

# Sunflower

## Downy Mildew

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### Identification and Life Cycle

Downy mildew of sunflower is caused by the fungus-like organism *Plasmopara halstedii*. The disease can occur in most sunflower production regions of the world, but is most common in the Red River Valley of North Dakota and Minnesota. The disease is initiated by soilborne dormant structures called oospores or infected seed. Oospores germinate in the spring in wet soils and produce swimming structures called zoospores, which migrate to roots, encyst, and germinate. Plants become increasingly resistant to infection with age, so systemic infections occurs over a short period (two to three weeks) after germination. The pathogen infects plants through roots, but becomes systemic within the plant. The pathogen produces zoosporangia profusely on roots and aboveground plant parts; zoosporangia are readily disseminated by wind and splashing water to other plants, where infection can occur through apical buds or leaves. The pathogen produces oospores in diseased tissues that are returned to the soil during tillage operations and serve as primary inoculum for future sunflower crops. Oospores can survive in the soil for five to 10 years. *P. halstedii* can also attack many weeds.

### Plant Response and Damage

Downy mildew infected sunflowers are stunted with yellow leaves. White cottony masses of pathogen mycelium are apparent on the lower surface of leaves opposite the yellowed areas. As plants continue to grow, leaves become wrinkled and distorted. Heads of infected plants do not nod as they mature, but remain erect and produce little if any seed. The disease is most damaging when sunflowers are grown on heavy, wet soils with a history of downy mildew.

### Management Approaches

### Biological Control

No biological control strategies have been developed for downy mildew.

## Cultural Control

Plant high quality certified seed free from the downy mildew pathogen. Practice a five-year or longer crop rotation between sunflower crops with nonhosts such as corn and small grains. Eliminate weeds that can serve as alternate hosts of downy mildew. Avoid reuse of irrigation water from sunflower fields, which can introduce oospores and zoosporangia into other fields. Provide adequate but not excessive irrigation, especially early in the season. Varieties resistant to some strains of the pathogen are available commercially.

## Chemical Control

Seed treatments and fungicides are most effective when used in combination with cultural control strategies.

### *Product List for Downy Mildew:*

<b>Pesticide</b>	<b>Product per Acre</b>	<b>Application Frequency (days)</b>	<b>Remarks</b>
<b>Metalaxyl/Methoxonam</b>			
Allegiance FL	1.5-3.0 fl oz	Seed treatment	
Allegiance LS	2.4-4.9 fl oz	Seed treatment	
Apron XL LS	1.28 fl oz	Seed treatment	
<b>Neem</b>			
Trilogy	2 pt	7-14 days	Maximum of 2 gallons; 0 day PHI
<b>Pyraclostrobin</b>			
Headline	6-12 fl oz	7-14 days	Maximum of 24 fl oz/Acre; rotate with other fungicide chemistry; 21 day PHI

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