

# Row Crop Diseases in Drought Years

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Drought impacts many diseases of row crops. In some cases, drought conditions will impact disease by making the environment more (or less) favorable for infection, disease development, and/or disease spread. In other cases, drought may not impact the pathogen at all, but may exacerbate the damage caused by disease in drought stressed plants. Although the effects of drought on disease are variable, certain diseases of some crops tend to be consistently more or less severe in drought conditions (Table 1).

## Diseases less severe in droughts

**Root Diseases.** Many different species of fungi cause root rots in North Dakota. Oomycete organisms (commonly called water molds, or near-fungi) such as *Phytophthora*, *Pythium*, *Aphanomyces*, and *Plasmopara* need wet soils to cause disease. Some common diseases caused by Oomycete pathogens that are usually less severe in drought conditions include downy mildew of sunflower, *Phytophthora* root rot of soybeans, *Aphanomyces* root rot of sugarbeet, and damping off of many plants caused by *Pythium* species.

**Leaf Diseases.** Many foliar pathogens are able to infect plants only when leaves are wet. In drought situations, there may be a lack of free moisture on the leaves, which reduces the pathogens ability to infect plants. Fungal or bacterial pathogens causing leafspots and some rusts tend to fall into this category.

Additionally, many foliar pathogens produce spores that are only dispersed by rain splash. Pathogens that need rain to spread are unlikely to cause epidemics in drought years. Many fungal and bacterial pathogens causing leaf spots fall into this category, but rusts do not.

**Stem Diseases.** Some stem diseases may be less likely to occur in drought years. White mold (caused by *Sclerotinia sclerotiorum*) infects many broadleaf crops grown in North Dakota including canola, edible beans, soybeans and sunflower. The soil must be wet for the white mold pathogen to germinate and produce airborne ascospores, and an extended wet period is needed for those asco spores to infect plants. When soils are dry and limited wet periods occur in the canopy, white mold is unlikely. One notable white mold exception is sunflower wilt, which is

caused when the white mold pathogen infects sunflower plants through the roots. This method of infection is less likely to be influenced by drought.

#### Diseases more severe in droughts

**Root Diseases.** Most root rot pathogens need some soil moisture to cause infection. However, once disease has been established in a drought stressed plant, the impact of the root rots may be significant. Some fungal species (*Fusarium* and *Verticillium*) that cause wilts reduce the plants ability to transport water. The pathogen plugs the xylem tissue that transports water through the plant. When root rots caused by these pathogens occur in drought stressed plants, the damage may be much greater than might occur in plants in a non-drought situation. These wilts are most severe when there is enough moisture to cause infection in the early part of the growing season, but the rest of the season experiences a drought.

**Leaf Diseases.** Droughts occur when there is a lack of rainfall, but that does not necessarily translate into a lack of humidity. Dew is likely to form if the air is humid and night temperatures fall below the dew point. Dew on leaves creates a favorable environment for some pathogens, and in drought stressed plants, damage from some leaf diseases may be extreme.

Dew on leaves often provides enough moisture for rust pathogens to infect plants. While many leaf spot pathogens cause dead spots on leaves, rust pathogens produce an open wound in living plant tissue. This open wound allows moisture to readily escape from the plant, causing a drought stressed plant to lose water more quickly. Additionally, rusts do not need rain to disperse spores, so if adequate dew is available for infection, rust epidemics may occur. In some drought situations, rusts can become a major concern.

Powdery mildew is occasionally found on most crops in North Dakota. High humidity provides a favorable environment for the infection and development of powdery mildew. Powdery mildew is likely to occur in drought years when the humidity is high.

**Stem Diseases.** Many stem diseases that begin as infections on leaves or florets (*Phomopsis* and *Phoma* of sunflower, white mold) are inhibited by drought conditions. However, stem diseases that first infect roots are largely unaffected. Charcoal rot (*Macrophomina*) is a stem disease of corn, soybean, sunflower, edible beans and other crops grown in North Dakota. The disease begins when microsclerotia (the pathogen's survival structure) germinate in the soil and infect the plants roots. Once infection progresses into the stem, the disease partially degrades the pith. This limits the plants ability to transport water. Charcoal rot is favored by high temperatures and water stressed plants, so the disease is more likely to be a problem in drought years.

Table 1. General effects of drought on different diseases.

Disease	Crop	Greater	*Disease Damage	
			No effect	Less
Oomycete root rots (Phytophthora, Pythium, Aphanomyces)	Many			X
Fungal root rots causing wilt (Verticillium, Fusarium species)	Many	X		X
Downy Mildew	Sunflower			X
White Mold (Sclerotinia)	Many broadleaf crops			X
Sclerotinia Wilt (root infection only)	Sunflower		X	
Charcoal Rot	Soybeans, Sunflower, Edible Beans, Corn, others	X		
Leaf Spot Pathogens	All			X
Rusts	Most Crops	X		X
Late Blight	Potato, Tomato			X
Rhizoctonia Stem Canker	Potato		X	
Early Dying (Verticillium)	Potato	X		
Black Scurf (tuber)	Potato			X
Ascochyta Blight	Pulse Crops (Pea, lentil, chickpea)			X

\*These are general effects only, exceptions occur in all categories. In categories with more than one box checked, drought may cause different effects under different conditions. See text for detail.



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