Managing Insects and Disease Damage Under an Organic System

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Introduction

With the advent of synthetic chemicals in the 1940s, farmers gradually began using them to control insects and diseases instead of relying on biological controls. Although these chemicals were effective at controlling insects and diseases and helped to increase yields, they did not come without costs. Today, people are questioning the sustainability of agriculture using synthetic chemicals.

Under any natural ecosystem, there are going to be pests. An agricultural pest can be defined as a living organism that can damage a crop and thus compete with humans for food. A pest, which can be an insect, weed, or pathogen, can become well adapted to its environment if given the right opportunities, such as food or overwintering locations.

Under conventional management, synthetic chemicals can get rid of insect pests, but they also get rid of other insects that do not cause harm and may be beneficial. Eventually, the pest population may rise and massive outbreaks may ensue. Under the organic system, the main goal is ecological balance rather than eradication.

Under the USDA's organic rule, organic growers must eliminate the use of synthetic chemicals to control insects and diseases in their fields. Organic farmers control these pests through integrated pest management (IPM). This is done by scouting fields to monitor which pests are present and then researching the insect's or disease's lifecycle as well as the lifecycle of their natural enemy in order to design a pest management system that will best control the pests. A farmer should do some research into the crop as well as decide how to monitor and record the farm's insect and disease program. Keeping a record of everything that happens in a field is important for current and future pest problems.

IPM first sets action thresholds, a point at which pest populations or environmental conditions indicate that pest control action must be taken. Under the organic system, there are three general components of insect and disease management—cultural, biological, and chemical. A farmer who has farmed conventionally may not know how to control insects and diseases on the farm without using chemicals. This fact sheet serves as a general overview of an organic farm's disease and management plan. Please refer to resources listed at the end for more detailed information.

Praying Mantis
(*Tenodera aridifolia sinensis*)

A relentless predator that will devour almost anything that crosses its path including pests such as aphids, grasshoppers, flies, caterpillars, and moths. It also will eat other beneficial insects.

Cultural Controls

Diversity

The first step to a healthy crop is a healthy soil. A healthy, biologically active soil will help keep the populations of insects and the incidence of diseases below their economic thresholds. Increasing the biological diversity both within the soil and above the soil is a beneficial means of preventing insect and disease damage. When there is a greater diversity of species, there is less chance of one organism becoming dominant. Increasing diversity on the farm can be done in many ways. Planting more than one cultivar of a crop can increase the genetic diversity of the cropping system. Crop rotations, intercropping, and strip cropping

Soldier Beetle
(*Chauliognathus pennsylvanicus*)

Larvae are predators that feed on small, soft-bodied insects; the adults are often found on flowers feeding on pollen or nectar during the late summer and early fall.

can also help to increase diversity above ground.

Crop rotations

Crop rotations are an important part of an organic production system. Rotating crops sequentially in the same field helps to achieve diversity both above and below ground. Rotating crops deters insects and diseases by disrupting their life cycles.

Intercropping and strip-cropping

A grower who practices intercropping (growing two or more crops in the same, alternate, or paired rows in the same area) and strip cropping (planting two or more crops in different strips across a field) increases diversity on the farm. These farming practices help to disguise plants from pests and can provide food for beneficial organisms.

Planting dates

A grower can also avoid disease or insect damage by altering planting dates. Waiting until a pest organism has died or has reached the stage beyond which it can cause damage is beneficial.

Biological Control

Biological control includes the use of organisms to keep pest populations at an economic or an action threshold. These thresholds are described as the point at which action must be taken in order for the population of pest organisms not to impact the grower's yields substantially. These organisms can be naturally occurring ones or ones that are released at appropriate times onto the farm to control insects and diseases. The beneficial organisms that occur naturally on the farm can be encouraged to stay there through what has been referred to as farmscaping. Farmscaping is when a farmer manipulates the farm's ecosystem to provide habitat for beneficial organisms. These organisms can be either predators or parasites; they include birds, bats, insects, fungi, bacteria, and viruses. A farmer has many options to choose from. When a grower makes a management decision, it is important for him or her to be knowledgeable about the beneficial and pest organisms in the field in order to use the right tools at the right time.

Web sites listed at the end of this fact sheet can help growers identify organisms, or they may visit WVU county Extension offices. Growers may also mail specimens to WVU extension specialists or the West Virginia Department of Agriculture Pest Identification Laboratory. Please visit http://www.wvu.edu/~agexten/ipm/submit.htm for more information.

Chemical Control

The Final Rule states that farmers may use some naturally occurring chemical controls as a last resort. Organic chemical controls include biorational pesticides that are derived from natural sources, particle film barriers, botanical pesticides made from plants, and compost teas. For a list of chemical controls that are permitted under an organic system, please visit the National List of Allowed and Prohibited Substances (http://www.ams.usda.gov/nop/NationalList/FinalRule.html). Or visit the Organic Materials Review Institute (OMRI) (http://www.omri.org/). OMRI is a nonprofit organization that publishes and disseminates lists of generic and specific (brand name) materials allowed and prohibited for use in the production, processing, and handling of organic food and fiber.

Disease Control

Plant diseases are caused primarily by fungi, bacteria, viruses, and nematodes. Similar methods are used to control both insect and disease pests under an organic system, but some specific ways of reducing diseases on a farm include use of resistant varieties, use of certified disease-free seed and plants, proper spacing of plants, proper selection of sites, and exclusion of contaminated materials.

Resistant varieties

Using varieties that have been bred for resistance to certain disease pests is the most important component of an organic disease control program. Although using resistant varieties has proven effective, it has limitations. First, a grower may not always be able to find a variety that is resistant to a specific disease, or the variety may be resistant to

one disease but not to another. Also, new pathogen strains can develop and become resistant to the cultivar. It is important for plant breeders to develop new varieties that are resistant to the changing pathogens.

Exclusion

Exclusion is the practice of keeping out any materials that may be contaminated with pathogens to prevent them from entering the production system.

For more information, please visit the following Websites:

- WVU Extension Pest Management http://www.wvu.edu/~agexten/ipm/
- West Virginia Department of Agriculture Pest Identification Laboratory http://www.wvu.edu/~agexten/ipm/submit.htm
- Biological Control: A Guide to Natural Enemies in North America http://www.nysaes.cornell.edu/ent/biocontrol/
- Key Pests http://www.ipmworld.umn.edu/keypests.htm
- Alternatives to Chemicals http://www.colostate.edu/Depts/CoopExt/4DMG/PHC/integrat.htm

References and Resources

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