

# Organic pest and disease control

extracted from COG's  
Organic Field Crop Handbook

ORGANIC FARMERS DO NOT USUALLY HAVE MAJOR PROBLEMS with insects and plant diseases in field crops. There are two factors working in the organic farmer's favour:

- Plant and insect diversity is greater in the complex ecosystem on organic farms.
- Plants fertilized by the slow-release of nutrients from compost are more resistant to insects and disease than crops fertilized by highly soluble nutrients.

Problems with insects and disease can usually be traced to problems with either the health of the soil or the crop rotation.

## A diverse ecosystem is the first line of defense

Pest problems are less likely to occur in complex farm ecosystems. In diverse ecosystems, pests are often kept in check by natural predators. As well, complex crop rotation and intercropping make it more difficult for pests to find the crops and also reduce the buildup of pest and disease problems.

The vast majority of insects cause no economic damage, and the best form of pest control is to support a balance of pests and their predators on the farm.

Pest predators are insects or other organisms that prey on the pests. These predators are considered to be 'beneficial organisms'.

Organic farmers provide a range of habitat to support diverse populations of wildlife and beneficial organisms on the farm, including spiders, parasitic wasps, ladybugs, birds, frogs and toads.

There are several ways farmers can increase biodiversity to reduce pest problems.

## Crop rotation

A crop grown as part of a rotation is less vulnerable to pests, compared to crops in monocultures. Growing the same crop, or those susceptible to the same disease, in the same place year after year, results in the build-up of disease organisms in the soil.

Rotations break the life cycle of pest species. For example, corn rootworm is only a problem if corn is grown in the same place for two consecutive years.

Disease susceptibility should be considered when planning crop rotations. For example, wireworm populations peak following sod, so planting a crop that is resistant to wireworm damage, such as oats or flax, is a good option following sod.

Also, crops that share the same diseases should not be planted after each other. There should be four to five years between planting sclerotinia-susceptible crops. (Disease susceptibility for common field crops is described on page 148 of the Organic Field Crop Handbook.)

## **Intercropping**

Intercropping can reduce pest problems by making it more difficult for pests to find crops, and by providing habitat for beneficial organisms.

Strip cropping row crops with perennial legumes often leads to better pest control. In particular, alfalfa attracts many beneficial organisms that can destroy pests in neighbouring crops.

Intercropping soybeans with corn can result in lower rates of European corn borer infestations (Martin et al., 1989).

## **Shelterbelts**

Field shelterbelts or hedgerows are rows of natural bush or trees surrounding fields. These areas provide habitat for many beneficial organisms, ranging from insects to toads to birds.

However, shelterbelts can also harbour pests. For details on constructing shelterbelts to trap snow and reduce erosion, refer to page 88 of the Organic Field Crop Handbook.

## **Weed control**

Certain weeds provide food or shelter for beneficial insects. Parasitic wasps, for example, are attracted to certain weeds with small flowers.

Research has shown that outbreaks of certain crop pests are more likely in weed-free fields. Obviously, care is needed to avoid weed competition with the crop.

Some weeds favour the pests, so each situation needs to be looked at separately. In some cases, mowing weeds at the field edge results in beneficial organisms moving into the crop where they are needed.

## **Trap crops**

Several plant species attract certain insects. These 'trap crops' can be planted with the production crop, around the edge of the field or along fence rows.

For example, sawflies prefer to lay their eggs in brome grass rather than spring wheat. The brome grass also harbours many of the native parasites of the sawfly and as a result few sawflies survive in a strip of brome grass. So strips of brome grass around a wheat field may reduce sawfly damage to the wheat crop.

For Colorado potato beetles, some farmers plant a row of early potatoes around the field (or plant the first row a few weeks before planting the rest of the crop). The potato beetles are attracted to the early potato plants. These plants, along with all the potato beetles, eggs and larvae are then turned under before the second generation of beetles can spread to the main crop.

Trap crops are most successful when the pest is destroyed on the trap crop. Otherwise, trap crops can become a breeding ground for pests.

The pests are controlled by mowing or disking the trap crop, or by spraying it with an acceptable organic substance (e.g. *B.t.*). Another option is to release a large population of beneficial organisms into the trap crop, though this may not be logistically or economically feasible.

## **Barrier crops**

In cases where a crop is disliked by a pest insect, the crop can be used as a barrier.

Planting yellow sweetclover around the edge of a wheat field has been suggested as a means of preventing grasshoppers from moving into the wheat.

Sirius field peas are also reported to repel grasshoppers.

## **Maintaining a balance of nutrients in the soil**

The importance of a balanced source of nutrients on the health of the soil cannot be overemphasized.

There is a great deal of anecdotal evidence that organic farms have a lower incidence of disease than conventional farms. One explanation for this is that the slow release of nutrients from compost and green manures maintains the biological balance in the soil.

A disturbed mineral balance in the soil, and subsequently in the plants, can lead to metabolic disorders in livestock.

For example, grass tetany in livestock occurs most frequently when grazing heavily-fertilized pastures. It is caused by low blood magnesium, resulting from deficiencies of magnesium in the forage brought about by high levels of nitrogen and potassium in the soil.

It is important to match crops to the fertility level of the soil. After a high nitrogen plowdown, a heavy feeder should be planted (e.g. corn, wheat), rather than a light feeder such as flax or oats.

Weak crops or crops lush from too much nitrogen are more attractive to pests and fungal disease. The reproductive rates of most pest insects are proportional to the supply of certain amino acids in their diet. Excess fertility increases the supply of these amino acids in plant tissue and the pest numbers increase too rapidly for natural enemies to control.

Low levels of soil nitrates reduce the incidence of pest outbreaks. For example, European corn borer infestations were lower on corn fields with 0 or 80 kg/ha of nitrogen (an amount which can be easily supplied by compost or legume plowdowns), than at 120 kg/ha of nitrogen (Martin et al., 1989).

On-farm research in Nova Scotia (Patriquin, 1988) demonstrated how the interactions between soil, weeds and insects on an organic farm provided natural pest control.

Weeds in fava beans provided habitat for ladybugs and other natural enemies of the aphid and also helped to lower soil nitrogen. Low levels of soil nitrate minimized excessive uptake of nitrogen by the fava beans, keeping reproductive rates of the aphids low.

Consequently, infestations were effectively controlled before the pod-fill stage (when they are most damaging to the crop). If there were high levels of soil nitrogen, weeds reduced yields. However at low nitrogen levels, the crops thrived and the weeds were kept in check.

Surprisingly, crop yields were higher in plots with weeds, compared to yields from the weed-free plots (because the weed-free plots had more aphid damage).

## **Environmental conditions**

Adverse environmental conditions can stress crops, making them more vulnerable to pests and diseases. Proper management can modify these conditions or prevent them from arising, making the environment more amenable to crops.

Farmers should select the appropriate field for the crop. Too much moisture or too little moisture can stress crops. If crops are drought-stressed, they are more vulnerable to insects. On the other hand, if alfalfa is planted in poorly drained soil, it will be vulnerable to root rot such as *Phytophthora*.

Environmental management can provide optimum growing conditions. Windbreaks modify air flow, help snow retention and conserve moisture. Research has shown that yields increase 10% in corn and 20% in soybeans in the lee of windbreaks up to a distance of twelve times the height of the barrier on the downwind side and five times on the windward side.

**This article was extracted from Chapter 13 of COG's Organic Field Crop Handbook.**

The chapter **goes on** to discuss preventive management, permitted disease management products, and prevention of problems in grain storage. You can order a copy of this **outstanding resource book book** at the COG website ([www.cog.ca](http://www.cog.ca)).