are members of another family. So, when rotating crops, rotate families as well.

Sanitation -- Removal of heavily diseased plants during the growing season and removal of crop residue in the fall after harvest are two good ways to reduce the number of insects and disease pathogens that will over-winter to infest next years crops. Once a plant becomes heavily infested, it's a source of the disease or insects to spread to other plants. The best way to treat plants like this is to remove them from the garden.

Weed control -- Weeds may harbor many insect pests and disease pathogens. In addition, weeds compete with crop plants for water, light, and nutrients. Keeping a garden free of weeds will not only reduce insect and disease pests but will improve the appearance of the garden or yard.

Resistant plant varieties -- Resistant plants will not be susceptible to a particular disease or insect pest, or they can grow and produce a crop in spite of the pest or disease being present. The resistance or tolerance of a certain plant may be very specific. A plant that is resistant to one particular disease may be susceptible to other diseases. Using resistant varieties is a good way to decrease the amount of pesticides you might need to use.

Manipulating the environment around plants -- Before a disease or insect will become a problem, you must have three things:

- a susceptible plant,
- the pest, and
- the right conditions for the pest to infect the plant and become established.

Poor air circulation and high humidity often will foster disease development. Therefore, properly spacing and staking plants, keeping the foliage dry, and allowing good air movement will reduce disease problems. Certain insects become more serious under hot, dry conditions. Mulching helps to maintain good soil moisture and cooler soil temperatures. Mulching combined with proper watering will help reduce the risk of some insects and other pests. Conversely, mulch may increase the likelihood of attack by some pests such as slugs.

Traps and Barriers

A variety of barriers can protect plants from some insect pests by keeping the pest away from the plant. Drape materials such as cheese cloth, mosquito netting, old sheer curtains, horticultural fleece, or window screen over plants to keep insects from coming in contact with healthy plants. This technique works well for insect pests such as caterpillars or maggots since the larger adults cannot get to the plants to lay their eggs.

Other physical barriers also can be effective for soil-borne insect pests like cutworms. Remove the bottoms from old cans, milk cartons or other containers and place over plants to keep pests away from the stems. Place a paper, cardboard, or plastic collar around plants to keep cutworms away from plant stems. Be sure to bury the bottom of the collar at least one inch below the ground to keep insects from crawling underneath.

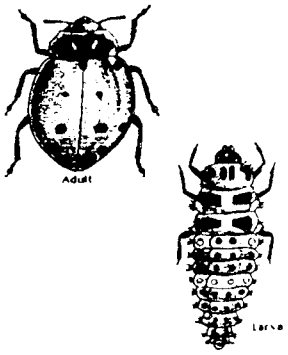
Catch slugs in the garden or flower bed by using a simple trap consisting of a saucer of beer, placed at the soil surface. Place old boards or other flat materials on the ground to attract slugs during the night. Flip the boards over the next day and collect or kill the slugs.

A variety of insect traps are available on the market, many of which are effective monitors. Be careful when using traps that attract insects, like light, scented or pheromone traps. These traps can be so effective that they may attract more insects to your garden and yard than ordinarily would be present. Place attractant traps away from your garden so incoming insects do not stop and make a meal of your plants on the way to the trap.

Sticky traps also are used primarily as monitoring tools and are not really an effective means of control; they are used to monitor insect population levels for timely pesticide application. Apply Tanglefoot or another thick, sticky material to red, apple-sized balls and hang them in apple trees to attract and capture apple maggot adults. Tanglefoot can be used in a number of other ways to trap crawling or flying insect pests. Catch whiteflies by hanging yellow, sticky cards around plants susceptible to whiteflies. The yellow color attracts these small, flying insects and they are captured on the sticky surface. A few whiteflies on the cards may indicate that large numbers of insects are present on the plants and that it 's time to spray.

Beneficial Mites, Insects, and Bacteria

Many insects, mites, and related arthropods perform valuable functions for humans including pollination of flowers, breakdown of organic material, and aeration of the soil. Some of these tiny creatures also perform a valuable service by preying on other damaging pests.



Predatory insects include the familiar ladybird beetles, praying mantid, green lacewings, and other predacious mites, flies, beetles, and bugs. Some predatory insects are specific in the type of insect they feed on. Others are general feeders, often eating any smaller insects they meet, even others of their own kind.

Certain insects are parasites of other insects, for example, various types of wasps parasitize various caterpillars, aphids, scale, and whiteflies. Unlike predators, these parasitoids rely on their prey to act as a host for development of their young. So, they are very specific as to which pests they attack.

Certain bacteria, viruses, protozoa, fungi, and nematodes also can act to parasitize various insect pests. To be effective, these often need to be eaten or come in direct contact with the insect. Once eaten, the organism will release toxins that will kill the pest. *Bacillus thuringiensis* or BT is commonly used to control caterpillars. When the caterpillars eat this bacteria, the bacteria multiply in the gut of the caterpillar and produce a crystalline toxin which kills the host insect. New formulations of BT have been developed to kill fungus gnat larvae, mosquitoes, black fly, and certain beetles.

Sources for predators and parasites are becoming more numerous as many gardening and seed catalogs now stock them. Gardeners have been very successful in controlling pests by using predators. However, remember that many predators and parasites need a certain population of the pest to be present to keep the predators fed and in the area. If food becomes limited, predators may move out of the area or die.

Pesticide use must be modified so beneficials will not be harmed while maintaining a sufficient food supply for the predators. Beneficials will often need to be reintroduced into the garden to provide for season-long or year-to-year control.

Commonly Used Botanical Insecticides

PYRETHRINS

Pyrethrin-type insecticides are derived from a type of chrysanthemum flower that has insecticidal properties. Pyrethrins rapidly kill insects by disrupting potassium and sodium metabolism. However, insects may develop resistance. Pyrethrins have low mammalian toxicity. Pyrethroid insecticides are synthetic pyrethrins that are more effective, longer lasting, and yet pose little threat to humans.

DIATOMACEOUS EARTH (DE)

This powdery material is actually made up of microscopic skeletons and shells of tiny marine organisms. DE kills by scratching and scraping the waxy body covering of soft-bodied insects that crawl through it. The insects eventually die from dehydration. DE is extremely safe to use, but it needs to be reapplied frequently and is most effective during dry weather.

SABADILLA

This pesticide is derived from the ripe seeds of a tropical lily. It contains several different alkaloids that are toxic to insects since they affect nerve cell membrane function. Sabadilla dust is one of the safest botanical pesticides, but it can be quite hazardous in its purified form. It's a general, broad-spectrum contact insecticide, particularly effective against the true bugs (order Hemiptera) like squash bug.

NICOTINE

This is a simple alkaloid derived from tobacco. Although many people routinely inhale small quantities of nicotine while smoking, in its purified form it is toxic to insects as well as mammals and humans. Nicotine is an extremely fast nerve toxin, and it often is used as a greenhouse fumigant or spray for soft-bodied insects. Use extreme caution when applying this material.

RYANIA

This insecticide comes from the powdered stem wood of a South American shrub. It 's a slow-acting stomach poison, so it must be eaten to become effective. Ryania has longer residual activity than other botanical insecticides. It often is mixed with other insecticides for use on vegetables and fruits. Ryania is moderately toxic if eaten by mammals but only slightly toxic through dermal exposure.

NEEM

This is a complex mix of biologically active materials from the Neem tree which grows in arid, tropical regions. Neem acts as a feeding deterrent and insect growth regulator, but it also may act as a sterilant or toxin. Neem has extremely low mammalian toxicity and usually is non-irritating to skin. Margosan-O is one of the most commonly registered Neem products, and it controls a wide variety of ornamental and field pests.

ROTENONE
This plant-derived insecticide provides fairly good control on a wide range of chewing insect pests. It kills by inhibiting cellular respiration. Rotenone commonly is used on potato beetles and caterpillars. This insecticide has fairly low human toxicity, but it is very toxic to fish.

INSECTICIDAL SOAPS
These are made from the salts of fatty acids. Soaps kill insects by breaking down the cell membrane and disrupting cell metabolism. Mammalian toxicity is very low. Insecticidal soaps are very similar to soaps or detergents used in the home.

Soaps are active against many soft-bodied pests including aphids, scales, mealybugs, whitefly nymphs, and mites. When using insecticidal soaps, coverage of the pest is extremely important as there is no residual effect. However, soaps may have a phytotoxic effect on some plants. Always check the label for a list of sensitive plants. The likelihood of phytotoxicity may be reduced by rinsing the plants shortly after application.

Many people use home soaps or detergents to control insects. However, these soaps are designed to dissolve grease and oil. Plant damage may be more likely with these products than with those manufactured specifically for insect control.

SUPERIOR HORTICULTURAL OILS
Dormant oil sprays have long been used to control overwintering stages of certain scales and mites. Although dormant oils are still an important management tool, use of superior oils for verdant (summer) application also is an option for some pest-plant combinations. Superior oils have a higher purity (less sulfonated compounds) than dormant oils, which increases plant safety. However, the superior oils still have restrictions on which plants can be sprayed, so consult the label before applying to a particular plant species.

Never apply oils to plants that are under water stress. Very hot, humid conditions often will increase likelihood of phytotoxicity.

Superior oils are effective against a wide range of insects and mites similar to the insecticidal soaps. Oils kill insects by interfering with respiration and cell membrane function.

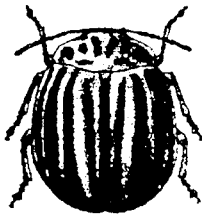
Suggested Controls for Common Pests

APHIDS
These soft-bodied insects may infest a wide variety of plants and can multiply rapidly under good conditions. Look for these small green, white, blue, or dark-colored insects, in large groups, along tender shoots and under

leaves. In some cases leaves will become distorted when aphids are present. Kill small numbers by rubbing or brushing them off the plants, or prune out infested shoots.

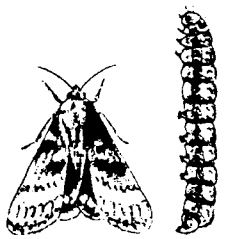
Control measures include using resistant varieties, netting, diatomaceous earth, insecticidal soap, 2 to 3% superior oil, 1% Rotenone dust, nicotine sulfate, or pyrethroid insecticides. Aphids also may be swept from the plant with repeated, forceful sprays of water. An aluminum foil mulch or interplanting with chives, garlic, mints, onions, or petunias also may deter infestation.

POTATO BEETLE
These small insects are common pests of potatoes but also may be found on peppers, tomatoes, egg plant, and other related plants. Most damage is done by the small, orange to pink-colored larvae which feed on leaves and stems. With large numbers, all the leaf tissue may be consumed, reducing plant vigor. Since the adults overwinter in plant debris, crop rotation and fall cleanup can reduce the problem. A mulch also will deter emergence of the over-wintering adults. The small, yellowish eggs or tiny larvae can be squashed easily on the leaves. Larger larvae or adults can be picked off and destroyed.



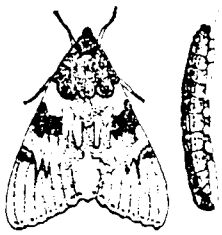
Control measures include netting, diatomaceous earth, or spraying with insecticidal soap, rotenone, or pyrethroid insecticides. Intercropping with tansy or catnip may deter this pest.

CORN EARWORM
These small, greenish worms cause their damage by feeding in the ear of corn. Damaged portions of the ear can be removed before cooking; however, most people try to control the earworms. The adults are buff-colored moths that deposit eggs on the silks. Control measures include BT as well as applying mineral oil or light horticultural oil to the silks after they begin to turn brown. Corn earworm is an occasional pest of corn in South Dakota. European corn borer is a more common pest of corn in this area.



CUTWORM

These variously colored caterpillars hide during the day only to come out at night in search of tender shoots to eat. Most small seedlings or young transplants are at risk.



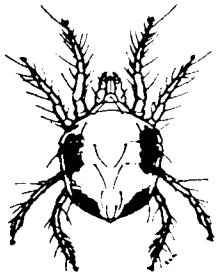
Protecting plants from these chewing pests with physical barriers is often the best means of control. A paper or cardboard collar or disk placed around the plant will keep the caterpillars from getting to the plant stem. Diatomaceous earth, sprinkled around the plants, also may offer control.

FLEA BEETLE

Flea beetles are tiny, shiny, black beetles about the size of a pin head. These active insects feed on a wide variety of plants by chewing small holes in the leaves. Very young plants may be killed, while larger plants may be weakened by their feeding. Protective barriers often are a good means of control. Pyrethroid insecticides and Rotenone are two good insecticides to use on this troublesome pest.

SPIDER MITES

These tiny, 8-legged pests may infest a wide variety of yard, garden, and houseplants. Warm temperatures and dry conditions favor their development and decrease generation time. Infested leaves often have a mottled, yellowish appearance. Close examination with a hand lens will reveal the tiny mites and, often, webbing on the underside of leaves, around new growth, or in leaf axils. Mites can be detected by tapping suspect leaves or twigs over a white piece of paper, then looking for specks moving about on the paper.



Keeping plants cooler and well watered and increasing the humidity will help keep spider mite numbers down. Vigorous misting with a forceful jet of water will often knock many of the mites out of the plant. Light horticultural oils and insecticidal soap can be very effective if the plants are sprayed thoroughly, especially the underside of leaves. Sabadilla dust may be effective. Destroy heavily infested plants.

SLUGS

These are small, soft-bodied members of the mollusk family and are closely related to snails. Typical garden slugs in South Dakota will be dark brown to gray and from one half to two inches long. They commonly are found in damp areas during cool weather, especially when much debris is present.

Slugs attack a wide variety of plants by feeding – mostly at night – on foliage, flowers and fruit. Slugs have a small mouth that causes ragged, streaked holes in the plant. Slug damage is easily identified by the characteristic slime trail they leave behind. Slugs will often hide under loose litter on the ground like bark chips, boards, rocks, or under heavy foliage.

A primary means of control is to eliminate daytime hiding areas or periodically to search out these hiding areas and kill any slugs that are found. Trap slugs by placing saucers of stale beer around plants so the lip of the saucer is at ground level. Protect plants from slugs by putting an aluminum screen fence around plants or by laying down a barrier of crushed egg shells, diatomaceous earth, coarse sand, or even salt, on top of a ring of petroleum jelly.

SQUASH VINE BORER

Squash vine borers are a common pest of squash, cucumbers, melons, and pumpkins. The most common symptom of attack by the larvae is the sudden wilting of a plant. When a larva is feeding inside a plant stem, frass often is seen outside its small entry hole. The stem also usually is swollen. The best control is to keep the adult moth away from the plant or kill the moth with a protective insecticide before it has a chance to lay its eggs. Apply a 1% Rotenone dust to the plant and the soil around the base of the plant. Adult moths also may be killed with a contact spray of pyrethroid. Once plants are infested, slit the stem and remove the larvae.

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