DOWNY MILDEW

Disease prevention and product rotation schedule

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DISEASE PREVENTION AND MANAGEMENT

Appropriate cultural practices and disease management strategies during production can minimize the effects of downy mildew in your greenhouse or nursery. Follow these tips to help prevent downy mildew on your crops.

Disease Symptoms

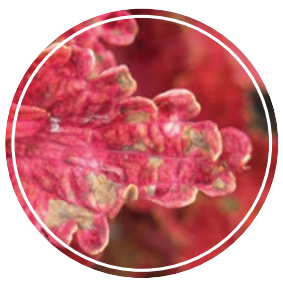
Recognizing the early signs of downy mildew is critical to plant quality and health. Leaf discoloration or spotting, often within the veins, are the most common initial symptoms. When the fungus invades the plant internally, stunting, distortion and mortality can occur.

Symptoms to look for include:

- Pale foliage with yellow, tan or reddish blotchy areas
- Distorted or downward curling of the leaves
- White or light gray/purple fuzz on the undersides of leaves
- Small emerging leaves
- Flower buds fail to form
- Stunting

Cultural Tips

- Provide a clean, dry growing environment
- Scout frequently
- Irrigate early in the day to reduce how long leaves are wet
- Keep humidity low and space out plants to allow for good air flow
- Remove diseased plants immediately to limit spore production and spread



Leaf spots are an early sign of downy mildew.
Photo courtesy of Ann Chase

Growing Conditions

Most downy mildew fungi prefer cool, wet conditions:

- Temperatures between 50 - 75°F
  - *Peronospora* species that infect rose and salvia tolerate higher temperatures (82 - 90°F)
- Relative humidity levels greater than 85 percent
- Extended periods (6 hours or more) of leaf wetness
  - Only a thin layer of moisture is needed for disease development

Susceptible Crops

These crops should be scouted weekly when conditions are conducive for disease development:

- Alyssum
- Aster
- Basil
- Brassica
- Buddleia
- Coleus
- Coreopsis
- Erysimum
- Gaillardia
- Geum
- Iberis
- Impatiens
- Lamium
- Osteospermum
- Pansy
- Phlox
- Rose
- Rosemary
- Rudbeckia
- Sage/Salvia
- Snapdragon
- Viburnum

Downy Mildew Prevention Programs

The following rotation example may be used for controlling downy mildew diseases in bedding plants or other herbaceous crops. The program utilizes a "systemic sandwich" approach, where systemic fungicides are applied as a drench at transplant or at the beginning of production and prior to shipping, and other fungicides with translaminar activity are applied as sprays in between. The use of systemic products as a drench prior to shipping provides extended protection in the landscape for the consumer.

Downy mildew has had a devastating effect on impatiens production in the U.S., but a Syngenta rotation can help restore this opportunity for growers.

Greenhouse Rotation

Crop	Week *(post-transplant)*	Recommended Treatment	FRAC #	Fungicide	Application Rates	Target Diseases
4-inch pot or smaller	1	Drench	4	Subdue Maxx®	0.5 - 1.0 fl. oz./100 gal.	Downy mildew, *Pythium, Phytophthora*
	2	Spray	11 + 7	*Mural™	7.0 oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	3	Spray	40 *M*	Micora® ***Protect® DF optional*	4.0 - 8.0 fl. oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	4	Spray	11 + 7	*Mural	7.0 oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	5	Spray	40 *M*	Micora ***Protect DF optional*	4.0 - 8.0 fl. oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	6 Final Week	Drench	U15 or U15, 43	Segovis® **OR** Segovis +◆Adorn®	1.2 - 2.4 fl. oz./100 gal. **OR** 1.2 fl. oz./100 gal. + 2.0 fl. oz./100 gal.	Downy mildew, *Phytophthora* ,◆*Pythium*
6-inch pot	6	Spray	21	Segway®	2.1 - 3.5 oz./100 gal. Apply on a 14-21 day interval	Downy mildew
	7	Spray	40	Micora	4.0 - 8.0 fl. oz./100 gal. Apply on a 7-14 day interval	Downy mildew
	8	Spray	11 + 7	Mural	7.0 oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	9 Final Week	Drench	U15 or U15, 4	Segovis **OR** Segovis + Subdue Maxx	1.2 - 2.4 fl. oz./100 gal. **OR** 1.2 fl. oz./100 gal. + 1.0 fl. oz./100 gal.	Downy mildew, *Pythium, Phytophthora*
Larger containers	9	Spray	40	Micora	4.0 - 8.0 fl. oz./100 gal. Apply on a 7-14 day interval	Downy mildew
	10	Spray	11 + 7	Mural	7.0 oz./100 gal. Apply on a 7-14 day interval	Downy mildew, Leaf spots, Botrytis
	11 Final Week	Drench	U15 or U15, 43	Segovis **OR** Segovis +◆Adorn	1.2 - 2.4 fl. oz./100 gal. **OR** 1.2 fl. oz./100 gal. + 2.0 fl. oz./100 gal.	Downy mildew, *Phytophthora* ,◆*Pythium*

U = Unknown

***Mural may be included in the rotation or used in place of Micora during periods of pressure from leaf spots, Botrytis, powdery mildew and rust diseases.

****Protect DF at 1-2 lbs/100 gal. may be included in the rotation alone or in combination with any of the other fungicides.

◆ Adorn may be included for additional control of *Pythium*.

Nursery Rotation

The following rotation may be used as an example for controlling downy mildew diseases in outdoor nursery crops. The program utilizes sprays in a "systemic sandwich" approach, since drench applications may be more difficult in outdoor nursery production.

Alternate systemic fungicides with other effective fungicides that have translaminar activity on a 14-day interval. Shorten the spray interval to 7 days at the first sign of disease or when conditions are conducive to disease development. Adding an adjuvant with spreading/penetrating type properties may help improve spray coverage and performance on woody ornamentals or crops with waxy leaves.

Keep in mind that low use rates perform best under low disease pressure and short application intervals, while higher use rates will provide better protection during long application intervals.

FRAC #	Fungicide	Application Rates
4	Subdue Maxx* + Protect DF**	0.5 - 1.0 fl. oz./100 gal. (Herbaceous plants) 1 - 2 fl. oz./100 gal. (Woody plants)
40	Micora	4 - 8 fl. oz./100 gal.
U15	Segovis	1 - 2.4 fl. oz./100 gal.
40	Micora	4 - 8 fl. oz./100 gal.
U15	Segovis	1 - 2.4 fl. oz./100 gal.
11 + 7	Mural	7 oz./100 gal. Mural may be included in the rotation or used in place of Micora during periods of pressure from leaf spots, Botrytis, powdery mildew and rust diseases.
Repeat		

U=Unknown

*When applied as a foliar spray, Subdue Maxx must be tank-mixed with another non-group 4 fungicide with activity on downy mildew (i.e. Protect DF or other products with FRAC Group #11, 33, 21 or 43). Subdue Maxx may also be applied alone as a drench for control of downy mildew diseases.

**Protect DF at 1-2 lbs/100 gal. may be included in the rotation alone or in combination with any of the other fungicides. Other Mancozeb products can be substituted.

Your Complete Downy Mildew Solution

A rotation of Segovis, Micora, Mural and Subdue Maxx fungicides offers long-lasting protection against downy mildew fungi for greenhouse and nursery operations.

Visit ***www.GreenCastOnline.com/Ornamentals*** to learn more about downy mildew control solutions.

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GS 426.38002 (3/16)

SCP 928-00002-D