1981

G81-548 Organic Gardening in the Backyard (Revised June 1990)

Dale T. Lindgren
University of Nebraska - Lincoln, dlindgren1@unl.edu

Don Steinegger
University of Nebraska--Lincoln, dsteinegger1@unl.edu

Frederick P. Baxendale
University of Nebraska - Lincoln, fbaxendale1@unl.edu

John E. Watkins
University of Nebraska&#8211Lincoln, jwatkins1@unl.edu

G81-548-A
(Revised June 1990)

Organic Gardening in the Backyard

Successful organic gardening requires consideration of many factors, including resistant cultivars, crop rotation, sanitation, incorporation of organic matter, garden location, and insect and disease control.

Dale T. Lindgren, Extension Specialist-Horticulture
Donald H. Steinegger, Extension Horticulturist
Frederick P. Baxendale, Extension Entomologist
John E. Watkins, Extension Plant Pathologist

Organic gardening is growing in popularity. Although this technique traditionally has been limited to backyard gardens, commercial organic farms now exist in Nebraska. The phrase "organically grown" generally refers to produce grown and processed without the use of synthetic organic chemicals in pesticides, fertilizers, preservatives, or flavorings. The main arguments for organic gardening are that food is less likely to contain potentially harmful chemicals and that fewer chemicals are released into the environment. Arguments against it include possible lower yields and reduced quality produce.

For the home gardener, organic gardening is an attractive alternative to using synthetic pesticides. Organic gardening can be challenging, interesting and rewarding, even if only partially successful. However, growers may have to accept some damage and/or lower yields from disease or insects if they don't use pesticides.

Almost all growers use certain well established methods of organic gardening, such as resistant cultivars, crop rotation, sanitation and incorporation of organic matter. A discussion of these and other techniques follows.

Resistant Cultivars (Varieties) and Crops

Selecting cultivars with resistance or tolerance to disease and insect attack helps reduce pest damage. Examples include tomatoes with resistance to fusarium, verticillium, and nematodes and cucumbers tolerant to bacterial wilt. When gardening without the use of pesticides, select cultivars that are the most resistant or tolerant to pest problems. For more information on resistant cultivars, check garden catalogues, seed packages and Extension publications.

Crop Rotation

Crop rotation can reduce insect and disease damage since pests and disease-causing organisms tend to increase when their host is continuously grown in the same location. For crop rotation to be effective, you need to know the genetic relationship between common garden crops. For example, you should not follow tomatoes with peppers since these plants are closely related and many of the same diseases and insects attack both. Crop rotation is especially effective with soil home diseases. Rotation periods are three to five years and may be difficult in a small garden.

Mulches

Commonly used organic mulches include grass clippings, sawdust, straw, hay, ground com cobs, wood shavings and newspapers. Summer mulches control weeds, reduce water evaporation from the soil, stabilize soil temperature, reduce fruit rot on bare soil, and eventually can be incorporated into the soil to improve soil structure. Winter mulches stabilize soil temperatures, which minimizes heaving of perennial crops caused by alternate freezing and thawing, and reduces water loss from evergreen plant tissue. The effectiveness of organic mulches will depend on the material used, the thickness of the mulch layer, and the weed species involved.

Organic mulches are not problem-free. Weed seed can be introduced as a mulch contaminant or, in the case of straw, as small grain seed. Insects, rodents, and other pests may be attracted to the mulch as an overwintering site. Mulching too early in the spring can keep soils cool, thus reducing growth of warm-season crops. Winter mulch applied too early in the fall for winter protection may result in more winter injury than if no mulch were applied.

Inorganic mulches, such as black plastic, aluminum foil, and even old carpets, can provide some of the same benefits as organic ones. However, they cannot be incorporated into the soil at the end of the growing season. For more mulching information, refer to NebGuide *G95-1257, Mulches for the Home Landscape*.

Sanitation and Cultivation

Sanitation is important for controlling weeds, diseases and insects. Removing diseased plants will limit the spread of disease to healthy plants. Many pathogens survive between growing seasons on diseased plant material, so removing diseased plants, fruits and vegetables in the fall will lower the inoculum level the following spring. Also eliminate weeds in and near the garden as these may harbor insect and disease pests.

Use caution when bringing plants into the garden. Buy vigorous transplants that are free of abnormal growth, lesions, or diseased foliage. Seeds and vegetatively propagated plants such as potatoes and strawberries should be certified true to cultivar and virus-free.

Keep gardens weed-free. Some weeds serve as a reservoir for insects such as flea beetles, spinach leafminers and aphids that may later move to garden plants. Regular cultivation will expose soil insects to predators, parasites, and weather. Plow or spade gardens in the fall to incorporate compost into the soil and expose soil pests.

Compost

A compost pile (sometimes referred to as synthetic manure) in the backyard provides valuable organic material. Compost consists of partially decomposed plant material with or without special supplements. Materials most commonly used for compost include leaves, hay, lawn clippings, and miscellaneous plant parts from the vegetable and flower garden. Thus, composting uses plant materials otherwise wasted to improve the soil structure. The final product of the compost pile is incorporated into the soil to increase the percent of organic material, resulting in improved water-holding capacity and physical condition of the soil. Do not use diseased plant material in the compost pile because compost temperatures may not be adequate to eliminate disease-causing organisms. Read more about composting in NebGuide *G86-810, Garden Compost*.

Manure

Manure not only improves the physical condition of the soil, but is also a good source of nutrients. The composition of nutrients will vary with the age of the manure and handling practices. Manure does have its limitations. Animal waste can spread weed seed and, when applied in excessive amounts, inhibit the germination of desirable seeds and damage soil structure from the high sodium content.

Location

Most gardeners are limited in their choice for a garden site, but a proper location can help reduce pest problems. A shaded garden with little air movement will tend to have more disease problems. Avoid sites with poor drainage and soils with high salt content. Gardens next to open fields are more likely to suffer from grasshopper damage. Effective control of grasshoppers under these conditions is often impossible. In addition, sites must be conveniently located to a source of water.

Planting Dates

Some disease and insect problems are especially prevalent at specific, predictable times of the year. Many crops can be planted at dates that protect them from these high risk periods. By planting early maturing varieties of sweet com, you can avoid most earworm problems. A late planting of summer squash and carrots may avoid damage by the squash vine borer and carrot weevil. Conversely, warm-season crops, such as tomato and pepper plants, that are set out too early may end up stunted and unhealthy. Bean seed planted before soil temperatures warm sufficiently may rot or damp off.

Water Management

Plants suffering from either a lack of or excess of water will be less vigorous and more susceptible to disease. Thus, you should water infrequently but wet the entire root zone. Sprinkler irrigation, if used, should be done during the early part of the day to encourage quick drying of the foliage. Use drip

irrigation to keep the foliage dry; this will reduce some foliar diseases and conserve water.

Insect Control

When insect numbers are high, injury may be reduced but is seldom eliminated by nonchemical methods. Physical barriers, such as collars placed around young plants, will help protect against cutworms. Trapping methods, such as the use of flat boards or shingles placed on the ground near plants, will attract pests such as slugs, snails,and squash bugs in search of darkness, moisture, and protection. Here they can be collected and destroyed. Floating row covers consisting of lightweight, fine-meshed fabric can be loosely draped over crop rows and anchored to the soil at the edges. The small mesh size excludes nearly all insects the size of aphids or larger. These row covers also extend the growing season and moderate harsh summer temperatures. For crops that require insect pollination (e.g., squashes, cucumbers, melons) or that benefit from insect pollination (e.g., eggplants, lima beans, okra, peppers), row covers should be removed once flowering begins. Metal screens or cold frames used to cover small garden areas also will exclude many harmful insects as well as birds and rabbits. Removing insects by hand can effectively control small populations of pests such as potato beetles or cabbage loopers. Reduce spider mite populations on some plants by syringing the foliage with water or by hosing down the plant with a strong force of water.

Natural populations of predators (e.g., lady beetles, lace-wings, syrphid flies, preying mantids, wasps, predaiceous mites) and parasites (e.g., wasps, tachinid flies, nematodes) are valuable in reducing infestations of garden pests. Usually, however, some level of pest infestation must be tolerated to attract and maintain natural enemy populations. Should pest control be necessary, select a management strategy that will conserve or minimize injury to beneficial insects, while attaining satisfactory control of the target pest.

Several species of mass-reared beneficial insects can be purchased from commercial suppliers for release in home gardens. Generally, this method is risky in terms of the benefit it may provide. Success requires an understanding of predator/prey relationships, a good sense of timing, and careful management.

The artificial introduction of natural enemies usually does little good in the home garden because the insects often die or disperse into areas outside the garden. It is probably more productive to provide good conditions for natural population growth of control organisms than to introduce exotics.

There are a few naturally occurring products that have insecticidal properties. Since they are not synthetically derived, they may be acceptable to some "organic" gardeners. Most of these materials kill beneficial as well as target insects.

Bacillus Thuringiensis *Bacillus thuringiensis,* commonly referred to as "B.t.", is marketed under the trade names Dipel, Thuricide and others. This "microbial" insecticide consists of spores and crystals produced by a soil-inhabiting bacterium. When certain insect species ingest these spores and crystals, the digestive tract becomes paralyzed and the insects stop feeding, become sick, and die in four to seven days. This is especially useful for controlling cabbageworms and a few other species of caterpillars that damage garden crops. ***Pyrethrins*** Pyrethrins are refined from natural pyrethrum, which is extracted from a species of chrysanthemum. These chemicals provide quick knock-down, but their residual activity is brief, so they must be applied often if insects persist. Pyrethrins are effective against most garden pests, especially soft-bodied forms, since the killing action is by absorption through the skin. They are not effective against spider mites.

Rotenone Most rotenone is produced from roots of the derris plant that grows in South America. Rotenone is the most effective and readily available of the non-synthetic insecticides. It is effective for most garden insects, but not for spider mites. The residual activity is very short.

Sulfur Finely-ground sulfur can be used as either a dust or a spray. It can be used to control spider mites but may cause a chemical "burn" on tender foliage if the air temperature is 90°F or higher. Sulfur also may cause an unpleasant taste if used on vegetables shortly before harvest.

Insecticidal Soaps Recent research indicates that certain detergents or soaps can effectively reduce populations of certain soft bodied pests such as aphids, mites, leafhoppers, plant bugs, and thrips. Insecticidal sprayed soaps kill insects and mites by disrupting cell membranes and causing cells to burst. These products usually require thorough spray coverage and multiple applications. Use soaps or detergents with caution, as leaf injury is possible with certain plants.

Nicotine Sulfate This "natural" insecticide is derived from the tobacco plant and is highly toxic to humans and other warm-blooded animals. It is not recommended for home use.

Home prepared pesticides are used by some gardeners and are publicized as seemingly successful. Be wary of methods which suggest boiling plant parts or grinding them up in a water solution to use as a spray on vegetables. This spray solution can be very poisonous. For example, boiling rhubarb leaves or soaking tobacco stems in water is apparently practiced by some gardeners. Both of these plants contain extremely toxic poisons and should be dealt with carefully. Remember that a naturally derived pesticide compound can be just as toxic as a synthetic one to both pests and people.

Be wary of so-called simple methods of insect control, especially those that claim to rid your garden of all insect pests. For example, light traps will attract and collect hundreds of insects, both harmful and beneficial. Light traps also attract insects that normally would pass by. Many of these insects do not get caught in the traps, but remain in the area and cause damage later. Further, the traps do not catch wingless insects or insects that do not come out at night. Insect-attracting compounds, called pheronomes, are not developed enough to effectively control insects. Their primary value is to determine the presence of a particular insect so that chemical control may be used more effectively.

Companion Planting

Companion planting refers to the practice of planting more than one crop in the same row, or planting a different crop between two rows of a like crop. It is theorized that the sap or aroma of certain plants are inhibitory to some diseases or insects. Some researchers report that this practice can help reduce insect and disease problems, but that it is not as effective as standard chemical methods. However, a paper in the *Canadian Entomologist* (1979) reports a study in which six companionate plants (marigolds, nasturtium, penny-royal, peppermint, sage and thyme) were each grown in association with cabbage. The cabbage was sampled weekly for eggs of common cabbage pests. There was no reduction in pest number as a result of the treatments. As they noted, some companion cropping may be effective, but carefully conducted scientific experiment -- not testimonials -- are required. Nevertheless, companion cropping can effectively use garden space and is particularly useful with small gardens. If companion cropping is used, select companions with care to avoid shading or excessive competition for water and nutrients.

Disease Management

The success or failure of organic gardening may depend on how well the organic gardener manages

diseases. All plants are subject to diseases caused by a variety of microorganisms, including fungi, bacteria, viruses, and nematodes. Disease in plants is a complex process involving an interaction between the pathogen, the host, and the environment. Seasonal fluctuations in disease incidence and severity often lead some home gardeners to false conclusions about the need for control measures. We need to be cautious about relying on what appear to be simple solutions for managing plant disease. Such recommendations usually fail when not based on a thorough knowledge of the cause and development of a disease.

Understanding how a plant disease develops provides the basis for making sound management recommendations. Prevention is the key because in most situations once a plant is diseased it cannot be cured.

Plant disease management is accomplished in many ways, depending upon past experience and the current situation. Generally, a combination of methods is recommended. This is especially true when weather and other conditions are favorable for disease development. Some, but not all, diseases may require spraying with traditional chemicals to provide adequate protection; for others, non-chemical controls are often effective. The less we depend on chemicals for disease management the better.

Summary

Some organic practices are valid while others are of questionable value. A combination of organic and standard gardening procedures (insecticides, fungicides, etc.) generally provides the best yields of good quality produce while minimizing adverse effects on the environment and gardener.

In many areas, concerns over food safety and environmental contamination from pesticide use have fostered an alternative approach to pest control. This approach, known as integrated pest management or IPM, uses all suitable methods and techniques of pest suppression in as compatible a manner as possible to maintain pest (weeds, insects, disease-causing organisms) densities below levels of unacceptable injury or yield losses.

When implemented in a well-thought-out and conscientious manner, the integrated pest management approach can effectively control pest populations while minimizing the adverse influences of pesticides on man, plants and the environment.

File G548 under: HORTICULTURE
C-22, Vegetables
Revised June 1990, 12,000 printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.