

# Cucurbit Downy Mildew Management for 2019

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The water mold cucurbit downy mildew affects cucurbits (vine crops in the squash family) in South Carolina every year, especially in summer and fall. Downy mildew spreads quickly on cucumber, cantaloupe, and watermelon. Prevention before it appears, and prompt action afterwards, are needed to manage this aggressive pathogen.



## Symptoms and Signs

Leaf spots on cucumber (top left photo above) or cantaloupe start as pale green to yellow, angular spots that turn brown. Leaf spots on squash and pumpkin (top right photo above) are small, bright yellow flecks across the leaf surface that enlarge and turn brown. Symptoms on watermelon are quite variable. Sometimes spots are small and yellow (bottom left photo above), and in other cases they are up to ½ inch wide, irregular, and brown. Brownish-purple spores are found in patches on the bottom of infected leaves in the early morning (bottom right photo above).

There are two strains of cucurbit downy mildew, A1 and A2. A1 attacks cucumber and melons (cantaloupe and honeydew) and is sometimes called the cucumber strain. The A2 strain attacks watermelon, pumpkin, squashes, cucumber, and melons. Because it is the only strain that attacks squash, it is sometimes called the squash strain.

## How Cucurbit Downy Mildew Spreads

Cucurbit downy mildew survives over winter on crops growing in southern Florida and Texas, where cucurbits do not freeze. In the spring, wind blows downy mildew spores northward from the South. Spores move farthest and fastest during cloudy, windy weather. Spores can be blown over 600 miles in 48 hours! Cucurbit downy mildew also can be moved on diseased transplants.

Outbreaks of cucurbit downy mildew are most likely to occur during mild, wet weather. Rainwater washes spores out of the air onto leaves. Rain, dew, or fog makes infection likely. After infection, downy mildew will continue to spread, even in dry weather, if temperatures stay above 60°F.

The Cucurbit Downy Mildew Forecast map ([cdm.ipmpipe.org](http://cdm.ipmpipe.org)) shows where downy mildew has been reported in the current year. The site also predicts where spores will spread from known sources, and where weather will be favorable for a new outbreak in the next 48-72 hours.

## Cultural Practices to Limit Downy Mildew

- To avoid downy mildew, plant cucurbits as early as possible. This disease is a greater threat to summer and fall crops than to spring crops.
- Choose cucumber varieties with resistance to downy mildew; see <http://www.growingproduce.com/southeasternvegetablecrophandbook/>. Downy mildew will develop slower on partially resistant varieties than on susceptible varieties. ‘Bristol’ is a new slicer with partial resistance.
- Summer squash, zucchini, and acorn squash tolerate some downy mildew. They still produce marketable fruit when they have downy mildew, so they do not need to be sprayed as often or with “high end” fungicides. Protectant fungicides might be enough.
- Trellising does not help manage downy mildew.

## Spraying for Cucurbit Downy Mildew

Fungicides are necessary to manage downy mildew on cucumber, melons, watermelon, pumpkin, and butternut squash.

1. Along the coast of South Carolina, cucurbit downy mildew usually shows up on or after May 1. In the Midlands and Upstate, downy mildew usually appears on or after June 1. A preventive spray program with chlorothalonil or mancozeb will give a head start before downy mildew spores blow into the area.
2. Check the Cucurbit Downy Mildew Forecast map ([cdm.ipmpipe.org](http://cdm.ipmpipe.org)). Start spraying downy mildew-specific fungicides (Table 1 below) when downy mildew is found in or near your state.
3. Once the first spray is applied, continue spraying on a 7-day schedule.
4. Cucurbit leaves form a very dense canopy. High pressure (at least 75 psi) and high volume (75 or more gallons of water/acre) are needed once vines touch.
5. Apply fungicides before a predicted rain rather than after it rains. To stick and work, fungicides must be dry on the leaves before rain starts.

## Fungicide Programs

Two different fungicide programs are recommended to prevent and manage cucurbit downy mildew (Table 1).

**Table 1. Fungicides Recommended to Prevent and Manage Cucurbit Downy Mildew**

Crop	Program 1: Prevent (Before symptoms appear)	Program 2: Manage (After symptoms appear)	
		Tank mix with protectant*	
		No	Yes
Cucumber, melons	chlorothalonil, mancozeb, Zampro	Orondis Opti, Elumin	Ranman
Watermelon, pumpkin, squash	chlorothalonil, mancozeb, Zampro	Orondis Opti, Orondis Ultra, Elumin, Ranman, Gavel, Zampro	Previcur Flex, Revus

\*Protectants are chlorothalonil (Bravo, Echo, Equus, and other products) or mancozeb (Manzate, Dithane, Penncozeb, and others).

## Prevention

Use Program 1 in Table 1 to prevent downy mildew.

## Management

Once downy mildew has been found in a field, use different fungicides to manage the disease. Spray at least two of the fungicides in Program 2 (Table 1) in rotation with each other. Rates and other details are in the *Southeastern U.S. Vegetable Crop Handbook* ([www.growingproduce.com/southeasternvegetablecrophandbookecrophandbook](http://www.growingproduce.com/southeasternvegetablecrophandbookecrophandbook)).

## Rotation Chemistry

Rotate fungicides to reduce the risk of fungicide resistance. Tank mixing fungicides specific for downy mildew with protectant fungicides also helps prevent fungicide resistance. Do not rotate Gavel with Elumin as both fungicides are in Fungicide Resistance Action Committee (FRAC) Group 22.

In most parts of the U.S., cucurbit downy mildew A1 is resistant to Ridomil, Revus, and FRAC Group 11 fungicides (Cabrio, Quadris, Flint, Pristine, and Reason). Forum, Presidio, Tanos, and Curzate may not always work, so these fungicides are not recommended on cucumber or melons against cucurbit downy mildew in South Carolina.

Orondis Ultra is not recommended on cucumber or melons, because the A1 strain is insensitive to the Revus component of the product (Table 2). Do not use Orondis Gold to manage downy mildew. Do not rotate Orondis products with each other. A longer spray interval of 10 to 14 days can be used with Orondis products than with other fungicides.

**Table 2. Special Notes about Foliar Orondis Products**

	Cucumber, Muskmelon, Honeydew	Watermelon, Pumpkin, Squashes
Orondis Opti (Orondis + Bravo)	√	√
Orondis Ultra (Orondis + Revus)	DO NOT USE	√

## Organic Production

In organic production, fixed copper fungicides help to prevent cucurbit downy mildew, but only if they are applied before infection.

## References

- Keinath, A. P. 2016. <https://doi.org/10.1094/PDIS-05-15-0499-RE>
- Thomas, A., et al. 2017. <https://doi.org/10.1094/PHYTO-07-16-0277-R>

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