UNIVERSITY OF MINNESOTA EXTENSION

Horticulture

Basil Downy Mildew

Peronospora belbahrii

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Early symptoms of basil downy mildew.
Photos by M. McGrath, Cornell University

IMPORTANCE

Basil downy mildew was first officially identified in Minnesota in 2012. Under the right weather conditions basil downy mildew can spread rapidly and result in complete yield loss. Although *Peronospora belbahrii*, the pathogen that causes basil downy mildew, cannot survive MN's winters, it can be reintroduced on infected seed or transplants or by windblown spores.

IDENTIFICATION

- Infected leaves first turn yellow in areas restricted by major veins, with time the entire leaf turns yellow.
- Irregular black spots appear on infected leaves as they age.
- Fluffy gray spores grow on the underside of infected leaves.
- Infection starts on lower leaves & moves up the plant.

Report Suspected Cases to Arrest a Pest
1-888-545-6684 (Voicemail) or Arrest.The.Pest@state.mn.us

BIOLOGY

Peronospora belbahrii, the pathogen that causes basil downy mildew, can be carried on seed, transplants, or fresh leaves. Infected transplants and leaves may not show symptoms if maintained in cool dry conditions. Spores of *P. belbahrii* can also travel long distances on moist air currents.

Peronospora belbahrii tolerates cool weather and can infect and produce spores in temperatures as low as 59F. The pathogen, however, thrives in warm, humid conditions. As a result the most devastating damage is often seen in late summer.

Peronospora belbahrii needs two different mating types to produce tough resting spores known as oospores. Currently only one mating type has been found in the USA. As a result no oospores are formed and the pathogen will not be able to survive Minnesota's harsh winters. This may change if the second mating type is introduced.

MANAGEMENT

Resistant Varieties

There are no resistant varieties of sweet basil (*Ocimum basilicum*) available. Commercially popular varieties are highly susceptible. Lower disease levels have been observed in red leaf basil varieties (*O. basilicum purpurescens*) and in lemon flavored varieties (*O. citridorum*). Only varieties of *O. americanum*, have shown no symptoms or sporulation when inoculated with downy mildew.

Table 1: Susceptibility of basil varieties to basil downy mildew		
Level of Resistance	**Scientific Name**	**Varieties**
Highly Susceptible	*Ocimum basilicum*	Genovese, Nufar, Italian Large Leaf, Queenette, Superbo, Poppy Joe's & many others
Moderately Susceptible	*O. basilicum purpurescens*	Red Rubin, Red Leaf
Moderately Susceptible	*O. citridorum*	Lemon std., Mrs. Burn's Lemon, Lemona & Lime
Less Susceptible	*O. americanum*	Blue Spice, Spice & Blue Spice F1

Varieties with no to low disease are not necessarily good substitutes for susceptible sweet basil varieties. They often have different leaf color and flavor, dramatically affecting the final product. Growers should choose the most resistant variety that is acceptable to their market. Breeders are working to combine the flavor and other characteristics of sweet basil with the resistance found in other species of *Ocimum*.

Cultural Control

Peronospora belbahrii is carried on seed. All seedlings and transplants should be monitored closely for yellowing leaves and gray downy growth on the lower surface of the leaf. If basil downy mildew is identified on any plant, it should be removed and destroyed immediately.

Increase row width and distance between plants to provide good air movement between plants to allow leaves to dry quickly after rain, dew or irrigation. Use drip irrigation if possible. If sprinkler irrigation is the only option, water deeply and infrequently early on a sunny day so leaves dry quickly in the sun. In greenhouse production, adjust ventilation to reduce humidity.

Diseased plants that are past harvest should be promptly tilled under to reduce the spread of the pathogen from one plant to another through spores produced on infected leaves.

Fungicides

Certain fungicides can protect plants from basil downy mildew but sprays must begin before infection occurs to be effective. *Peronospora belbahrii* is not a true fungus but rather a member of the Oomycota. As a result many common fungicides provide no control against downy mildew. In one study, extreme periods or rainy wet weather resulted in no control by any fungicide combination. All label instructions should be read and followed whenever a fungicide is applied. Tank mixes and rotation between fungicides should be used to reduce the risk of fungicide resistance.

Table 2: Research results demonstrating fungicide control of basil downy mildew		
70-90% disease reduction when applied every 7 days		
Trade Name	**Active Ingredient**	**FRAC Code**
Quadris	Azoxystrobin	11
Ridomil Gold SL+	Mefenoxam	4
Fosphite or ProPhyt	Phosphorous acid	33
2-45% disease reduction if applied at label recommended intervals		
Trade Name	**Active Ingredient**	**FRAC Code**
Milstop	Potassium Bicarbonate	NC
Actinovate	*Streptomyces lydicus*	NC
Oxidate	Hydrogen Peroxide	NC

*Trade names indicate products tested in research trials & registered for use in MN in 2012. No endorsement of any product by UMN Extension is implied.
+ Do not apply Ridomil Gold SL within 21 days of harvest as stated on the label.