

# The Plant Doctor

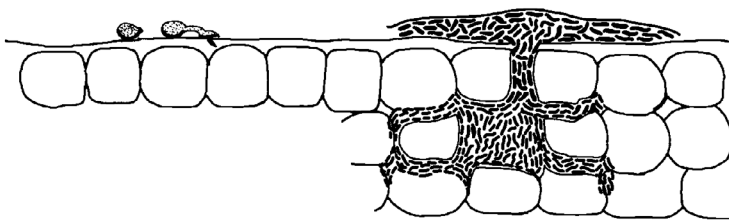
## Watering and Plant Disease

Water, especially water droplets on leaves and stems, plays a major part in plant diseases. Unlike other important factors, such as temperature, you can sometimes control water levels and moisture levels. By understanding a few basic principles of how free water (water droplets and films of water on the surface of plant tissues) relates to plant disease and by watering appropriately, you can limit disease in your garden.

Most plant diseases in the state are caused by fungi, but bacterial diseases also occur. Fungi and bacteria that can cause disease are called pathogens. They spread by seed-like structures called spores or by cells.

The fungal spores and bacterial cells are often not released until they have been wet for a certain period. Once released, they may be carried on the wind, in raindrops, or in irrigation water. Fungi and bacteria must have water to spread and infect plants.

Fungal spores are small and delicate (Figure 1). Like plant seeds, they require moisture to begin germination, and once they germinate, they die if they dry out. Many fungi require a film of free moisture for at least 9 hours to germinate and penetrate the plant leaf. Some require slightly less time and others more.



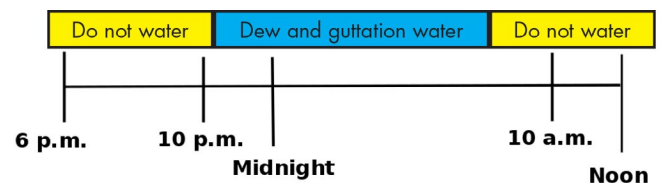
**Figure 1. Diagram of the cross-section of a leaf with fungal spores (top of leaf, left) and bacterial cells (top of leaf, right). The surface of the leaf often has a cuticle, beneath which are living cells (represented by square blocks). Water on top of the leaf lets the spores and bacterial cells penetrate the plant and cause infection. Drying the leaf kills the fragile spores.**

Splashing water droplets move pathogen “seeds” short distances. The splash carries the “seeds” from the soil to lower plant leaves, from the lower plant leaves to the upper plant leaves, and from one plant to another. The “seeds” may move longer distances by windblown water droplets.

Moisture is the critical factor in disease development. The amount of disease depends on the number and length of wet periods.

You can control many plant diseases by controlling the number of free moisture periods and how long those periods last. Reduce the number of periods by watering only when needed, and then watering deeply.

Reduce the amount of time leaves are wet. Remember that dew is water, too, so your watering schedule has to account for it. Do not extend the period of leaf wetness by watering as the dew is beginning to dry in the morning or before it forms in the evening (Figure 2). Extending the period of leaf wetness will let more pathogen “seeds” germinate.



**Figure 2. Irrigation scheduling. Free water on plant leaves is a major contributor to plant disease. You cannot control how heavy or long a dew is, but you can water while the dew is still on the plants. This lessens the length of time the leaves stay wet and reduces disease.**

Observe how long the dew stays on the plant canopies and turf; then time watering to coincide with the dew’s presence on the plants. Dew is usually present from about midnight to 8:00 in the morning. If watering in the evening, make sure you stop watering early enough that the watered areas dry before dark. If watering in the morning, stop early enough that the watered areas dry at the same time as or before unwatered areas.

A plant has leaves on the outside and on the inside of its canopy. The inside leaves are sheltered from direct sun and

drying winds, so water will stay longer on them. Plants shade the soil, slowing the drying time and raising the humidity levels around the plants. This means diseases are more likely to become established inside the plant canopy than on the outside.

Reduce disease inside plant canopies with proper pruning and landscaping. Make best use of morning winds and sun to dry your landscape. You may hasten drying of particularly valuable areas of turf or plants by brushing a bamboo pole or pulling a garden hose over them to remove the dew drops.

Consider using drip irrigation in your established plantings and soaker hoses in your more temporary ones. If watering by hand, try to water at the base of plants. Drip irrigation and watering at the soil level will help reduce the amount of free moisture on plant canopies. This won't be possible with your lawn, so water it at the proper time.

## How Much to Water

Have you ever noticed that as you dig a hole, the soil becomes moister the deeper you dig? Even when the upper soil layers are quite dry, the deeper layers are moist. So there is more moisture deeper in the soil.

How does water get into the plant? Through the roots. So, putting the two together, you want the plant roots to penetrate as deeply into the soil as possible—to avoid the drying cycles of the upper soil layers.

How can you do this? Encourage the roots to grow deeply. Just as branches twist and turn to get more light, roots grow toward a supply of water.

If the area is constantly watered lightly, there will be enough soil moisture just below the surface for the plants. But the soil moisture will dry up quickly and leave plants desiccated in hot weather. Instead, water deeply so the moisture penetrates to about 4 inches. Then, don't water until it is needed. See Figure 3.

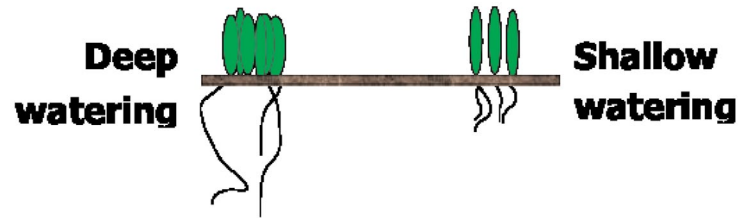


Figure 3. Root systems respond to watering type.

You can check the depth of the soil moisture using an unpainted wooden dowel like you use a toothpick to check if a cake has fully baked. Soil crumbs clinging to the dowel indicate moist soil.

By understanding the relationship between free moisture and disease development, and adjusting your watering practices to reduce the duration of leaf wetness and the frequency of irrigations, you can minimize the risk of plant diseases in your landscape.

Publication 3881 (POD-06-25)

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Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. ANGUS L. CATCHOT JR., Director