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Entomology

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Integrated Pest Management for the Home Vegetable Garden

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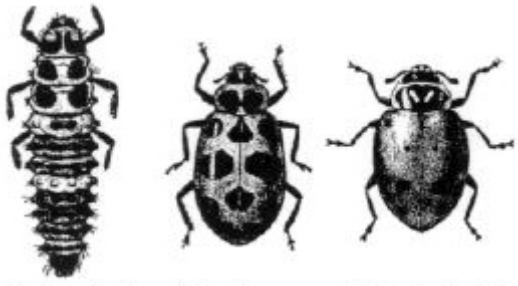
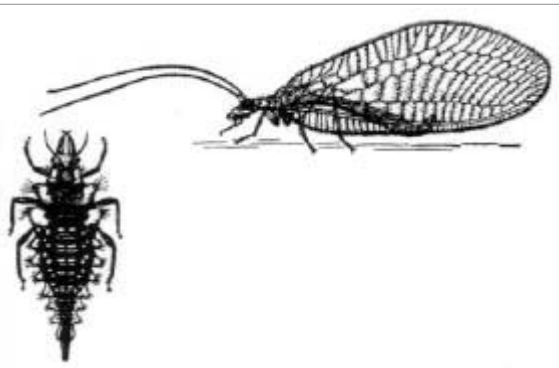
Ronald Becker
Celeste Welty

Beneficial Insects That Feed On Pests



Lady beetle larva (left) and two types of adults



Lacewing larva (left) and adult (right)

Parasitic wasp that attacks aphids

Overview

Integrated Pest Management (IPM) is the name given to the practice of using a combination of treatment methods to keep pests from ruining a crop. With IPM, the term "treatment" does not always imply the use of a chemical control. Non-chemical pest control strategies include cultural, mechanical, and biology controls as well as good sanitary practices. Most of these controls are used as preventive measures in an attempt to help keep pests below critical levels. However, certain conditions can still allow a pest population to build up to injurious levels. If this should occur, a rescue treatment can be used to reduce the population of the pest and rescue the crop.

At the heart of IPM is the understanding that many crops can tolerate a certain amount of pest damage. As a result, a rescue treatment is not needed until the pest population reaches a critical level usually referred to as a threshold. In the home vegetable garden, this threshold may be economic, but is more likely to be aesthetic. A commercial grower' s produce must be blemish free (or nearly so) for fresh market. If a cabbage is found to have holes in the leaves from insect feeding, it will probably be culled or sold at a lower price, making the threshold economic. On the other hand, the threshold for home grown vegetables is often dependent on an individual gardener's tolerance to the damage.

Thresholds for the different pests may vary greatly. In the case of the striped or spotted cucumber beetle, a pest on melons and cucumber plants and a vector of bacterial wilt disease, the threshold is only one actively feeding beetle in the entire planting. Conversely, the threshold for aphids on silking sweet corn is an average of fifty or more aphids per plant. Because the same pest may affect different plants in different ways, the threshold for a certain insect on one crop may not be the same for another crop.

Scouting the Garden

To evaluate the effectiveness of preventive measures and the possible need for a rescue treatment, the gardener should scout the garden on a regular basis, at least once per week or more often if time permits.

The first step in scouting is to identify the pest. The next is to learn about the pest' s habits and life cycle, allowing you to plan the most appropriate management strategy. This is evident when working with Colorado potato beetles. When the beetle larvae have just hatched, certain types of insecticide may be used with good results; if the beetle larvae are any larger, then another type of treatment will need to be used for control.

Scouting a garden is done by examining a representative sample of each crop to determine the average infestation level. The number of plants to examine can vary according to the type of crop and size of the planting. You may look at all of the plants of a crop if there are only five or six in the planting, or you may look at a sample of 10 plants if there are as many as 50 or more plants per crop. Probably the best rule to go by for the average home garden is to examine enough plants to feel comfortable that you know what pests are present and how much damage is being done.

When examining plants it is important to look at them closely. By doing so you will be able to see the egg

masses or small larvae that are present before damage is evident. All parts of the plant should be examined, even if they are not parts that will be harvested. Pests may be found on the underside of leaves, on top of leaves, on stems, in stems, in buds, or on developing fruit. For example, even though the pods of a bean plant may not show feeding damage from a bean leaf beetle, the damage the beetle does to the leaves can still cause a reduction in the yield of the plant and the quality of the bean. It is only by thorough scouting that you will truly know what is going on in your garden.

Not all insects found in the garden are pests. Lady beetles, lacewings, mantids, parasitic wasps, and soldier beetles are just a few of the beneficial insects that may be found. Observing beneficial insects as well as the pests should be part of the scouting program. Ideally, a healthy balance of beneficial insects and pests should be present. Spraying a pest to the point of eradication should not be a goal. Doing so may kill the beneficial insects as well, or cause them to migrate to other areas where prey is available. In either situation, pest populations will generally reestablish more quickly than beneficial insects. This can then result in unchecked plant damage as the pest population builds up. Therefore, the presence or absence of a healthy population of beneficial insects, or pests showing the effects of parasites, should be taken into account when determining the need for a rescue treatment.

Control Measures

Cultural Control

Crop rotation is one of the most simple yet effective types of control for diseases and for insects that have a single generation each year. This involves planting a crop in an area of the garden where it (or a related crop) has not been grown for at least one year.

When a crop is grown in the same spot year after year, insects and disease organisms can become established in the soil. This can result in a more rapid infestation of pests each year. Rotating even a short distance from the previous site can help to deter, delay or avoid damage.

Proper fertility and selection of varieties of plants that are resistant to diseases are also important parts of an IPM program. Plants that are healthy and vigorous are able to withstand pest pressure better than stressed plants.

The use of a trap crop can be a control in itself or used in combination with the use of chemical or mechanical controls. A trap crop, which is usually planted around the crop to be protected, can be any plant known to be highly attractive to a pest. One example is to leave a patch of smart weed at the end of the garden to draw away the Japanese beetle. Once the trap crop is infested, the trap crop may be sprayed to kill the insect, or the insects can be hand picked, or the insects may be left to feed on the trap crop.

Mechanical Control

Several types of barriers may be used to protect a crop. Row covers, which allow for the penetration of sunlight and the movement of air and moisture (but not insects), can be used to protect a crop from migrating insects. If crop rotation is not used, however, this type of cover can trap insects emerging from the soil in with the crop, creating a false sense of security. Collars made of paper plates, aluminum pans and tin cans can also be placed around the bases of individual plants to protect the upper plant parts from crawling insects such as cutworms that live in the soil, or to protect the stem base from egg-laying by the cabbage maggot fly.

Several types of traps are also available for pest control or monitoring. Traps that attract an insect by color (usually yellow or white) may be cards covered with a sticky substance or colored bowls filled with soapy water. Other traps use a scent or "pheromone" to attract the pest to a sticky surface or an enclosure. Traps

such as these should not be relied on to control insects in an open area, but should be used more as an indicator of the pest's presence.

Mechanical control also includes simply removal of a pest by hand.

Sanitary Control

Removal of overripe produce will help in preventing the movement of scavenger type insects, such as the picnic beetle, into the garden. Complete removal of disease infested plants can also sometimes help in preventing further spread of the disease. This involves taking the diseased plant completely out of the garden area, not just pulling it and leaving it in the area. For plants that are susceptible to tobacco mosaic virus, the banning of all smoking or chewing tobacco products from the garden area is an important practice.

Biological Control

Biological control relies on naturally occurring organisms. In some instances this may be a fungus or bacterium that attacks the pest when weather conditions are right. It can also be the action of beneficial insects and parasites. The lady beetle and its larvae are well known for their habits of feeding on aphids.

If beneficial insects do not seem to be present, they can be purchased commercially. The success of this approach depends on which type of predator is purchased. Lacewings sold as eggs or pre-fed larvae can be effective for controlling aphids and other small pests. Lady beetle adults collected and shipped in from distant states seem to be of lesser value for pest control than local populations, making their purchase uneconomical.

To attract and preserve a population of local beneficial insects, grow flowers such as dill and angelica (even a few dandelions and wild carrot), and protect the eggs and larvae that are already present on the plants by spraying insecticides only when necessary.

Chemical Control

If a pest population reaches threshold levels despite preventive measures and other types of controls, chemicals may be the last resort as a rescue treatment. Even chemicals are not a foolproof way of controlling pests. If the pest is too far along in its growth cycle or has built up a resistance to a pesticide, use of chemical may do more harm than good. The squash bug, for example, can be controlled with a chemical in its younger stages, but is difficult to control chemically in its adult stage. Repeated spraying to try to control it at this stage may only result in killing the beneficial insects present. In a situation such as this, the grower of a small planting of squash would be better off removing the bugs and egg masses by hand.

Most chemical controls are divided into five classes. The following table lists these classes and also gives some examples of each. Gardeners interested in "organically grown" crops usually use products from classes #2-5, but not from #1.

Toxicity of any type of pesticide to mammals can be high (for products such as rotenone or diazinon), or low (for products such as B.t.), or anywhere in between. Botanical and biological pesticides tend to break down more rapidly than conventional pesticides. This can be favorable in that the insecticide is in the environment for a shorter period of time, but it also offers a shorter period of protection for the plant.

Insecticidal soaps and oils are often considered as part of an organic pest control program. Oils work on the basis of suffocation of the insect and its eggs. Soaps are used as desiccants on soft bodied insects. Both need to come into direct contact with the insect to be effective. Care should be taken when using these products to

avoid damage to sensitive plants. Plants are usually more sensitive to soaps and oils when they are under stress from high temperatures.

If a pesticide is needed for a rescue treatment, regardless of what type, be sure to follow the directions on the label. Do not apply at higher rates than directed on the label or use on crops that are not listed on the label. Also be certain to wear protective clothing as required by the label, and observe re-entry and pre-harvest limitations.

Integrated Control

Control strategies that can be used for common vegetable pests are listed in the table of Strategies. These strategies may be used individually, but they offer better chance of success when combined in an integrated pest management program.

Types of Chemical Controls

Conventional synthetic pesticides

- diazinon
- carbaryl (Sevin)
- malathion
- methoxychlor

Inorganic pesticides

- sulfur
- copper
- lime sulfur

Botanical pesticides

- rotenone
- pyrethrum, pyrethrins
- sabadilla
- ryania
- neem

Microbial pesticides

- B.t. (DiPel, MVP, M-One, etc.)

Soaps and horticultural oils

NOTE:Disclaimer - This publication contains pesticide recommendations that are subject to change at any time. These recommendations are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. Due to constantly changing labels and product registration, some of the recommendations given in this writing may no longer be legal by the time you read them. If any information in these recommendations disagrees with the label, the recommendation must be disregarded. No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. The author, The Ohio State University and Ohio State University Extension assume no liability resulting from the use of these recommendations.

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