

Lettuce

Downy Mildew

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Identification and Life Cycle

Downy mildew is caused by the fungus-like organism *Bremia lactucae*, and is a serious disease of lettuce worldwide. The disease can be devastating in temperate climates if not controlled. Infection occurs when wind, seed, or soil-borne spores (oospores or sporangia) germinate on leaves in the presence of free moisture or relative humidity near saturation when temperatures are cool to moderate (40 to 86°F). High and low temperatures extend the latent period and slow disease development, but extended periods of morning leaf wetness favor infection. The pathogen survives between lettuce crops in and on lettuce seeds, pathogenically on wild *Lactuca* spp., and soil-borne oospores, but wind-blown spores can also be important in disease development.

Plant Response and Damage

Downy mildew symptoms first appear as angular, variably sized light green or light yellow lesions, but later become yellow or necrotic. Lesions are often bounded by large veins. When temperatures are moderate and humidity is high, sporulation is evident on leaves, especially on the lower sides of leaves. Older lesions become brown and necrotic. Severe infection can kill seedlings, but adult plants are rarely killed. Early infections can also become systemic and cause a dark brown discoloration of vascular tissues. Low levels of infection can downgrade the crop, causing significant trimming losses at harvest, and promoting decay during post-harvest storage. High levels of downy mildew can cause an entire crop to be unmarketable.

Management Approaches

Biological Control

Biological control strategies have not been developed for downy mildew.

Cultural Control

Plant lettuce varieties resistant to downy mildew. Resistant varieties effectively control the disease, but new races of the downy mildew pathogen have developed that can overcome single-gene resistance. Other varieties are available and can provide high levels of resistance to all races of the pathogen and have been more stable sources of resistance. Use subsurface drip irrigation; avoid sprinkler or furrow irrigation. If sprinkler irrigation is used, time irrigations to allow foliage to dry before dusk to prevent extended periods of leaf wetness.

Chemical Control

Fungicides can provide effective downy mildew control, but strains of the pathogen insensitive to metalaxyl are widespread. Fungicides with different modes of action should be used if metalaxyl-insensitive strains are present.

Trade/Common Name	Product per Acre	Application Frequency	Remarks
Azoxystrobin and Strobilurin Mixtures			
Amistar	4-5 oz	5-7 days	Maximum of 1.88 pounds or 4 applications per season; Rotate with fungicides with a different mode of action such as maneb or Aliette; 0 day PHI
Quadris Flowable	12.3-15.4	5-14 days	Rotate with fungicides with a

			different mode of action such as maneb or Aliette; Maximum of 2.88 quarts or six applications per season; 0 day PHI
Tanos	8 oz	5-7 days	Rotate and tank-mix with fungicides with a different mode of action such as mancozeb or Aliette; Maximum of 36 ounces per season; 3 day PHI
Copper			
Copper fungicides	Varies	7-10 days	Various formulations, such as Kocide 101, Top Cop + S, Tri Basic Copper, and Champ among others; 0-1 day PHI
Dimethomorph			
Acrobat 50WP	6.4 oz	5-10 days	Tank-mix with another fungicide activity against downy mildew; do not make more than 2 sequential applications; 0 day PHI
Forum	6 oz	5-10 days	Tank-mix with another fungicide activity against downy mildew; maximum of 5 applications per season, maximum of 30 oz per acre per season, do not make more than 2 sequential applications; 0 day PHI
EBDC			
Maneb	Varies	7-10 days	Various formulations such as Maneb 75DF and Manex; 10 day PHI
Fosetyl-Al			
Aliette 80	2-5 lb	7-21 days	Maximum of 7 sprays; must be applied in at least 15 gpa water;
Mefenoxam			
Ridomil Gold EC	1-2 pts	Pre-plant incorporated soil drench or soil band (a 7" band is recommended)	Suppression of early season downy mildew

Phosphorous Acid

Agri-Fos

0.5 gallons

7-21 days

Apply in at least 200 gpa

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