The Pros and Cons of Organic Gardening

Linda Naeve
Iowa State University, lnaeve@iastate.edu

Donald Lewis
Iowa State University, drlewis@iastate.edu

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The Pros and Cons of Organic Gardening

Abstract
"Organic gardening" or "organic farming" is a term that has received a lot of media and consumer attention in recent years. The term is used quite vaguely to describe different cultural systems for growing plants. A simple and clear definition of organic gardening is the enrichment of a garden soil with naturally-occurring plant foods and the control of garden pests (insects, diseases and weeds) by cultural, mechanical and biological methods.

Disciplines
Entomology | Horticulture | Plant Biology | Plant Pathology

Comments
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The Pros and Cons of Organic Gardening

Linda Naeve, Extension Horticulturist
and
Donald Lewis, Extension Entomologist
Iowa State University

“Organic gardening” or “organic farming” is a term that has received a lot of media and consumer attention in recent years. The term is used quite vaguely to describe different cultural systems for growing plants. A simple and clear definition of organic gardening is the enrichment of a garden soil with naturally-occurring plant foods and the control of garden pests (insects, diseases and weeds) by cultural, mechanical and biological methods.

Organic gardening is a way of home gardening. For many people it is challenging, exciting and rewarding. They find great personal satisfaction in raising a garden with little or no synthetic input.

The concept of organic gardening is not new. Some appreciation of the value of organic matter in maintaining the structure and fertility of soils is nearly as old as agriculture. Natural forms of pest control, such as parasites, predation and use of botanic insecticides, have been keeping insect populations in check for hundreds of years. In recent years, the concept of organic gardening has gained popularity because many people are concerned about pesticides in our food we eat and protect the environment. Many gardeners are aware that most scientists and educators view the organic gardening movement with mixed emotions. We all agree that we must be concerned about the food we eat and protect the environment. It is also well understood that organic matter and crop rotation are important factors in plant growth. However, there is much misinformation about organic gardening that needs to be corrected.

All too often we hear claims that food grown the “organic way” is more nutritious than food grown with chemical fertilizers. This is disturbing because there are no valid data to support this claim.

The practice of incorporating large amounts of organic matter into the garden soil is important and recommended. Organic matter improves soil tilth, increases water holding capacity, slows erosion and releases nitrogen and other nutrients to growing crops through its decay. The process of building up or restoring organic matter content in the soil can be a very slow process.

The breakdown of organic matter into a usable form for plants takes time and requires specific environmental conditions. Nitrogen in organic matter is unusable; it must be converted to nitrates, a form plants can take up and use. The conditions for this conversion (call nitrification) are:

1. Oxygen-containing materials
2. Proper soil pH (around 6.8)
3. Proper soil temperature, above 50°F
4. Good soil aeration
5. Adequate soil moisture

Nitrates from plant organic matter or animal wastes and synthetic fertilizers are identical to the plant. Also, the source of nitrates does not determine the nutritional levels within produce.

Gardeners relying only on organic materials to provide the nutrients to garden plants must be knowledgeable about the soil and its properties. They should know when organic materials should be applied, the quantity to apply and the possible need to supplement the organic matter with mineral nutrients. For example, animal manures differ in the amount of essential plant nutrients they contain. The analysis of cow manure may be 0.60-0.15-0.45 as compared to the analysis of poultry manure at 1.30-1.17-0.48. These two products would not be applied at the same rate. Also, animal manure is not always a complete, well-balanced fertilizer. It may be necessary to broadcast a complete organic fertilizer or rock phosphate and potash in addition to the manures to prevent an imbalance in essential nutrients in the soil.

The second half of the definition of organic gardening refers to nonchemical methods of pest control. A lot of folklore and home garden testimonials have been perpetuated regarding non-chemical pest control strategies. Some of the control measures have no valid or logical basis and a few are quite comical.

For example, “bug juice” was once recommended by popular home garden publications as a method to prevent or deter insect feeding on many garden crops. The formulation and preparation of “bug juice” is quite simple: Hand pick several insects from the plants in your garden. Place them in an OLD blender and add water. Purée for a few seconds. Strain and spray the liquid on your garden plants. This technique was tried at Iowa State on cabbage in 1979 and compared with other control measures. The results below show that “bug juice” proved no better than doing nothing at all (check).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% usable heads produced</th>
<th>Average weight (lbs.) of heads produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevin spray</td>
<td>85</td>
<td>.96</td>
</tr>
<tr>
<td>B.t. spray</td>
<td>81</td>
<td>.59</td>
</tr>
<tr>
<td>Handpicking</td>
<td>47</td>
<td>.42</td>
</tr>
<tr>
<td>Handpicking &amp; bug juice</td>
<td>44</td>
<td>.35</td>
</tr>
<tr>
<td>Bug juice</td>
<td>41</td>
<td>.31</td>
</tr>
<tr>
<td>Check</td>
<td>57</td>
<td>.35</td>
</tr>
</tbody>
</table>

“Organic gardening” or “organic farming” has long been regarded as an organic pest-control strategy. This involves planting one crop next to another in the belief that the “companion crop” will deter insects from the desirable crop. A common example is planting marigolds or thyme around cabbage to prevent cabbageworm feeding. Unfortunately, research has proven most companion planting is not effective. In a study conducted at Virginia State University in 1978, researchers found that neither marigolds, nasturtium, pennyroyal, peppermint, sage or thyme resulted in a decrease in insect damage to cabbage. In fact, they suggested that some of the companion crops may have attracted some insects and caused more damage to cabbage than would otherwise have occurred. Similar studies on snap beans also found that companion planting was not effective. Companion planting studies at Iowa State University demonstration gardens also proved them ineffective when compared to other methods of pest management.

There is one possible companion plant combination that may show some benefit in the garden. It has been reported that there is less incidence of nematode damage to tomatoes when they are grown beside marigolds. However, this has not been tested in Iowa.

There are several non-chemical pest control methods that are effective in a home garden. Cultural practices such as crop rotation, resistant varieties, good sanitation, fall plowing or tillin, proper watering and maintaining healthy plants will help reduce disease and insect problems. Handpicking insect pests from garden plants is a mechanical control measure that can be effective if just a few plants are being grown. For example, if you have a few tomato plants in your garden and find one or two tomato hornworms feeding on them, the most logical and effective means to control them is to remove, or handpick, the pests from the plants. Handpicking cabbageworms from a few cabbage or broccoli plants may also give acceptable control.

Barriers can also help prevent insect feeding. Cucumber collars placed around the lower stem of a tomato plant and buried an inch or two may help prevent cutworm attack. Planting a crop under a screen or other protective covering, such as Reemay, can also prevent damage from leaf-feeding insects.

An area of great potential in the search for alternative pest controls is the development of
of biological insecticides (called biorational insecticides). Biorational insecticides are naturally occurring microorganisms (disease organisms) that can be formulated, processed and manipulated for each and timely application to insect-infested plants. Sprayable pathogens developed so far, and the pest they control, include: *Bacillus thuringiensis* (Bt)—caterpillars *Bt. israelensis*—gypsy moth larvae *Bacillus popilliae*—Japanese beetle grubs "Preserve" NPV virus—European pine sawfly larvae *Nosema locustae*—some grasshopper species

Of these sprayable pathogens, only Bt has been broadly successful; that is, widely available, effective and practical. It is highly selective against caterpillars (larvae) of butterflies and moths. When the bacterium is sprayed on plants and eaten by caterpillars, it kills them. *B. thuringiensis* is selective against caterpillars (larvae) of butterflies and moths. When the bacterium is sprayed on plants and eaten by caterpillars, it kills them. *B. thuringiensis* will not harm bees or other beneficial organisms that can be formulated, in the use of soaps as an alternative to synthetic insecticides. How soaps kill insects is still poorly understood. There may be some mortality from the removal of protective oils and waxes on the insects. However, the speed with which some soaps and detergents kill insects varies widely. As a direct action on the insect nervous system. Soaps and detergents useful for insect control include commercial solutions as well as certain household products. Commercial insecticidal soaps consist of potassium salts of fatty acids. Inert ingredients such as water and alcohol aid in the mixing of the soap concentrates. These products are made of a blend of specific fatty acids selected for high toxicity to pest insects and low phytotoxicity to plants. Dishwashing liquid detergents have also been effectively used for insect control. While these household products may contain a variety of ingredients, it is the detergents' fatty acids, solvents and degreasing agents that give them insecticidal activity once the material has dried on the surface. Repeated applications at short intervals may be required to control most pests. In general, soap sprays have been effective only against small, soft-bodied insects such as aphids, scale insects, whiteflies, thrips, mollybugs, spider mites and everybody's favorite, boxelder bugs. Larger insects such as caterpillars, sawflies and beetles are usually not controlled.

Other products such as organic insecticides include dormant oil, boric acid and diatomaceous earth. Dormant oil is highly effective on fruit and vegetable trees even at very low concentrations. Boric acid is highly effective indoor insecticide when properly used, but has little beneficial use in the garden. Similarly, diatomaceous earth, a crystalline dust product that is abrasive and slowly lethal to insects, is of little or no benefit outdoors where rain, wind and high humidity remove its effectiveness.

An appealing approach to organic gardening is the use of biological controls such as lady beetles (aka ladybird beetles and "ladybugs"), praying mantis, lacewings and Tricho wasps. All of these beneficial insects are valuable predators or parasites in natural ecosystems. However, their usefulness in artificial, manipulated environments such as gardens is limited because both predators and parasites must have a steady, abundant supply of food and hosts to survive. Otherwise, they migrate away or die. It is important to protect and encourage predators and parasites that occur naturally in the garden. Limiting pesticide use, allowing a small pest population to persist and maintaining a variety of plants and habitats will do this. However, purchase and importation of biological controls, while causing no harm, also does very little immediate good.

Fortunately, for most of us, gardening is a hobby and we can pursue it any way we choose—with strict "organic" methods or with a pest management program that combines cultural and chemical control measures. Most home gardeners have learned to tolerate a few blemishes or some insect feeding on home-grown produce. However, we will tolerate scabby apples or wormy sweet corn on the produce counter at the grocery store while repelling all pests. Organic production practices usually result in food of no higher nutritive value, but with a higher incidence of disease and insect blemishes and a considerably higher cost.

A lot more research needs to be done before we can demand entirely "organically-grown" produce. The late Carew, former Director of a Michigan State University, through the Leopold Center for Sustainable Agriculture, is working to develop new alternatives to our current reliance on chemical fertilizers and pesticides. The Leopold Center, established in 1988, has a mission focused on three major activities:

1. Conduct and sponsor research to identify and reduce negative environmental and socioeconomic impacts of agricultural practices.
2. Research and assist in developing emerging alternative practices consistent with a sustainable agriculture. 
3. Develop an association with the Iowa Cooperative Extension Service through an educational forum to inform Iowans of its findings.

References