

## Lesson 4: Weeds, Diseases, Insects

Many areas of the world are plagued by food shortages because of pests. High percentages of crops are lost due to pest damage. Each year, billions of dollars are spent to research the causes of crop damage and possible ways to prevent crop loss due to pests. Plant growth depends on a combination of external factors and internal processes. Successful production of food and fiber crops involves more than just plowing the soil, planting the seeds, and waiting for harvest. Many factors must be managed for successful plant growth.

### Plant Pests

Plant pests include all life forms that cause damage to plants. Pests can range from the smallest living organism, such as bacteria, to a deer that wanders into a field and eats or tramples a corn crop. Pests are commonly categorized into three groups: weeds, diseases, and insects.

### Weeds

As was discussed in Lesson 3, plants need sunlight, water, and essential nutrients for growth and development. All plants, including weeds, require these elements. Therefore, weeds compete with crop plants for nutrient elements.

Each year American farmers lose billions of dollars because of weeds. Weeds can inhibit crop growth and lower crop quality. Weeds are vigorous in their competition for plant nutrients and often develop an immunity to other pests. Weeds often overpower crops when their seed germination rates are higher and emergence occurs before the food crop. Weeds can populate an area quickly and steal the essential nutrients before crop plants can absorb the needed nutrients.

### Disease

Healthy plants are able to carry out normal physiological functions. Normal physiological functions include: cell division, development, absorption of water and essential nutrients from the soil, translocation, photosynthesis, food storage, reproduction, and overwintering.

Normal plant functions can be affected by either adverse environmental conditions or a combination of harmful factors. When normal plant functions are altered beyond some tolerance point, the plant may become diseased. The major causes of disease are environmental conditions under which plants are exposed to pathogenic living organisms (pathogens). Pathogens are organisms that transmit diseases.

Plants respond differently to various diseases. However, most diseases are harmful to plants. Injury to plant tissues and cells reduces the plant's ability to produce food through photosynthesis. The reduction of photosynthesis can stunt the growth of the plant or kill it entirely. Diseases affecting tissues and cells also affect the plant's structural strength. Weakened structural strength increases crop losses due to reduced yields and quality.

### Condition for Diseases

A plant can become diseased when it has been damaged or injured by environmental causes or attacked by a pathogen. In order for plant disease to develop, certain conditions must be present: a susceptible host, a virulent pathogen, and a favorable environment.

A susceptible host refers to a weakened plant that comes in contact with a pathogen. Plants that have been injured or stressed are more susceptible to infection. Plant scientists and breeders have made great progress in developing disease-resistant crop varieties. In order for the disease process to start, the combination of the plant and pathogen must be favorable. Disease-resistant crop varieties reduce the possibility of a disease starting.

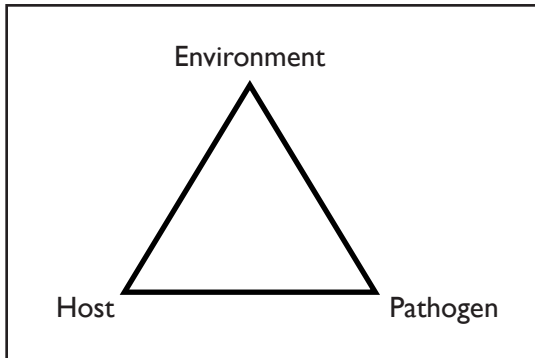
The second condition is the virulent pathogen. Not only does the plant need to be a susceptible host, the pathogen must carry the disease organism. A virulent pathogen is one that is able to successfully attack a plant and inflict the disease.

The third condition necessary for the development of a disease is the environment. When the first two conditions are present, but the environment does not enhance that contact, no disease will develop. If the environment is too

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cold, too hot, too dry, or some other extreme, the disease may not develop at that time. These three conditions necessary for the development of a disease can best be illustrated in what is known as the disease triangle. See Figure 4.1. The absence of any one of the three factors will prevent occurrence of the disease. Disease control practices are directed toward eliminating one or more of the three factors.

Figure 4.1 – Disease Triangle



## Insects

The presence of insects is a part of life. Insects need nourishment and shelter; plants provide both. Insects inflict damage to crops that cost producers and consumers billions of dollars annually. For example, the European corn borer can destroy up to 35 million dollars of the corn crop annually, and that is only one species of insect. However, not all insects are harmful to plants. Some insects actually help by destroying other harmful insects.

Insects inhibit plant growth in two ways: by causing physical damage or physiological damage. Physical damage is caused by insects attacking physical structures of the plant. For example, insects that are categorized as foliage feeders are chewing insects.

Foliage feeders are the largest group of insects. Foliage feeders chew on leaves, stems, and flowers. Some foliage feeders may bore themselves into the plant and eat the tissues inside the stem like the cutworms or army worms. Foliage feeders are found in large numbers and can do extensive damage in a short period of time.

Sap sucking insects also do physical damage to plants. Aphids and leaf hopper nymphs are species that attach themselves to plants and suck plant sap from the leaves and stems. Sucking the sap from the plant robs the plant of essential nutrients. Other physical damage caused by insects may occur on the roots, the seeds, or the fruit of plants. Attacking the physical structure often reduces plants to a weakened state and therefore more susceptible to disease.

Physiological damage refers to disruption of natural processes within the plant. Photosynthesis, respiration, and translocation of nutrients and water throughout the plant are examples of physiological processes. Physiological damage to the plant may also be caused by insects. Insects are considered vectors. A vector is a carrier. Vectors can be beneficial by carrying pollen and aiding in the pollination of plants. Vectors can also be harmful by carrying disease-causing organisms from plant to plant. Insects can also cause physiological damage to plants by depositing their eggs on or within the plant. Insect eggs can inhibit certain growth processes or even destroy the plant.

## Summary

Plant growth damage from pests continues to destroy portions of the world's food supply. Pests such as weeds, diseases and insects reduce yields and crop quality. Researchers continue to work to develop crop varieties that can resist pests and therefore reduce crop losses.

## Credits

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