# Spray Recommendations and Cultural Practices for Disease Control in Cucurbits

Thomas A. Zitter
Professor, Department of Plant Pathology
Cornell University, Ithaca, NY 14853

The keys for the successful control of cucurbit diseases are: 1) knowing the specific diseases that affect your crop (most common are listed below) (3); 2) exercising the most important cultural practices (host resistance, clean seed, crop rotation, no-till cover crops, and soil moisture management) (1, 2); and 3) choosing the most appropriate fungicides from the more than 20 fungicides covered in Table 1 (protectants vs. specific fungicides with a history or potential for fungicide resistance) (4).

## Bacterial Diseases

Bacterial Wilt

ID: *Erwinia tracheiphila* is the bacterium responsible for bacterial wilt and replicates only in the xylem; wilt appears initially on leaves and then on one or more runners on a plant; look for vascular browning in the xylem by cutting at the grown level (crown of plant) (visible to the naked eye)

Cultural Practices: Beetles will aggregate on preferred varieties (due to cucurbitacins levels); this feature makes use of a susceptible variety as a trap crop.

Chemical Control: Imidacloprid (Admire) is the preferred material for striped beetle control, but others are registered.

Angular Leaf Spot

ID: *Pseudomonas syringae* pv. *lachrymans* Young spots are water-soaked and older spots may have holes in center; spots are usually limited by the main veins of leaves; circular water-soaked and then sunken spots appear on fruit. (both visible to the naked eye)

Cultural Practices: Use pathogen-free seed and rotate out of cucurbits for 2 years.

Chemical Control: Use copper or a mixture of copper (**Group M1**) plus maneb (**Group M3**); discontinue sprays during extended rain-free periods.

## Oomycete Diseases

Phytophthora Blight

ID: *Phytophthora capsici* The blight phase starts in lower areas of fields with saturated soils; yeast-like growth may start on underside of fruit and spread to topside; (visible with the naked eye).

Cultural Practices: Management is critical; organism survives in the soil for many seasons; rotate at least 3 years out of susceptible crops (pepper, tomato, all cucurbits); avoid planting in fields with a history of standing water; provide adequate drainage by sub-soiling and disking in spray alleys during the season; provide means for water to exist fields away from surrounding susceptible crops.

Chemical Control: Acrobat (**Group 15**) tank mixed with a protectant fungicide labeled for the cucurbit of interest (chlorothalonil, maneb or mancozeb, **Groups M5 and M3**) may provide some suppression of the disease.

Downy Mildew
ID: *Pseudoperonospora cubensis* Chlorotic spots appear on the upper leaf surface and purplish or gray spores form on these spots on the lower leaf surface. (visible with a hand lens)
Cultural Practices: None available; use the downy mildew forecast web site from the North Carolina State University http://www.ces.ncsu.edu/depts/pp/cucurbit/ to monitor movement.
Chemical Control: Consider using Acrobat (**Group 13**) tank mixed with a protectant labeled for the cucurbit of interest (chlorothalonil, maneb or mancozeb, **Groups M5**, and **M3**) and alternated with Ridomil Gold Bravo or Ridomil Gold Copper (**Group 4**) or Gavel (**Group 22**) (only labeled on C, M SS, W) and use Bravo and maneb in alternate weeks; or consider Aliette (**Group 33**) or Phostrol or ProPhyt (**Group 33**), combined or alternated with a protectant fungicide.

**Fungal Diseases**
Powdery Mildew
ID: *Podosphaera xanthii* (formerly *Sphaerotheca fuliginea*) and *Erysiphe cichoracearum* Produces white powdery colonies on upper and lower leaf surfaces, on stems and petioles. (visible with the naked eye)
Cultural Practices: Choose PM tolerant varieties for cucurbit of interest if available.
Chemical Control: Management of chemicals use for control is critical; refer to **Table 1** and make sure to tank mix protectant fungicides (**Group M5, M3, M1** or other chemicals (chlorothalonil, maneb, mancozeb, copper, oil, sulfur, etc.) with a strobilurin (**Group 11**); or with demethylation inhibitors (**Group 3**) or thiophanate-methyl (**Group 1**) and follow alternation protocol. If resistance to Quadris occurs in the area, you must use a fungicide from different fungicide group.

Gummy Stem Blight and Black Rot
ID: *Didymella bryoniae* Leaf symptoms are infrequent unless plants are infected during a wet growing season; lesions if they develop are circular and may have black pepper-like specks which are pycnidia; pycnidia also occur on lower stems and on fruit; fruit lesions may be water soaked and purplish in color before turning black; field infections often appear as a dry "petrified wood" beige semi-circular lesion with pycnidia. (visible with naked eye)
Cultural Practices: Use fungicide-treated seed, as organism is seedborne; rotate two years out of all cucurbits.
Chemical Control: Bravo (**Group 5**) used alone or combined with Topsin M (**Group 1**) will reduce chance for resistance from developing.

White Mold
ID: *Sclerotinia sclerotiorum* Look for white, cottony growth on stems and especially fruit; raisin-shaped black sclerotia appear within this growth. (visible with naked eye)
Cultural Practices: Rotate 3 or more years out of susceptible crops, choosing crops like sweet corn and grass cover crops.
Chemical Control: For farms with short rotations, consider the biological product Contans for incorporation into the soil prior to planting.

Fusarium Crown and Fruit Rot
ID: *Fusarium solani* f. sp. *cucurbitae* Crown of plant may be girdled and the dark brown decayed area covered with white or pinkish colored fungal mycelium; tan or white circular lesions appear on side of fruit touching the ground. (visible to naked eye)
Cultural Practices: A soilborne fungus that survives in the soil for at least 2 years; rotation out of cucurbits for 3 years.
Chemical Control: None available

Plectosporium Blight (formerly Microdochium Blight)
ID: *Plectosporium tabacinum* (previously *Fusarium tabacinum*) Light tan lesions that are spindle shaped develop on the underside of the leaf, which may lead to leaf distortion; spindle shaped lesions also appear on stems, petioles and fruit stems and also on fruit shoulders, where it appears a white, tan or silver russeting. (visible to the naked eye)
Cultural Practices: A soilborne pathogen recently introduced into Massachusetts and Connecticut, which in a moist season can result in considerable loses for pumpkin and summer squash. The fungus prefers a depth of 2-4 inches; use of a no-till cover crop can reduce disease levels compared to bare ground culture.
Chemical Control: The protectant fungicide chlorothalonil (Bravo) (**Group M5**) should be included in the spray program when fruit begin to set.

Alternaria Leaf Spot or Blight
ID: *Alternaria cucumerina* Lesions first appear on the older crown leaves as circular brown spots; as lesions expand they develop concentric rings; more common on muskmelon than pumpkin or winter and summer squash. (visible to the naked eye)
Cultural Practices: Follow a 2-year rotation out of all cucurbits.
Chemical Control: Can be controlled with most protectant fungicides (**Groups M5, M3 and M1**) and used in alternation with strobilurins (**Group 11**) fungicides.

Anthracnose
ID: *Colletotrichum orbiculare* More likely to occur on muskmelon, watermelon and cucumber. Appears as tan or brown oval lesions on upper leaf surface; raised acervuli (often salmon-colored) with hair-like setae (whiskers); lesions with fruiting bodies will also appear on fruit. (visible with a hand lens)
Cultural Practices: Use disease-free seed; follow a 2-year rotation out of cucurbits. Be mindful under moist conditions and high humidity for 24 hrs.
Chemical Control: Apply Bravo (**Group M5**) alone or in combination with Topsin M (**Group 1**) in alternation with **Group 11** fungicides (Quadris and Cabrio). If resistance to Quadris occurs in the area, you must use a fungicide from different fungicide group.

Septoria Leaf Spot
ID: *Septoria cucurbitacearum* Initially appears as very small water-soaked spots which turn beige or white in color; pycnidia (small black-pepper-like spots) appear inside the leaf and stem lesions; raised rash-like white spots also appear on fruit of pumpkin and winter squash. (visible with naked eye or hand lens)
Cultural Practices: Following a 2-year rotation will eliminate most disease carryover. Requires cool temperatures and summer rains to spread to fruit.

Chemical Control: Disease is controlled with a good fungicide program that includes Bravo (**Group M5**).

Scab
ID: *Cladosporium cucumerinum* Young lesions are water soaked but when older turn tan with a yellow halo and eventually crack and fall out; fruit lesions vary as cavity or erumpent lesions on fleshy fruit (summer squash) or sunken dry and corky lesions on hard fruit (pumpkins and winter squash. (visible to the naked eye)
Cultural Practices: Use disease-free seed; follow a crop rotation out of cucurbits for 2 years.
Chemical Control: Control is achieved with protectant fungicides like Bravo (**Group M5**) and is especially needed during cool and wet springs and summers.

**References**

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2. Pumpkin Production Guide. 2003. Ed. D. Riggs, NRAES, Ithaca, NY. 152pp.

3. Vegetable MD online web site: http://vegetablemdonline.ppath.cornell.edu for selected fact sheets, news articles (ie. Occurrence of Strobilurin Resistance and Impact on Managing Powdery mildew of Cucurbits), and images.

4. Fungicide Resistance Action Committee site for **Fungicide Groups** used in this paper. http://www.frac.info/publications/FRACCODE_sept2002.pdf