Impatiens Downy Mildew

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Impatiens are popular plants in the landscape

Heavy sporulation on the underside of the leaves

Introduction

- Destructive foliar disease of the common garden impatiens, *Impatiens walleriana* and also garden balsam (*I. balsamina*)
- All cultivars of *I. walleriana* are susceptible as well as all interspecific hybrids with *I. walleriana* as a parent; New Guinea Impatiens (*I. hawkeri)* are highly tolerant
- Primary causal agent: ***Plasmopara obducens***

HEALTHY

PLASMOPARA OBDUCENS

DISEASED

Historical background

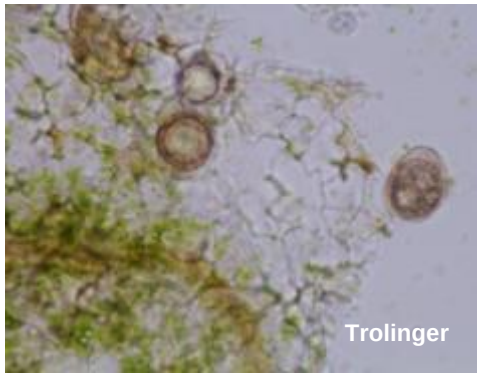
- *Plasmopara obducens* present in the U.S. since late 1800's
- Reported on *Impatiens pallida* and *I. capensis* **(native species of N. America)**
- First reported as problem in UK (2003)
- Often a devastating disease outside of North America
- Found in U.S. greenhouse production in spring of 2004
- 2004 reports included locations in the U.S.: CA, IN, MI, MN, MS, MO, WI and WV and Manitoba and Quebec in Canada
- Sporadic reports in U.S. since 2004
- More severe in 2011 and reported in: coastal southern CA; HI; northeast IL; northern IN; Cape Cod, MA; Minneapolis/St. Paul, MN; NY; eastern PA; and northern WI
- Outside of North America and Europe, reported in: Australia, Asia, Africa, Central and South America

Biology

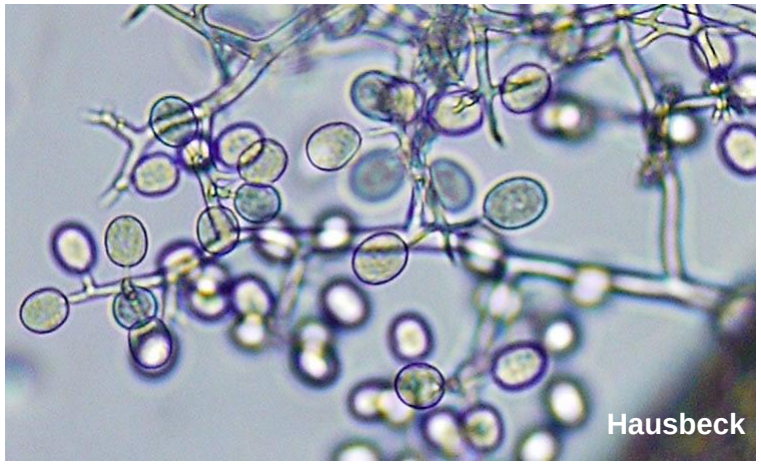
- Two species of downy mildew reported on Impatiens: ***Plasmopara obducens* (primary)** and *Bremiella sphaerosperma*
- Water molds or oomycetes
- Parasitic on Impatiens and does not threaten other flower crops
- Zoospores are the primary spores which cause infection – can swim, produced in sporangia on sporangiophores (emerge on undersides of leaves)
- Sporangia released in response to light, temperature and/or humidity changes
  - Spread through air and water
- Cool, moist conditions (59-73°F/15-23°C) conducive to sporangia formation and zoospore germination
- Period between infection and visible sporulation varies between 5 -14 days

Biology (cont.)

- Sporulation may not occur and symptoms may be subtle in dry and warm conditions
  - Can result in inadvertent movement of infected plants
- Oospores – responsible for survival (long-lived)
  - Formed in leaves and stems (roots not studied thoroughly)
  - Accompany infected plant debris
  - Survive to 5°F (-15°C) in landscapes (USDA Hardiness Zone 5)
- **NOT** seed transmitted



OOSPORES



PLASMOPARA OBDUCENS

Symptoms

- Yellow to pale green foliage and mild, inconspicuous mottling
- Can be mistaken for:
  - Nutritional imbalance
  - Spray injury
  - Chilling
  - Spider mite infestation
- Advanced symptoms
  - Stunting of plant growth/malformation leaves and flower buds
  - Downward curling/distortion of foliage
  - Wilting
  - Plant collapse
  - Severe defoliation
- Symptoms can be delayed or masked by high fertility levels

Severe defoliation as the disease progresses

Cultural control

- PREVENTION
  - Disease-free propagation material
  - Segregate vegetatively propagated from seed propagated
  - Maintain moderate humidity
  - Avoid extended periods of foliage moisture
  - Irrigate early in day
  - Employ sound greenhouse sanitation practices
  - Use a regular preventive fungicide program
  - Scout crop frequently/identify suspects
  - Submit to lab for confirmation
- AFTER CONFIRMATION
  - Place all symptomatic plants and debris in closed bags
  - Remove from greenhouse
  - Remove and discard plants from buffer of at least 3 ft. radius
  - Use approved greenhouse disinfectant
  - Begin enhanced preventive fungicide program

Products for control of Downy Mildew in production

MOA (FRAC#)	Product	Active Ingredient	Activity	Application	REI	Company
4	Subdue MAXX® fungicide	Mefenoxam	Systemic	Spray Drench	48 hr *REI exemptions (0 hr) for certain drench applications*	Syngenta
11	Heritage® fungicide	Azoxystrobin	Systemic	Spray	4 hr	Syngenta
11	Disarm® O fungicide	Fluoxastrobin	Systemic	Spray	12 hr	OHP
11	Fenstop™ fungicide *Greenhouse Use Only*	Fenamidone	Systemic	Spray	12 hr	OHP
11+7	Pageant™ fungicide	Pyraclostrobin + Boscalid	Translaminar (11) + Systemic (7)	Spray	12 hr	BASF
21	Segway™ fungicide	Cyazofamid	Translaminar	Spray	12 hr	FMC
33	Aliette® fungicide	Fosetyl-AL	Systemic	Spray	12 hr	OHP/Bayer
33	Alude™ fungicide	Potassium salts of Phosphorous Acid	Systemic	Spray	4 hr	Cleary Chemical Corp.
33	Vital® fungicide	Potassium phosphite	Systemic	Spray	4 hr	Phoenix
40	Micora™ fungicide	Mandipropamid	Translaminar	Spray	4 hr	Syngenta
40	Stature® SC fungicide	Dimethomorph	Translaminar	Spray	12 hr	BASF
43	Adorn® fungicide	Fluopicolide	Systemic	Spray Drench	12 hr	Valent
M	Protect™ DF fungicide	Mancozeb	Contact	Spray	24 hr	Cleary Chemical Corp.

NOTES:
- Always test products on a small area before using on an entire crop.
- For brevity some products with the same mode of action have been omitted.
- **All products may not be registered for sale or use in all states. Please check with your state or local extension service before buying or using Syngenta products.**

Fungicide evaluation for control of Downy Mildew *(Plasmopara obducens)* on impatiens

Treatments	Rate/100 gal	Wilt 12/6	Wilt 1/17	Oospores (stem)
Inoculated		1.3 a	2.7 a	+
Non-inoculated Control		1.2 a	1.8 a	+
Micora	8 oz (Spray)	0 b	0 b	-
Subdue MAXX	1 fl.oz (Spray)	0 b	0 b	-
Subdue MAXX	1 fl.oz (drench)	0 b	0 b	-
Heritage + Capsil® wetting agent	4oz + 4oz (Spray)	0 b	0 b	-
Stature SC	12.8oz (Spray)	0 b	0 b	-

Wilt rating 0 – 4 scale; 0 = no wilt; 1=25%; 2=25-75%; 3=75-99%; 4 = completely wilted plant – 10 reps/trt

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2011 – Daughtrey, Cornell University

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Examples of prevention programs

Production of Finished Plants

	Week Post-Transplant	Application	Fungicide FRAC #	Target Diseases
4 inch pot or smaller	1	**Recommended Drench**	4 + 43	Pythium, Phytophthora, Downy Mildew
	2	**Optional Treatment**	M	Downy mildew, Leafspots, Botrytis
	3	**Recommended Treatment**	40	Downy Mildew
	4	**Optional Treatment**	11	Downy Mildew, Leafspots, Botrytis
	5	**Recommended Treatment**	33	Downy Mildew, *Pythium, Phytophthora *(drench)*
	6	**Optional Treatment**	11	Downy Mildew, Leafspots, Botrytis
6 inch pot	7	**Recommended Treatment**	40	Downy Mildew
	8	**Optional Treatment**	11	Downy Mildew Leafspots, Botrytis
	9	**Recommended Treatment *(drench)***	4 + 33 or 4 + 43	Downy Mildew, *Pythium, Phytophthora *(drench)*
Larger containers	9	**Recommended Treatment**	40	Downy Mildew
	10	**Optional Treatment**	11 or 21	Downy Mildew, Leafspots
	11	**Recommended Treatment** *(drench)*	4 + 33 or 4 + 43	Downy Mildew, *Pythium, Phytophthora *(drench)*

Plugs

Propagation Week	Plugs *(Seed or URC)*
1	
2	Drench – 21 or 4
3	
4	Spray – M or 11

**Additional diseases controlled with drench application*

~A mancozeb product may be added to the suggested spray treatments for additional protection as plant tolerance and production schedules allow.

Example of a Downy Mildew prevention rotation

Crop	Week *(post-transplant)*	Application	FRAC #	Fungicide *(example)*	Target Diseases
4 inch pot or smaller	1	**Recommended treatment (drench)**	**4+43**	**Subdue MAXX + Adorn**	Pythium, Phytophthora, Downy Mildew
	2	Optional treatment (spray)	M	Protect DF	Downy Mildew, Leafspots, Botrytis
	3	**Recommended treatment (spray)**	**40 + M****	**Micora** ***Protect DF optional***	Downy Mildew
	4	Optional treatment (spray)	11+ M**	Heritage *Protect DF optional*	Downy Mildew, Leafspots, Botrytis
	5	**Recommended treatment (spray or drench)**	**33**	**Vital®**	Downy Mildew, *Pythium, Phytophthora
	6	Optional treatment (spray)	11 + M**	Heritage *Protect DF optional*	Downy Mildew Leafspots, Botrytis
6 inch pot	7	**Recommended treatment (spray)**	**40**	**Micora** ***Protect DF optional***	Downy Mildew
	8	Optional treatment (spray)	11	Heritage *Protect DF optional*	Downy Mildew Leafspots, Botrytis
	9 (final week)	**Recommended treatment (drench)**	**4+33 *or* 4+43**	**Subdue MAXX + Vital *or* Subdue MAXX + Adorn**	Downy Mildew, *Pythium, Phytophthora
Larger containers	9	**Recommended treatment (spray)**	**40**	**Micora**	Downy Mildew
	10	Optional treatment (spray)	11 *or* 21	Heritage *or* Segway	Downy Mildew, Leafspots, Botrytis
	11 (final week)	**Recommended treatment (drench)**	**4+33 *or* 4+43**	**Subdue MAXX + Vital *or* Subdue MAXX + Adorn**	Downy Mildew, *Pythium, Phytophthora

** Additional diseases controlled with a drench application*
***A mancozeb product may be added to the suggested spray treatments for additional protection as plant tolerance and production schedules allow*

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A sound management program should include:

- Sanitation/scouting
- Rotation of effective fungicides with different modes of action *(Fungicide Resistance Action Committee (FRAC))*
- Foliar sprays and periodic drenches to growing medium to maximize efficacy
- A drench treatment prior to shipment with FRAC # (33 + 4) *or* (4 + 43) fungicides to minimize risk of early infection in the landscape
- Recommend impatiens not be replanted into landscape beds where downy mildew of impatiens was identified the previous season

Thank You ~ Questions

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