

Welcome to the Iowa Certified Nursery Professional Training program Module 9: Managing Plant Diseases and Insects.



Upon completing this module you will:

- 1. Be able to define IPM;
- 2. Know the basic methods of monitoring insect pests and plant diseases;
- 3. Know how to prevent and manage plant diseases and insect problems with IPM tactics



Integrated Pest Management, or IPM for short, is a way of thinking about and approaching pest management. IPM takes into account the social, environmental, and economic costs of a pest management technique. IPM promotes prevention over remediation and advocates integration of at least two or more strategies to achieve long-term solutions.



In particular the management of plant disease relies on prevention. In order to prevent disease you must have a good understanding of what conditions make disease likely to occur. Diseased plants cannot be cured, but further spread can be prevented.



In the case of insects, treatments can be done in a preventative or curative manner. We first start by thinking about the injury level. The economic injury level is when the pest causes a monetary loss by directly reducing yields, we use this concept primarily with field crops. Greenhouses and nurseries also deal with the aesthetic injury level. This has a much lower threshold, we are concerned about the appearance of the plant, not just the yield. Aesthetic injury also leads to economic losses.

When we calculate injury levels we take into account the value of what we are treating, how much treatment will cost, what the potential loss from the pest might be and how susceptible our plant is to injury.



Monitoring pest is the most important part of using an integrated pest management approach. It is important to know what pests are present, where they are, and how many of them there are. Monitoring must be done routinely because conditions can change rapidly and pest populations can build quickly. It is very important to keep good records of what you observe. What diseases and insects are a problem in your operation? When do you see problems starting? What are the weather conditions? What plant species? How did you manage the problem before? What worked? What didn't work? This sort of information is invaluable for your operation. Some pests occur each year, some pests once in 10 years. Being able to look back at your records and know when to keep an eye out for a certain pest is important, because it is much easier to control a small problem than a large one.



As we approach monitoring we think of the what, where, when why, and how of monitoring our insects and disease problems.



When scouting for and monitoring insects and diseases it is very important to properly identify the insects or disease you find. If you do not diagnose the problem correctly you could waste money treating for something that isn't a pest, or use the wrong pest management tactic on a pest and not achieve control. The result is wasted time and money.



So when should you begin monitoring for pests? Basically whenever you have plants growing. Knowing what pests are likely to occur and enough about their life cycle will help you know when to begin monitoring for a particular life stage. You also want to monitor before populations would be high enough to cause damage. Monitoring will also help you identify when a life stage that is most vulnerable to control tactics is present. Your past records will indicate when you have observed problems in the past, and help you time when to begin monitoring.



It is easy to say look where the pest is, but that can be a hard part of monitoring. But prior experience and knowledge of the biology of the pest will help.



We monitor to know when pests are present. But almost of more importance we monitor so we know when populations of the pest are increasing and there is a risk of damage. This tells us when to apply treatments.



How we monitor a pest sort of depends on what sort of situation you are in and what sort of pests you are monitoring. In a greenhouse situation you could visually examine the plants, or use sticky cards to catch thrips. In a field situation we also visually examine plants, or can even use nets to catch insects and determine the population size.



Integrated Pest Management uses a combination of control methods to manage disease and insect problems. Management strategies can be classified as cultural control, biological control, or chemical control.



Many cultural practices can be used to help minimize disease and insect problems. First, we can make our host plants less susceptible to diseases and insects. When choosing plants for a landscape, choose species and cultivars that are less prone to problems. Sometimes, disease-resistant cultivars are available. Plant a variety of species. Keep the plant in good vigor by choosing an appropriate plant for a site, planting it properly, and caring for it properly to minimize its stress.



We can also use cultural practices to make the environment less favorable for disease. Many fungal and bacterial diseases are favored by a moist, humid environment around the leaves. Promoting airflow around plants can help to minimize disease. For example, plants should be spaced out well so there is plenty of space for air to move between them. Fans can be used in greenhouses to maintain airflow. Watering plants at the base, rather than overhead, keeps the leaves from getting too wet. Watering in the morning allows the leaves to dry off more quickly. Root rot problems are favored by overly wet soil conditions, so managing the soil or potting media moisture level can help reduce these problems. Make sure that soil or potting mix drains well, and avoid over- or under-watering plants.



Another cultural control method is to quarantine new plants from the rest of the greenhouse or nursery for a period of time, to ensure that diseases and insects are not introduced to the rest of the plants. New plants should always be closely inspected for disease and insect problems before being placed with the rest.



One of the most important cultural controls we can use is sanitation. Greenhouses and nurseries should be kept free of weeds, which can harbor diseases and insects. Diseases and insects may also survive in piles of growing media, or plant debris and discarded plants, so be sure to keep the growing area free of these materials. Leaving a greenhouse bay empty of plant material between crops for at least one week can help prevent insects and diseases from the first crop from infesting the second one.



Many plant pathogens survive on infected plant debris. Removing this debris throughout the growing season, or at least at the end of the season, can help minimize problems in the next year. Cultivation to bury infected debris is also an option to minimize disease problems the next season.



Most pest insects have a variety of predators, parasites and diseases, called natural enemies, to help keep populations down. We can also manipulate biological control organisms to help manage pest populations. Biological control is often used in situations where we want to avoid using chemicals, such as on plants in a public garden.



Using biological control is an effective and safe manner to manage pest insect populations. Biological control does require that you have the pest properly identified so you introduce the right natural enemy. You also have to keep in mind that the natural enemy will have needs as well, for instance parasitic wasp female will lay her eggs in insect pests and her larvae will kill them, but she often needs nectar to eat.

Natural enemy vendors are usually very knowledgeable and can help you figure out what natural enemies you need, how many, when to release them, and what other control tactics can also be used.



Chemical controls are often used to prevent disease outbreak and keep insect pest populations down. They are an important management tactic in an integrated pest management approach. Remember to read and follow all label directions and safety precautions. Be sure the chemical you choose controls the pest on the plants you have and can be used in that situation.



This is a case study of using IPM principles to manage a plant disease. Black spot is the most important disease of roses. It is caused by a fungus (*Diplocarpon rosae*). The fungus causes black spots on the leaves of rose plants, as well as on the canes and petals sometimes. Affected leaves turn yellow and may fall off prematurely. This can weaken the plant, as well as reduce its aesthetic value. The fungus survives the winter on dead, infected leaves that have fallen to the ground. In the spring and summer, it produces spores that splash onto new leaves and infect them. The fungus needs a moist, humid environment in order to infect the plant, so the disease is favored by high humidity and leaf wetness.



There are several tactics that can be used to manage black spot. Since the fungus needs leaf wetness to infect the plant, keeping the foliage dry can help minimize disease. Planting roses in sunny locations where there is plenty of air movement can help to minimize leaf wetness. Watering the plants at the base can also help to keep the leaves dry. Watering early in the morning allows the leaves time to dry off before the evening.

Another way to minimize black spot is to use good sanitation. Diseased leaves can be removed throughout the season, to prevent infection of nearby healthy leaves. At the end of the season, raking up all fallen leaves, and pruning off any infected shoots, can help to keep the fungus from overwintering in the area.

Some varieties of rose are resistant to black spot. Choosing a resistant variety is another tactic that may be used to manage this disease.



Finally, preventative fungicide sprays may also be used to help minimize black spot. Fungicides protect leaf tissue from infection by the fungus, but they will not cure an infected leaf, so they must be applied before or just as symptoms start to appear. Fungicides tend to be ineffective if other cultural controls, such as managing leaf wetness, are not also used. Fungicides usually need to be applied repeatedly in order to be effective, according to label direction. A combination of cultural and chemical management strategies can best manage diseases such as black spot.



The management of bagworm is an example of Integrated Pest Management. Bagworm is an insect that creates bags of needles on conifer and broadleaf trees. Arborvitae and juniper are common host plants for bagworms. There are multiple control methods that can be used to manage a bagworm problem. If the infestation is small, you can pick the bags off by hand. For larger infestations it might be easier to use a biological control or chemical control.



This concludes the module on managing plant diseases and insects.