

## Impatiens Downy Mildew

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This NebGuide discusses the biology, identification and management of Impatiens Downy Mildew.

### Cause and Occurrence

The causal agent responsible for Impatiens Downy Mildew, *Plasmopara obducens*, is a fungus-like water mold belonging to a class of organisms called Oomycetes. Impatiens Downy Mildew has been found in greenhouse plantings in several states throughout the U.S. since 2004. It wasn't until 2011 that the disease started appearing in landscape beds. The disease has spread rapidly and has been reported in the landscape and greenhouses in 39 states, including Nebraska.

All cultivars and intraspecific hybrids of *Impatiens walleriana* are susceptible to Impatiens Downy Mildew. This is the plant that is widely available and used extensively for season-long color in part shade to shade environments. Touch-me-not (*Impatiens balsamina*) and some other wild impatiens (yellow jewelweed, *I. pallida* and orange jewelweed, *I. capensis*) are also susceptible to this disease. New Guinea impatiens (*I. hawkerii*) have been found to be resistant (Table 1).

### Symptoms

Initially, the youngest or smallest leaves of infected plants become chlorotic (yellowed) and may curve downward at the leaf edges. As the disease progresses, older leaves become symptomatic. Leaves may remain small and undeveloped, and the whole plant can be stunted. In some cases, faint gray lines appear on the upper surface of the leaves. As symptoms worsen, a white downy or cottony growth can be seen on the undersides of the leaves (Figure 1). If the disease is severe, the flowers and the leaves will drop off, leaving only the bare stems (Figures 2 and 3). Eventually, the stems themselves will collapse. It is important to note that *Plasmopara obducens* may cause a latent infection. This means that plants may be infected with the pathogen but not showing any symptoms. It is important to inspect all nursery stock for plants exhibiting the described symptoms.

### Disease Cycle

Infection may occur throughout the season but is favored in late summer and early fall when nighttime temperatures fall below 50°F. Disease often results when healthy plants are transplanted into infested soil. In the greenhouse, healthy plants can become infected if placed in close proximity to diseased plants.

*Plasmopora obducens* produces two types of spores, sporangia and oospores.

Sporangiophores (spore-bearing structures) are produced on the undersides of the leaves. When mature, they release spores called sporangia (Figure 4). Sporangia are produced 5–14 days after infection depending on host susceptibility, pathogen aggressiveness and weather conditions. These spores are infectious and can be rain-splashed short distances or wind-blown long distances to susceptible plants and induce disease. A minimum of four hours of leaf wetness is required for infection.

Oospores are produced inside infected plant material (leaves, stems, flower petals and buds). In landscape plantings, these spores can survive in plant material in the soil and cause infection the following season. Based on survival studies of closely related *Plasmopara* species, it is estimated that *P. obducens* can survive in the soil for up to five years. This means that impatiens planted in beds with a history of downy mildew will be at risk of infection. There has been no evidence of seed transmission.

### Favorable Environmental Conditions

Disease is favored by moisture and high humidity, which can be the result of excess irrigation or rain events. The pathogen is most active under cool temperatures (~60–73°F). Tightly spaced plantings may be more susceptible to infection due to decreased air circulation. The shaded locations preferred by impatiens also reduce the drying effects of sun, contributing to humidity levels and leaf wetness.

## Management for Greenhouse Production and the Landscape

**Cultural Practices** — The best strategy for managing *Impatiens* Downy Mildew is prevention. In the greenhouse, physically isolate new arrivals from other *impatiens* for up to two weeks and regularly scout for symptoms. It is important to avoid overwintering plants or holding any *impatiens* for more than one growing season. Any symptomatic plants should be collected, sealed in plastic bags and removed from the greenhouse. All nursery stock should be inspected for symptoms before purchase and placement in the greenhouse or landscape. Take steps in the greenhouse and the landscape to minimize the cool, wet conditions that favor the disease. Ensure adequate spacing between plants to encourage air movement. Heating the greenhouse may be necessary during cooler weather, and fans may need to be installed to increase air circulation and decrease relative humidity. Avoid overhead irrigation and water in the morning if possible. Remove any wild weed species of *Impatiens* that might be secondary hosts for the disease. Avoid planting *Impatiens walleriana* in landscape beds that have a history of downy mildew. Because the disease is host-specific, alternative plants can be used to provide color in the landscape. See *Table II* for a list of alternative plants that are hardy for shady Nebraska landscapes and/or container production.

**Chemical Control** — Chemical control with fungicides is strictly preventative. There are no curative products available for control of *Impatiens* Downy Mildew. It is important to regularly scout plants for evidence of the disease. For best results, chemical control should be used in combination with cultural management. To avoid development of resistance in the pathogen population, products with different active ingredients should be used in mixtures or in rotation. Always read and follow label instructions and restrictions before and during application of fungicides. Commercial producers should implement a preventative fungicide schedule any time susceptible *Impatiens* sp. are grown. A list of fungicides effective against downy mildew is included in *Table III*.

**Diagnosis** — The spores released on the undersides of the leaves can be diagnostic for this disease but a microscope is needed for visualization. For confirmation of diagnosis, samples can be sent to the University of Nebraska–Lincoln’s Plant and Pest Diagnostic Clinic, 448 Plant Sciences Hall, 1875 N 38th St. Lincoln NE, 68583-0722.

**Table I. List of Plant Hosts Susceptible to *Impatiens* Downy Mildew**

Common Name(s)	Scientific Name
<i>Impatiens</i> , balsam, busy Lizzie	<i>Impatiens walleriana</i>
garden balsam, garden jewelweed, rose balsam, touch-me-not	<i>Impatiens balsamina</i>
pale touch-me-not	<i>Impatiens pallida</i>
orange jewelweed, common jewelweed, spotted jewelweed, spotted touch-me-not, orange balsam	<i>Impatiens capensis</i>
Himalayan balsam	<i>Impatiens b glandulifera</i>



**Figure 1. White downy growth on the undersides of *impatiens* leaves.**



**Figure 2. Symptoms of *Impatiens* Downy Mildew. Blossoms and leaves fall off, leaving just the stems standing.**

**Table II. A list of Alternative Landscape Plants Resistant to Impatiens Downy Mildew**

<i>Common Name</i>	<i>Scientific Name</i>	<i>Family</i>	<i>Hybrids</i>	<i>Site Preference</i>
ageratum, floss flower	<i>Ageratum houstonianum</i>	Asteraceae	Leilani Blue, High Tide, Blue Pacific, Blue Horizon	Sun, part shade
alternatheria	<i>Alternanthera dentata</i>	Amaranthaceae	Purple Knight, many others	Sun, part shade
alyssum, sweet	<i>Lobularia maritima</i>	Brassicaceae	Snow Crystals, Easter Bonnet	Part shade
begonia, angel wing	<i>Begonia x hybrida</i>	Begoniaceae	Dragon Wing, Baby Wing	
begonia, tuberous	<i>Begonia tuberhybrida</i>	Begoniaceae	Nonstop, Nightlife	
begonia, wax leaf	<i>Begonia semperflorens-cultorum</i>	Begoniaceae	Whiskey Mix, Nightlife, Cocktail	
caladium	<i>Caladium bicolor</i>	Araceae	Sweetheart, Red Ruffles, Moonlight	Shade, part shade
calla lily	<i>Zantedeschia sp.</i>	Araceae	many	Sun, part shade
canna	<i>Canna x generalis</i>	Cannaceae	Tropical White, The President, Red King Humbert, South Pacific series	Sun, part shade
coleus	<i>Solenostemon scuttellarioides</i>	Lamiaceae	Kong Mosaic, Black Dragon, Wizard, Sonora, The Line, Sun Coleus, Millennium, Solar Flare, Fishnet Stockings, Redhead, Sedona	Part shade
flowering maple, abutilon	<i>Abutilon sp.</i>	Malvaceae	Crepe de Chine Hybrid mix	Sun, part shade
impatiens	<i>Impatiens auricomia</i>	Balsaminaceae	Jungle Gold Hybrid	Shade, part shade
impatiens, New Guinea	<i>Impatiens hawkeri</i>	Balsaminaceae	Tango, Tango Improved, Sunpatiens	Shade, part shade
larkspur	<i>Consolida ajacis</i>	Ranunculaceae	Earl Grey, Sydney Mix, Giant Imperial	Sun, part shade
linaria, toadflax	<i>Linaria maroccana</i>	Plantaginaceae	Enchantment, Flaming Passion	Sun, part shade
lobelia	<i>Lobelia erinus</i>	Campanulaceae	Fan Trio Hybrids Regatta, Moon, Riviera, Fountain, Hot Water Blue	Part shade
monkey flower	<i>Mimulus x hybridus</i>	Phrymaceae	Magic	Part shade
nemesia	<i>Nemesia strumosa</i>	Plantaginaceae	Masquerade	Sun, part shade
nicotiana, flowering tobacco	<i>Nicotiana x sanderae</i>	Solanaceae	Avalon Hybrids, Perfume, Domino, Nikki, Havana Appleblossom, Heaven Scent, Saratoga	Sun, part shade
nicotiana	<i>Nicotiana sylvestris, N. alata</i>	Solanaceae	Only the Lonely	Sun, part shade
pansy	<i>Viola x wittrockiana</i>	Violaceae	Colossus hybrids, Matrix Coastal Sunrise Mix, Majestic Giants, Bingo, Accord, Atlas, Bolero, Crown, Delta, Chianti Terracotta	Part shade
Persian shield	<i>Strobilanthes dyerianum</i>	Acanthaceae		Sun, part shade
sweet potato vine	<i>Ipomoea batatas</i>	Convolvulaceae	Ace of Spades, Margarita, Blacky, Sweet Caroline	Sun, part shade
Swiss chard	<i>Beta vulgaris subsp. Cicla</i>	Chenopodiaceae	Bright Lights, Ruby	Sun, part shade
verbena, African	<i>Verbena bonariensis</i>	Verbenaceae		Sun, part shade
viola	<i>Viola</i>	Violaceae	Sorbet Blue Babyface, Hobbit hybrids	Part shade

**Table III. Fungicides\* available for Impatiens Downy Mildew control.**

<i>Trade Name</i>	<i>Fungicide Active Ingredient</i>	<i>Commercial (C) / Homeowner (H) Use</i>
Adorn (Valent)	<i>Fluopicolide</i>	H
Agri-Fos (AgBio)	<i>Phosphorous Acid</i>	H
Alude (Cleary)	<i>Phosphorous Acid</i>	H
Disarm O (OHP, Inc.)	<i>Fluoxastrobin</i>	C
Fenstop (OHP, Inc.)	<i>Fenamidone</i>	C
Fore 80 WP (Dow AgroSciences)	<i>Mancozeb</i>	H
Heritage (Syngenta)	<i>Azoxystrobin</i>	H
Mefenoxam 2 AQ (Quali-Pro)	<i>Mefenoxam</i>	C
Micora (Syngenta)	<i>Mandipropamid</i>	H
Orvego (BASF)	<i>Ametoctradin + Dimethomorph</i>	H
Pageant (BASF)	<i>Pyraclostrobin + Boscalid</i>	C
Pentathlon DF (SePRO)	<i>Mancozeb</i>	H
Protect DF (Cleary)	<i>Mancozeb</i>	H
Segway (FMC Agricultural Solutions)	<i>Cyazofamid</i>	H
Stature SC (BASF)	<i>Dimethomorph</i>	H
Subdue MAXX (Syngenta)	<i>Mefenoxam</i>	H
Vital (Kelly Solutions)	<i>Potassium Phosphite</i>	C
Zonix (PropTera)	<i>Rhamnolipid Biosurfactant</i>	C

\*This list is presented for information only and no endorsement is intended for products listed or criticism meant for products not included. Always consult the label for specific application rates. Read the label carefully before making any application.

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**Figure 3. Impatiens in the landscape suffering from Impatiens Downy Mildew. Flowers and leaves fall off, leaving only stems.**



**Figure 4. Sporangia and sporangiophores of an Oomycete.**

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