

Pest Patrol: Integrated Pest Management

Welcome beneficial insects and natural ingredients to your farm to banish bad bugs!

By Jessica Walliser

Until recently, for many farmers and gardeners, the sight of an insect feeding on a plant conveyed a feeling of dread and panic—followed by a prompt trip to the garage for the sprayer.

With all the information available today about the dangers of synthetic chemical pesticides and their effects on the environment, the “Nuke ‘em and leave” philosophy is thankfully on the wane.

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[Organic Food and Resources](#) The practice of IPM, Integrated Pest Management, was developed to help growers deal with insects, diseases and weeds in a more reasonable manner.

Gone are the days when reaching for the spray bottle was thought to be the best solution.

Organic farmers and gardeners have now discovered that by wedding IPM techniques with organic principles, they can manage pests and still maintain the integrity of the soil, the population of beneficial insects, and the health and vigor of crops.

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[Defining IPM](#)

Integrated Pest Management uses preventative, surveillance and corrective measures to reduce the number of pests without high pesticide use; understanding the principles of IPM is an integral part of organic pest management.

IPM begins by making use of preventative methods like row-covers, pheromone traps, and mulching to prevent diseases and weeds. If the pest is never allowed to establish itself, there will be no pest problems.

If preventative methods fail, IPM then leads the grower to examine his or her own actions in the field.

Pest Prevention Tips

Some helpful tips for keeping pests at bay: Pheromone traps hung in the orchard lure and trap codling moths before they mate. Red spheres coated in non-drying glue and hung in fruit trees capture apple maggot flies. Floating row covers (a lightweight, translucent fabric) placed over crops like cabbage, broccoli, cucumbers, carrots and melons, will keep egg-laying pests off the foliage. They also prevent cabbage loopers, carrot root maggots, flea beetles, cucumber beetles, squash bugs and many more. Be sure to remove the fabric when plants are in bloom to allow access to those precious pollinators. Paperboard collars placed just below the soil level around new transplants will prevent stem-munching cut worms. Place squares of corrugated cardboard in the lettuce patch. Earwigs will nestle in the tunnels at night and you can collect them in the morning. To deter slugs, surround entire raised beds, or individual plants, with copper strips. Slugs and snails sizzle when they contact copper because of a chemical reaction between something in their slime and the copper. If raccoons and deer always seem to strip your corn the night before you're prepared to harvest, place a radio playing an all-hours talk station in the garden each evening. It won't work for more than a couple of days, so use it only for a few nights before harvest. A single strand of electrified wire placed about four inches above soil surface will keep groundhogs out of the garden. Plug-in chargers work better than solar-powered ones, but either is effective. For prevention of soil-borne diseases, mulch well immediately after planting. Straw, hay, compost and even newspaper help prevent spores from splashing up on leaves. This is a great technique to control blight on tomatoes. Powdery mildew, rust, anthracnose, blight, black spot and other diseases are readily spread by working in wet conditions and not cleaning pruning equipment properly. Sterilize clippers, loppers and saws with rubbing alcohol between plants.

TopThe practice of identifying and reducing the factors causing the problem in the first place is a key element. Were proper cultural practices followed? Were plants fertilized and pruned properly? Was equipment cleaned between uses?

If the grower changes some method of maintenance, a subsequent reduction in pests may result.

Examples include the increase in pests that often accompanies an over-application of nitrogen fertilizer; such an application can cause excessive tender growth that is extremely appealing to pest insects.

String trimmers may damage tree bark, creating an entrance for fungal and bacterial issues; allowing debris to linger in between crop rows attracts pests like slugs and earwigs.

Keep the garden clean, locate plants in conditions in which they are known to thrive and employ good maintenance practices: These are easy ways to design the pest out of the garden.

After the grower determines if the injury is somehow a result of human error, any necessary changes in maintenance techniques are made and the damage is closely monitored.

Often this simple change is all that's necessary to alleviate a pest problem. If further damage is noted, it then becomes essential to determine if pest levels are causing enough damage to warrant a response.

For some growers, a few holes in their cabbage are no cause for concern. These farmers would rather see this minor aesthetic damage than spray their crops with anything. For other growers with a lower tolerance level, even a minor amount of damage warrants a response.

No farmer wants to see their hard work destroyed by insects or diseases, so discovering your own tolerance level is important.

In organic production, contrary to popular belief, you do not need to sacrifice flawless crops for the elimination of pesticides; it's quite possible to grow perfect produce organically.

And you do not need to raise your tolerance threshold, though it may make life on the organic farm a little less stressful.

Most growers realize that "organic" produce is beginning to be more valuable than "flawless" produce in today's market, so raising the tolerance threshold is an easy task.

The principles of IPM state that once unacceptable damage begins and pest levels are continuing to rise, appropriate actions should be taken.

Remember, IPM does allow for the use of conventional chemical pesticides, it just aims to reduce the amounts used.

Here's where organic farming takes a divergent path.

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Organic Pest Control

In organics, pest control begins with healthy soil. Quality soil results in vigorous plants that are unattractive to pests and that can withstand moderate amounts of pest activity with no ill effects. In essence, healthy soil equals healthy plants.

Crop Yield and Organics

Organic farming produces the same yields of corn and soybeans as does conventional farming, but uses 30 percent less energy, less water and no pesticides," says David Pimentil, a professor from Cornell University.

Based on the review of a 22-year farming trial study, this research compares the outputs of organic versus conventional farming in the United States. Plus, the organic fields utilized no chemical fertilizers and managed to maintain prime soil quality and reduced soil erosion.

The same study noted that during drought conditions, the yields from organic plots surpassed those grown with conventional methods.

Another study of note, from Johns Hopkins University, states that organic crops contain significantly more vitamin C, iron, magnesium and phosphorus, and significantly less nitrates than conventional crops. Additionally, the protein contained in organic crops was of higher quality. The content of certain heavy metals was significantly lower in organic crops as well.

Top Sometimes, however, despite everything an organic farmer has done to ensure strong, happy plants, pest problems occur. After examining the failure of any preventative methods, the farmer is then left to determine ways to control the pest without synthetic chemical inputs.

Biological Pest Control Options

Thankfully, the food chain is alive and well in most farms and gardens—especially organic ones. There is a natural cycle of predator and prey in every existing eco-system—the farm is no exception.

“Good” bugs, heralded as beneficial insects, are great allies in organic production. Beneficial insects consume copious amounts of “bad” insects (they aren’t really “bad,” of course, because they do serve a purpose—as a pollinator, a decomposer or a food source for larger critters).

One of the easiest ways to maintain a healthy farm is to understand this natural cycle of predator and prey, and to encourage it to prosper. Lure plenty of beneficial insects to crops that are frequently plagued with pests. Ladybugs, lacewings, hoverflies, pirate bugs, tachinid flies and parasitic wasps (don’t worry, they are very tiny and have no stinger) are just a few of the predatory insects that will make a home on the organic farm.

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Attracting and Keeping Good Bugs

Here’s what you need to do to attract, and keep, plenty of the “good” guys:

- Plant nectar sources. In many cases (but not all), it’s the larvae of beneficial insects that consume the “bad” bugs, while the adults feed on nectar. If they don’t have ample nectar, they’ll either leave to find it or they won’t lay as many eggs. Most adult beneficials prefer plants with clusters of many small flowers: Herbs like dill, parsley, fennel, oregano, cilantro, chervil and thyme, and annuals like sunflowers, cosmos, amaranth, alyssum and statice. Also, perennials like yarrow, daisies, tansy and angelica are preferred. Interplant crops with these flowers and watch them “buzz” with beneficial activity!

- Create habitat. Many beneficial insects need a safe place to lay eggs. Some lay them right on the backs of the “bad” insects (parasitic wasps lay eggs on tomato hornworms and Aphidius wasps lay eggs on aphids), while others deposit eggs on nearby grasses and shrubs. Allow an area adjacent to the garden or field to be slightly unkempt. Lacewings lay their eggs along blades of grass, while praying mantids place egg cases on twigs or woody perennial stems to over-winter.

- Don't eliminate pests completely. If there are no pests at all, there will be no food source for hatching beneficials. The goal is to keep pest populations at tolerable levels while allowing enough of them to make the "good" guys want to stick around. Predator and prey population levels are in natural proportion with each other. The more prey present, the more the beneficials will reproduce. If you totally eliminate the "bad" guys, the beneficial insects will be unable to maintain a robust population.

- Quit spraying. Many pesticides (most conventional, but a few organic, too) will not only kill pest insects, but beneficials as well. Read product labels carefully and be sure not to apply anything when beneficials are present. If the "good" guys are already working, they will take care of the pests quite fine on their own. Spraying will send nature's balance off kilter and you'll end up doing more harm than good. Watch pest levels for a few days; note the quick increase in beneficial activity followed by the rapid decrease in pest numbers.

Besides utilizing the natural cycle of predator and prey, growers can rely on microscopic biological controls as well. Many pests are susceptible to specific strains of bacteria; these living bacteria can be applied to crops being consumed by that pest.

One of the most common biological pesticides available for use in organic farming is Bt (*Bacillus thuringiensis*). It targets foliar feeding caterpillars (like cabbage loopers and gypsy moths, among others) by disrupting their gut. Bt is safe for humans and the environment when used on targeted plants; it will not affect beneficials or soil life.

Different strains of Bt exist, with some targeting beetles, mosquito larvae and fungus gnats. Be sure to choose the appropriate type.

Another effective biological control is spinosad (*Saccharopolyspora spinosa*). This bacterium offers excellent management of potato beetles, fire ants, cabbage loopers, leafminers, caterpillars and many others. Again, it has little toxicity to humans and soil life, so it's an ideal choice for organic growing.

Bacillus subtilis and *Bacillus pumilus* are biological fungicides that combat downy and powdery mildews, rust, bacterial spot, blight, botrytis and other mildews on veggies, fruits, ornamentals, trees and shrubs. Because they consist of a living organism, all biological pesticides should be stored and mixed according to label instructions.

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Botanical Pest Control Options

Derived from plant sources, botanical products are a natural way to combat pests. Many of them were discovered by observing the natural defenses of these plants and then unearthing what it is that makes them so unappealing to pests. Below are several botanical pesticides and some information about how they work.

- Neem is made from the seeds of the tropical neem tree. It is an all-purpose pesticide. Neem not only repels insects, it suppresses feeding and prevents them from molting. It's effective against a broad range of insects, including aphids, leafminers, loopers, sawfly larvae, four-lined plant bugs and mites, to name just a few. Neem is not harmful to humans, animals or soil life, but if applied incorrectly, it may be harmful to bees and other beneficials. Neem has fungicidal properties as well.

- A sometimes controversial organic pesticide, pyrethrins should be used only when absolutely necessary. They harm beneficials and aquatic life, so care must be taken with their application. Pyrethrin is derived from a species of chrysanthemum and acts against the pest's nervous system. It is an instant kill and is often used against wasp and yellow jacket nests. Be sure to select only natural pyrethrins and avoid their synthetic cousins the pyrethroids, which are not organic.

Pyrethrins are valued for combating a huge number of pests, including many types of beetles (potato, bean, blister, cucumber, asparagus and flea), loopers, caterpillars, thrips, earwigs, aphids and whiteflies.

- Working as a pest repellent, garlic oil should be used as a preventative measure before pest populations begin to expand. It deters ants, aphids, cutworms, earworms, hornworms, leaf miners and others. Avoid spraying garlic oil when vegetables are in bloom—it will also repel pollinators.

- Botanical essential oils are made from various plant oils, including clove, wintergreen, cinnamon, rosemary and peppermint; some forms of these pesticides control root pests like wireworms and cutworms, while others serve as foliar pesticides, eliminating aphids, potato beetles, loopers, mites, whiteflies and more. Very safe and surprisingly effective,

essential oils can also be used as a fungicide to control mildews and rusts.

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Other Organic Control Options

There are several other products considered safe for use in organic production. They include oils, soaps and elemental compounds.

For insect pests, horticultural oil works by suffocating soft-bodied insects like aphids, mealybugs and certain species of scales. Insecticidal soap acts by dehydrating and suffocating pests like aphids, mites, leafhoppers, earwigs, grasshoppers and mealybugs, among others. These two products must come in direct contact with pests to be effective, so thoroughly coating all leaf and stem surfaces is a must.

The elemental compound iron phosphate has been introduced recently as an organic slug and snail bait that is not dangerous to dogs, cats and other mammals. Slugs stop feeding as soon as the bait is consumed and will die within a few days.

Another effective class of products are those based on kaolin clay. These products are sprayed onto fruit and foliage to deter pest insects from landing to feed. They surround them with a protective barrier of white powder and are essential to organic fruit production. The powder is easy to wash off and is safe for consumption (it's a common ingredient in toothpaste and Kaopectate).

Elemental compounds used to combat fungus and disease include lime sulfur, a very effective old-time remedy for most fungal diseases including brown rot, scab, blight, peach leaf curl, powdery mildew, anthracnose, rust and black spot. It's a liquid formulation with a limited shelf life, so pay attention to the expiration date.

Another elemental fungicide is copper. Though it can be harmful to aquatic life and some plants if it's misused, copper is quite effective against leaf curl, leaf spot, anthracnose, rust, fire blight, bacterial blights and others. Use great caution when applying copper-based fungicides.

Potassium bicarbonate products (baking soda) are simple, safe solutions for fungal issues of all types. They work on contact, so the organism must already be present for optimum control. It works against fungus on lawns, fruits, veggies, ornamentals and roses; potassium bicarbonate products are easy to find and fairly inexpensive.

An important note: For certified organic growers, it's necessary to check with the certifying agency to ensure any products used are acceptable under their guidelines. Growers can also check with the Organic Materials Review Institute to ensure a material's compliance with certified organic production. Take care to follow all label instructions and use only products that are labeled for the specific issue being dealt with.

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Organic Weed Control

Battling weeds on an organic farm doesn't necessarily come easy; but with careful planning and a bit of time (not much, really), it's possible to control weeds effectively and without chemical inputs. As with many things organic, the key is both the strategy and the timing. In the past, regular tilling was the most common option, but research suggests this technique disrupts beneficial soil life and breaks down the good soil structure most farmers work so hard to create. A better plan: fight weeds with forethought and fire.

The forethought involves fighting the weeds before they arrive.

Mulch by applying a 3- to 4-inch layer of organic matter on the soil surface in mid-spring before weed seeds have a chance to germinate. Straw, hay, chopped leaves, grass clippings, mushroom manure, compost and even newspaper (no shiny pages, please) or corrugated cardboard will form a protective barrier over the soil.

Lay mulch between rows and around plants.

Better yet, plant a living mulch. White Dutch clover, red clover, cowpeas and other cover crops can be sown around and between new transplants to help drown out weeds and replenish soil organic matter. Simply mow them down when they get high enough to compete with crops.

Black plastic is another organic mulching option for market farmers, but be sure to remove it from fields at the end of the growing season.

More forethought: Use an organic pre-emergent herbicide. These products are made from corn gluten, a by-product of the corn processing industry. They work by killing the initial root that emerges from a seed, thereby preventing them from germinating.

Ninety percent effective after two years use, corn gluten has become a terrific alternative to conventional weed and feeds for the lawn and perennial border. It works just as well between rows of tomatoes, cucumbers and peppers.

Remember, though, that corn gluten will prevent all seeds from germinating, so don't use it where you plan to grow crops from seed in the following six to eight weeks.

For established weeds, turn to fire. Flame throwers use ignited propane to torch weeds by heating plant tissue to temperatures high enough to blow out cell walls. The flame they throw can be adjusted to quite a narrow range, so you can use them between crop rows and under fence lines with a little care.

Though they don't completely kill the root of many of the tougher perennial weeds, they sure do knock them back. "Flaming" the weeds will certainly prevent them from flowering and setting seed, and it works especially great for weeds growing in driveway and sidewalk cracks.

Another alternative for established weeds are the many clove oil-based organic herbicides on today's market, most of which also include citric or acetic acid. These herbicides are non-selective, meaning they will kill any foliage they contact and, with perennial weeds, a repeat application may be necessary. They readily control plantain, dandelion, morning glory (field bind weed), chickweed, thistles and lots more.

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It's All Good ...

Effective organic pest control results from good planning.

Begin with prevention: Build your soil, choose naturally pest-resistant varieties, and keep your plants happy and healthy with proper maintenance techniques.

Regularly observe your plants, monitor any pests and promote those beneficial insects.

When problems arise, take the time to research the pest and find an appropriate organic control method; apply it judiciously and evaluate the results.

Keep careful notes on what worked and what did not ... and don't be afraid to learn something new.

About the Author: Jessica Walliser can be heard every Saturday from 12 to 2pm EST on Sirius satellite radio channel 114 where she co-hosts "The Organic Gardeners."

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