Impatiens Downy Mildew: Guidelines for Growers

Quick Facts

Common Name Impatiens downy mildew
Scientific Name *Plasmopara destructor* (synonym=*P. obducens)*
Plants affected *Impatiens walleriana*
Primary symptoms: light-green yellowing or stippling of leaves, leaves curl downward at the margins, white downy-like growth on underside of leaves, stunting, leaf and flower drop

Quick Tips

- Train your staff to recognize early symptoms of downy mildew
- Inspect liners and plugs on delivery
- Apply fungicides preventively
- Scout frequently, turning leaves over to look for white sporulation
- Minimize greenhouse humidity and limit leaf wetness <4-5 hr, especially at night

Background

Impatiens downy mildew is a destructive foliar disease of *Impatiens walleriana* that is capable of causing complete defoliation or plant collapse, especially in landscape plantings under moist conditions and cool nights.

Regional outbreaks of this disease were seen for the first time in landscape beds and container plantings in North America in summer 2011. In early January 2012, outbreaks of impatiens downy mildew were observed in landscape beds and greenhouses in south Florida. By the end of the 2012 season, impatiens downy mildew had been confirmed in 34 states. However, the occurrence and timing of when the disease showed up within a geographic region was highly variable. In early November 2012, outbreaks were again seen in south Florida landscapes signaling the start of a new cycle of disease for the 2013 season. In 2013, the distribution of the disease was similar to the previous two years, with the addition of infected landscape beds in regions of Colorado, Kansas and Utah. In most regions of the country the occurrence of the disease in 2013 was late in the season, similar to what was observed in 2011. Each year since, the disease has been observed in landscapes across the United States and lower Canada. The occurrence is generally earlier in the southern states (November-February) and later in the northeast and upper midwest (August-October). However, reports of impatiens downy mildew have decreased each year. This may be due to healthier impatiens going into the landscape due to grower prevention, fewer impatiens being planted into the landscape, as well as better recognition of the disease and fewer plants submitted to clinics for diagnosis.

Young plant and finish growers are at an increased risk for this disease if:

1. Located in region where production of *I. walleriana* conincides with plantings of *I. walleriana* growing in the landscape.
2. Source of incoming liners and plugs from region where infected impatiens currently growing or have been reported in landscape.

Hosts

- ✓ All cultivars of *Impatiens walleriana* (common garden impatiens) and interspecific hybrids with an *I. walleriana* parent are susceptible including Fusion, Fiesta and Patchwork.
- ✓ A few wild species of impatiens are also susceptible; however, there are no other bedding plant species that are known hosts.
- ✓ Both vegetative propagated and seed-raised *I. walleriana* are susceptible but there is NO EVIDENCE of seedborne transmission of *P. obducens*.
- ✓ New Guinea impatiens (*Impatiens hawkeri*) including Fanfare, Divine, Celebration, Celebrette, and Sunpatiens have high resistance to this disease and natural infection has not been observed.
- ✓ Beacon impatiens have high resistance to downy mildew. Under high disease pressure leaf abscision coupled with yellowing and sparse sporulation is possible, but plants do not collapse and die.

Spread

Sporangia (sac-like structures filled with zoospores) produced on the underside of infected leaves are easily dislodged and can be spread short distances by water splash, and longer distances by air currents.

Overwintering

Oospores (overwintering structures) can be produced in infected, collapsing stem and leaves. There is some evidence that the oospores could overwinter in landscape beds and infect impatiens the following year. Research is continuing to understand the role that the oospores may play in year-to-year survival and spread. However, the pathogen can survive during the winter months on living impatiens plants growing in warmer regions of the country (Florida). The aerial spores can then potentially move north during the following growing season infecting impatiens along the way.

Two potential routes for entry into a greenhouse facility:

1. infected plant material (plugs, cuttings, liners)
2. wind-dispersed, aerial spores from infected plants growing elsewhere (may potentially travel on the order of hundreds of miles).

Symptoms

Young plants and immature plant tissues are especially susceptible to infection. Symptoms are often first observed on terminal growth. Seedling cotyledons are highly susceptible to infection.

Early symptoms include:

- ✓ Light-green yellowing or stippling of leaves
- ✓ Downward curling of infected leaves
- ✓ White downy-like fungal growth on the undersides of leaves

Advanced symptoms include:

- ✓ Stunting in both plant height and leaf size when infected at an early stage of development
- ✓ Leaf and flower drop resulting in bare, leafless stems
- ✓ Infected stems become soft and plants collapse under continued wet and cool conditions (more likely to see in landscape plantings)

- ✓ Sparse sporulation, discoloration or leaf abscission may be observed with Beacon impatiens when grown under high disease pressure.

Impatiens Downy Mildew Fungicide Rotation

Preventive application is critical. Control is nearly impossible once sporulation has occurred in a growing facility.

Rotate among fungicides with a different mode of action (FRAC code) Drench applications have longer efficacy than foliar applications.
See table on following page for products labeled for use in Canada

Application No./Interval	FRAC Code	Fungicide	Method	Rate /100 gal
1 Cuttings	43+M3	Adorn + Protect DF + Capsil	Spray	2 fl oz +2 lb + 6 fl oz
Plugs (or cuttings as soon as rooted)	43+4	Adorn + Subdue MAXX (if Adorn was **NOT** applied to cuttings)	Drench	1 fl oz +1 fl oz
		or		
	4+33	Subdue MAXX + K-Phite 7LP T/O (if Adorn was applied to cuttings)	Drench	1 fl oz + 4 pt
		or		
	U15	Segovis (if supplier applied Subdue MAXX prior to ship)	Drench	2.5 fl oz
2 (14 days after drench) (7 days after spray)	40 40	Stature SC **or** Micora	Spray Spray	12.25 fl oz 8 fl oz
3 (7 days after spray)	11+7 +M3	Pageant + Protect DF + Capsil	Spray	18 oz + 2 lb + 6 fl oz
4 (7 days after spray) **(final application)**	4+43	Subdue MAXX + Adorn (6 wk after last drench)	Drench	1 fl oz + 1 fl oz
		or		
		Subdue MAXX + K-Phite 7LP T/O	Drench	1 fl oz + 4 pt
		or		
		Segovis	Drench	2.5 fl oz
(rotation application) **In 7 days:** begin again with application 2	21	Segway	Spray	3.5 fl oz

Chemical Control

- ✓ **Plugs: make first fungicide application as soon as rooted; a sprench/drench application provides longest efficacy**
- ✓ **Unrooted cuttings: make first fungicide application within 7 days of receipt and then drench as soon as rooted**
  - ➢ **Under low disease pressure or low risk (and if you have drenched):** Reapply foliar applications at 14-day intervals with different FRAC code product
  - ➢ **Under high disease pressure or high risk (or if you have not drenched)**: keep in mind 7-day intervals with foliar applications may not be sufficient due to limited residual activity **
- ✓ **Drench again 6 weeks after first drench application if plants still onsite (or 4 wk if using 0.5 fl oz/100 gal Subdue MAXX)**

**** Foliar applications of mancozeb (Protect DF or Dithane 75 DF) exhibited the longest residual efficacy** of all foliar-applied fungicides

Cultural Control

- ✓ Minimize greenhouse humidity and leaf wetness (<85% humidity)
- ✓ Frequently scout crop, pay particular attention to early leaf symptoms of leaf yellowing or stippling
- ✓ Remove symptomatic plants and any fallen leaves immediately
- ✓ Bag plant(s) and seal before carrying out of greenhouse; do not compost

These products are labeled for greenhouse use. Products shaded red are labeled for use in Canada (CA). This table is not a substitute for the label.

FRAC Code (MOA)	Fungicide	Active ingredient(s)	Activity	Rate/100 gal	Application	REI (re-entry interval)	Residual efficacy (>7 day)
M3	Protect DF	mancozeb	Contact	2 lb	Spray	24 hr	++++
M3	Dithane 75DF	mancozeb	Contact	2 lb	Spray	24 hr	++++
4	Subdue MAXX	mefenoxam	Systemic	1 fl oz 0.5-1.0 fl oz	Spray Drench	48 hr 0 hr (drench)	++RT +++++R
4	CA: Subdue MAXX (Pythium/Phytophthora)	metalaxyl-M	Systemic	See label	Drench		
11	Heritage[C]	azoxystrobin	Translaminar	2 oz	Spray	4 hr	+
11	Heritage	azoxystrobin	Translaminar	See label			
11	Disarm O[C]	fluoxastrobin	Systemic	4 fl oz	Spray	12 hr	+
11	FenStop[c] (not registered in NY)	fenamidone	Systemic	7-14 fl oz[A]	Spray	12 hr	++
11+7	Pageant	pyraclostrobin+boscalid	Translaminar/Systemic	12 oz	Spray	12 hr	++
11+7	CA: Pristine	pyraclostrobin+boscalid	Translaminar/Systemic	See label	Spray		
21	Segway[C]	cyazofamid	Contact; limited systemic	3.5 fl oz	Spray	12 hr	++
21	CA: Cyazofamid 400SV	cyazofamid	Contact; limited systemic	See label	Spray		
21	CA: Torrent 400 SC	cyazofamid	Contact; limited systemic	See label	Spray		
33	Aliette	fosetyl-AL	Systemic	12.8 oz	Spray	12 hr	++
33	Aliette	fosetyl-AL	Systemic	See label			
33	K-Phite 7LP T/O	potassium phosphite (56%)	Systemic	4 pt (64 fl oz) 1.25 pt (20 fl oz)	Spray Drench	4 hr 4 hr	+++ ++++ R
33	Resist 57	potassium phosphite (57%)	Systemic	4 pt (64 fl oz) 1.25 pt (20 fl oz)	Spray Drench		
33	CA: Phostrol (*Phytophthora*)	potassium phosphite (53.6%)	Systemic	See label	Drench		
33	CA: Confine Extra Fungicide	potassium phosphite (53%)	Systemic	See label	Drench		
40	Stature SC	dimethomorph	Translaminar	12.15 fl oz	Spray	12 hr	++
40	CA: Forum	dimethomorph	Translaminar	See label			
40	Micora	mandipropamid	Translaminar	8 fl oz	Spray	4 hr	+++
40	CA: Micora	mandipropamid	Translaminar	See label			
40+45	Orvego (not registered in Suffolk or Nassau counties NY state)	dimethomorph+ametoctradin	Translaminar	11 fl oz	Spray	12 hr	++
43	Adorn[C]	fluopicolide	Local systemic Translaminar/Systemic	2-4 fl oz 1 fl oz	Spray Drench	12 hr 12 hr	++RT +++++RT
43	CA: Fluopicolide 4 SC	fluopicolide	Local systemic Translaminar/Systemic	See label	Spray Drench		
43 + 21	CA: Presidio Tank Mix with Torrent 400 SC	fluopicolide tank mixed with cyazofamid	Local systemic Translaminar/Systemic Contact	See label	Spray		
U15	Segovis (drench application not permitted in all states)	Oxathiapiprolin	Protectant Systemic (drench)	0.6-3.2 fl oz 1.0-3.2 fl oz	Spray Drench	4 hr	

Efficacy ratings based on research trials conducted at Ball: + = poor (not recommended), ++ = fair, +++ = good, ++++ = very good, +++++ = excellent

[C] Trials were conducted with the addition of Capsil 6 fl oz/100 gal)

[A] CAUTION: higher rate may cause phytotoxicity on young plants

[T] Fungicide must be tank mixed with another product effective against downy mildew

[R] CAUTION: Populations resistant to mefenoxam have been observed

(Not all commercially available products may be listed. The use of brand names or commercial products listed does not imply endorsement by Ball Horticultural Co. or discrimination against similar products not mentioned. This table is not intended as a substitute for the product label. Obtain current information about usage regulations before purchasing or applying any chemical.)

LISTED PRODUCTS MAY NOT BE REGISTERED IN ALL STATES.

Dr. Colleen Warfield: cwarfield@ballhort.com Corporate Plant Pathologist, Ball Horticultural Co

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