Managing Cucurbit Powdery Mildew Successfully in 2022

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Effectively managing powdery mildew is essential for producing a high-quality cucurbit crop. This foliar, fungal disease is common wherever cucurbits are grown, including in the northeastern U.S. This is because the pathogen produces an abundance of asexual spores (the powdery growth) easily dispersed by wind, thus it can spread widely, and the pathogen can produce a sexual spore in fall that enables it to survive over winter. Leaves affected by powdery mildew die prematurely which results in fewer fruit and/or fruit of low quality (prone to sunscald, poor flavor, poor storability).

Powdery mildew is managed with resistant varieties and fungicides. An integrated program with both management tools is the best approach for achieving effective control because the pathogen is adept at evolving new strains resistant to individual tools such as resistant varieties or a specific conventional fungicide. It is more difficult for new pathogen strains to develop when an integrated program is used, and effective control is more likely. Powdery mildew management program often needs adjustments as the pathogen and management tools change.

Cultural and biological controls including resistant varieties

Genetic resistance is used extensively in cucumber and melon, and has been incorporated into most other cucurbit crops. Most resistant squash and pumpkin varieties in the United States contain one or two copies of the same major resistance gene from a wild cucurbit. Genetic of resistance is different in cucumber and melon. Recently a decline in the degree of suppression achievable with resistant varieties has been detected indicating adaptation in *Podosphaera xanthii*. Successive cucurbit plantings should be physically separated or at least planted up-wind of older plantings because older plants can serve as a source of conidia. Fungicides containing antagonistic fungi for biological control have been developed.

Resistant varieties are now available in most crop groups with new varieties released most years. Resistance in cucumber is standard in modern varieties and is so strong it is easy to forget this cucurbit type is susceptible until an Heirloom type is grown. Resistance in other cucurbit crop types is not adequate used alone (without fungicide applications) to prevent impact of powdery mildew on yield. Melon varieties with resistance to pathogen races 1 and 2 have exhibited very good suppression in experiments conducted at LIHREC until recently. Squash and pumpkin exhibit a moderate degree of resistance. Select varieties with resistance from both parents (homozygous resistance) when possible. This term is used in a few catalogues (for example Outstanding Seeds) whereas others use terms like ‘high resistance’ and ‘intermediate resistance’ or ‘tolerance’ to generally refer to homozygous and heterozygous resistance, respectively. Degree of disease suppression obtained with a variety also depends on modifying genes present. Tables of resistant varieties and articles about evaluations of these are at

https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/.

Chemical control – General information

Fungicides should be applied every 7-10 days beginning very early in disease development following detection through an IPM scouting program. Inspect plants weekly beginning at the start of fruit formation (when plants become susceptible). Examine upper and lower (under) surfaces of five older leaves at each of 10 sites or until symptoms are found. When there are multiple varieties in a planting, focus on those that lack resistance to powdery mildew and/or those that start to produce fruit early. Initiate a weekly spray program when symptoms are found. A spring planting of summer squash will become infected before main season crops; therefore, when available, it can be used as an indicator of when the pathogen is developing in the area. For a preventive schedule, applications should begin when first female flowers have opened. To obtain adequate control, fungicide is needed on the undersurface of leaves and on leaves low in the plant canopy because the fungus develops best on these surfaces. This can be best accomplished by using mobile fungicides. Another approach is to improve efficacy of contact materials (i.e. chlorothalonil, sulfur, oil) by maximizing spray coverage on undersurfaces of leaves. This is challenging with cucurbit crops due to leaf size and density. Air-assist sprayers are generally considered one of the most effective means to increase spray deposition on all leaf surfaces, but cucurbit crops are a difficult target for sprayers. Coverage produced by traditional hydraulic boom sprayers can be improved by using narrow nozzle spacing (10 inches is better than 20 inches) and examining output to ensure appropriate overlap for nozzle type used, using adequate volume (around 75 gpa), good pressure (80-120 psi), and changing to nozzle tips that direct the spray at an angle to the canopy (e.g. TwinJet). It is valuable to use water sensitive paper to check spray coverage. Likely it will show improved coverage, but not enough to achieve effective control without using mobile fungicides.

Development of fungicide resistance and consequent control failure is always a concern with mobile fungicides due to their single site mode of action. Strains of the powdery mildew fungus resistant (insensitive) to such fungicides have been found throughout the United States, including New York where research on resistance started in 1990. Reduced sensitivity to fungicides from several chemical groups have been detected in other areas of the world as well. Therefore, tactics should always be used to minimize the potential of resistant pathogen strains being selected, starting when a new product is first available: apply mobile fungicides together with a contact fungicide (tank mix), apply them only when needed most to protect yield (which begins at the start of disease development; contact fungicides alone can suffice late in the season), use highest labeled rates, and alternate among as many different mobile fungicides as possible selecting based on resistance occurrence and on modes of action as indicated by their FRAC code (see link to current fungicide information at top of page). In addition, maximize spray coverage and also use nonchemical (cultural) control practices. Frequency of resistant strains can increase rapidly with use during a growing season, especially when products are used exclusively rather than in a resistance management program.

Several biopesticides approved for organic production are registered for this disease in the United States. These products contain natural ingredients such as botanical oils, bicarbonates,

hydrogen dioxide, and microbes that function as biocontrol agents and/or induce resistance in plants. Most are contact materials, thus good coverage is critical for effective control. Products evaluated in university trials have exhibited a range in efficacy with some being as effective as conventional contact fungicides. For more information including products labeled for cucurbit powdery mildew see https://www.vegetables.cornell.edu/ipm/diseases/biopesticides/.

Fungicide program

The most important component of an effective management program is an effective fungicide program. And the key to that is using mobile fungicides targeted to powdery mildew. Mobile fungicides are needed for control on the underside of leaves. Because these fungicides have targeted activity, additional fungicides must be added to the program when there is a need to manage other diseases such as downy mildew and Phytophthora blight.

Alternate among targeted, mobile fungicides and apply them with a protectant fungicide to manage resistance development and avoid control failure if resistance occurs, and also to comply with label use restrictions (most mobile fungicides are not permitted used exclusively). The powdery mildew pathogen has a long history of developing resistance to fungicides (it was the first occurrence of resistance in the USA), thus a diversified fungicide program applied to resistant varieties when possible is critical for success. Always implement a resistance management program; do not wait until there is a problem. The goal is to delay development of resistance, not manage resistant strains afterwards.

When to apply fungicides

The action threshold for starting applications is one leaf with symptoms out of 50 older leaves examined. Examine both surfaces of leaves. Starting treatment after this point will compromise control and promotes resistance development. Powdery mildew usually begins to develop around the start of fruit production. Protectant fungicides applied before detection may slow initial development. After detection, continue applying fungicides weekly. Conditions are favorable for powdery mildew throughout the growing season.

Recommended targeted fungicides

Alternate among targeted, mobile fungicides primarily in the following three chemical groups (principally the first two) and apply with protectant fungicide. Both are recommended to manage resistance development and avoid control failure if resistance occurs, and also to comply with label use restrictions. All targeted fungicides are at risk of resistance developing. The specific fungicide recommendations below are based on results from conducting fungicide evaluations and studying fungicide resistance. See https://blogs.cornell.edu/livegpath /research/cucurbit-powdery-mildew-research/. An important finding from this work is existence of isolates with multi-fungicide resistance (resistant to fungicides in different FRAC groups), which means applying one of these fungicides can also select for resistance to other fungicides in different FRAC groups when multi-fungicide resistant isolates are present. All of the isolates collected at the end of the 2020 growing season (both research and commercial plantings) that were determined to be resistant to Quintec (FRAC 13) were also resistant to Endura (FRAC 7) and

Torino (FRAC U6) although these fungicides had not been used (Quintec had been applied), with the exception of the last application in one commercial field being Torino. Of the 21 isolates collected in 2021 that were determined to be Quintec resistant, 15 (71%) were also resistant to Endura and Torino. For more information about our research testing powdery mildew isolates see https://blogs.cornell.edu/livegpath/research/cucurbit-powdery-mildew-research/yearly-results-from-testing-isolates-for-fungicide-resistance-with-the-leaf-disk-bioassay/. See "Mobile Fungicides for Mildews and Phytophthora Blight" for more information about these and other targeted fungicides.

Federal pesticide labels can be viewed and downloaded at: http://www.cdms.net/Label-Database. New York state labels are available at: http://www.dec.ny.gov/nyspad/products?0 (enter product name under 'Names' in center of page, then click on Search at bottom of this section).

Vivando (FRAC Code 50, formerly U8) has exhibited excellent control in fungicide evaluations. Activity is limited to powdery mildew. It is recommended used with a silicon adjuvant. Do not mix with horticultural oils. It can be applied three times per year with no more than two consecutive applications. REI is 12 hr. PHI is 0 days. Prolivo is a new fungicide with a new active ingredient in this FRAC group registered in NY April 2018. It was not as effective as Quintec for managing powdery mildew on lower leaf surfaces in a fungicide evaluation conducted at LIHREC in 2016 in which Vivando was not included.

DMI fungicides (FRAC Code 3) include Proline*, Procure, Luna Experience*†, and Rhyme*† (these considered most effective) plus Aprovia Top*, Inspire Super*, Mettle, and Rally. †not labeled for use on Long Island. *Fungicides labeled for additional cucurbit diseases; see section below on other diseases. Resistance is quantitative. While these fungicides have good efficacy, highest label rate is recommended because the pathogen has become less sensitive to this chemistry. Efficacy has varied among products in fungicide evaluations. Proline is thought to have the greatest inherent activity; it was the most effective fungicide evaluated in 2020 on Long Island. Procure applied at its highest label rate provides a higher dose of active ingredient than the other FRAC 3 fungicides. Five applications can be made at this rate. REI is 12 hr for DMI fungicides. PHI is 0 days for some including Procure; 7 days for others including Proline. Inspire Super (FRAC 3 and 9) is recommended for other labeled diseases. It is expected to provide some control of powdery mildew. but there are other FRAC 3 fungicides with greater intrinsic activity for powdery mildew that are better choices when this is the only disease developing. Cevya (FRAC 3), which was registered in NY in 2021, is not recommended because it was not as effective as other DMI fungicides when tested in 2020 and 2021 (see paragraph below on fungicide evaluations at LIHREC). TopGuard is labeled but not recommended because it has Code 11 ingredient plus same DMI ingredient in Rhyme. Additional products are registered for use outside NY.

Gatten (Code U13) is the newest fungicide; it was introduced in 2018 and registered in NY in 2020. REI is 12 hr. PHI is 0 days. Activity is limited to powdery mildew. In NY, Gatten can only be applied twice (five times elsewhere) and it is not allowed used on Long Island. It was as effective as Vivando for managing powdery mildew on lower leaf surfaces in a fungicide evaluation conducted at LIHREC in 2019 but not in 2018.

Recommended used sparingly:

Carboxamide aka SDHI fungicides (FRAC Code 7) registered in NY and recommended are Aprovia Top, Luna fungicides†, and Miravis Prime† (†not allowed used on Long Island). Endura, Pristine and Merivon are not recommended. Resistance to boscalid, the FRAC Code 7 active ingredient in Endura and Pristine has been detected routinely on Long Island since 2009 and likely is the reason their efficacy has varied in fungicide evaluations. Full cross resistance was documented between several carboxamides, including those in Pristine, Merivon and also Fontelis (not registered for use in NY), but not Luna fungicides, through laboratory assays conducted with pathogen isolates resistant and sensitive to boscalid. However, Luna Sensation has exhibited limited control in fungicide evaluations conducted in 2017-2019 on Long Island. Luna Experience is the best choice because it also contains tebuconazole (Code 3), which needs to be considered when developing an alternation program. Luna Sensation is not recommended because it also contains trifloxystrobin (Code 11); resistance to this chemistry is very common. Aprovia Top, Luna Experience, and Miravis Prime are the only Code 7 fungicides recommended. Limit use. Aprovia Top and Luna Experience have the advantage that they contain a second active ingredient with activity for powdery mildew (Code 3). All have 12 hr REI. PHI is 0, 7, and 1 day respectively. Maximum number of applications is 2-5, depending on product and rate. Low rate isn't recommended.

Recommended used sparingly (one application) if at all:

Torino or Quintec are recommended applied at most once based on recent results from testing powdery mildew isolates collected from commercial and research plantings in NY at season end. Resistance was common where these products were applied, with most isolates resistant to both fungicides even where only one was used. While resistance was not detected in many plantings where neither Torino nor Quintec were applied, indicating these products would likely have been effective, it is possible resistance was at a low frequency not detectable with only about 8 isolates tested per planting. Additionally, resistance was detected in some plantings where neither fungicide was applied documenting that resistant isolates are common and competitive. It is not possible to predict efficacy of Torino and Quintec without testing isolates in a planting prior to applying that season. Results from prior year testing in a location provide some indication of expected resistance occurrence, but the pathogen population changes yearly reflecting ability of the pathogen's wind-dispersed spores to be dispersed widely. Seedling bioassays conducted on Long Island (2017-2021) have yielded some useful information about occurrence of resistance, but bioassays conducted at the start of powdery mildew development have been hampered by high summer temperatures in the greenhouse impacting powdery mildew development.

Torino (FRAC Code U6) exhibited excellent control in fungicide evaluations until recently. It failed in an experiment in North Carolina in 2016 and on Long Island in 2017, where resistance to Torino was detected in pathogen isolates. Torino resistance has been detected every year since on Long Island and in upstate NY when examined in 2020 and 2021. Activity is limited to powdery mildew. Recommended applied at most once to a crop where Quintec not applied; labeled for twice to a field in a 12-mo period. REI is 4 hr. PHI is 0 days.

Quintec (FRAC Code 13) was consistently effective in fungicide evaluations conducted on Long Island until 2019 when it was significantly less effective than Vivando for the first time in the fungicide evaluation conducted annually on Long Island. This was not surprising because insensitivity to a high concentration of Quintec (similar to the dose when applied in the field) has been detected in some pathogen isolates collected from commercial fields and/or fungicide-treated research fields at the end of the growing season on Long Island and/or upstate NY since 2015. Resistant isolates evidently were sufficiently uncommon most of the season in 2015-2018 and also 2020 not to impact Quintec efficacy. Because Quintec resistance is being detected every year, especially in plantings where applied, Quintec is now recommended applied at most once to a crop where Torino was not applied; label permits a crop maximum of four applications. Aerial applications are not permitted and no more than two consecutive applications. Activity is limited to powdery mildew. It is the only mobile fungicide that does not move into leaves: it redistributes to foliage where spray was not directly deposited, including the underside of leaves, through diffusion and a continual process of absorption and desorption in the cuticular waxes of foliage. Labeled for use on non-edible peel crops: melons, pumpkin, and winter squash. REI is 12 hr. PHI is 3 days.

Fungicides classified for "Restricted Use" in New York: Aprovia Top, Gatten, Miravis Prime, and Procure.

No longer recommended. Resistant pathogen strains are sufficiently common in NY to affect the efficacy of the following fungicides which in the past were highly effective:

Topsin M (FRAC Code 1; MBC fungicide).

QoI fungicides (Code 11), which include Quadris, Cabrio and Flint.

SDHI fungicides (Code 7) containing boscalid (Endura and Pristine) or an active ingredient that has exhibited full cross resistance in laboratory testing of pathogen isolates (Merivon).

Recommended protectant fungicides. Many fungicides have contact activity for powdery mildew; mancozeb is an exception. They include chlorothalonil, sulfur, copper, mineral oil, and several biopesticides. Many of these products are approved for organic production (see list below).

Sulfur is one of the most effective and least expensive products. Its activity is limited to powdery mildew, thus it is especially useful early in disease development when other diseases are not a concern, including as a preventive application. Microencapsulated formulations are recommended. Melons are sensitive to sulfur especially when hot; there are tolerant varieties.

Fungicide evaluations conducted each year on pumpkin at LIHREC on Long Island include fungicides at risk for resistance tested alone (this is neither a labeled nor recommended commercial use pattern for these fungicides; it is done in efficacy evaluations to determine if resistance affects control). Not every fungicide chemistry prone to resistance is tested every year. In 2021, Proline alternated with Vivando provided excellent control (99% control on lower leaf surfaces) while Cevya, a new FRAC 3 fungicide, was less effective (67%), similar to 2020. In 2020 Proline provided exceptional control (99.5% control on lower leaf surfaces); Luna

Experience, Quintec, Vivando, and Procure also performed well (89-95%) while Cevya did not (44% at highest rate tested). The FRAC 7 active ingredient in Luna pre-mix fungicides (fluopyram) was shown to be highly effective through testing Luna Privilege, which has only fluopyram; it is not labeled for powdery mildew. In 2019 Vivando was the most effective single product tested providing control statistically similar to the alternation program (Vivando, Quintec, Proline), albeit numerically lower control (75 and 92% control on lower leaf surfaces). Gatten was as effective as Vivando (65%); Luna Sensation and Quintec were less effective (47 and 40%). In 2018 Vivando was most effective albeit not significantly better than Quintec, which was not significantly better than Luna Sensation (54, 42, and 28%). In 2017 Torino, Pristine, and Luna Sensation were ineffective, while Vivando was most effective (80%) albeit not significantly better than Quintec (72%) or Procure (54%). In 2016 Quintec and Procure were as effective as an alternation program (98, 91, and 97%) while Pristine was substantially less effective (43%). In 2015 Quintec, Pristine, and Vivando were as effective as an alternation program (69-78%). Quintec and Vivando were the most effective of the targeted fungicides evaluated in 2014 (96 and 98%); Pristine was moderately effective (54%); Procure was slightly but not significantly better (70%). In 2013 Quintec, Pristine, and Procure provided excellent control (93-99%). In 2012 Pristine and Fontelis were ineffective (albeit treated pumpkins were numerically less severely affected by powdery mildew than the non-treated plots) while Quintec was very effective (96%) and Procure was moderately effective (57%). These experiments have documented year-to-year variation in the pathogen population.

Fungicides Labeled for Other Diseases in Addition to Powdery Mildew.

Proline (FRAC 3). Fusarium blight and gummy stem blight.

Rhyme (FRAC 3). Gummy stem blight.

Luna Experience (FRAC 3 and 7). Alternaria leaf spot, anthracnose, gummy stem blight, and belly rot.

Aprovia Top (FRAC 3 and 7). Anthracnose, Alternaria leaf blight, gummy stem blight, and Plectosporium blight.

Inspire Super (FRAC 3 and 9). Alternaria leaf blight, anthracnose, gummy stem blight, Plectosporium blight, and Septoria leaf spot

Miravis Prime (FRAC 3 and 12). Alternaria leaf blight and spot, gummy stem blight, and scab.

Organic fungicides. Products labeled for cucurbit powdery mildew, in addition to several formulations of copper and sulfur, include:

Actinovate AG. 0.0371% *Streptomyces lydicus* strain WYEC 108. For best results with applications to foliage, label indicates to use a non-ionic spreader-sticker. OMRI-listed. EPA Reg. No. 73314-1.

Aviv. 0.08% *Bacillus subtilis* strain IAB/BS03. OMRI-listed. EPA Reg. No. 91473-1-86182.

Carb-O-Nator. 85% potassium bicarbonate. OMRI-listed. EPA Reg. No. 70051-117.

Cinnerate. 60% cinnamon oil. OMRI-listed. Exempt from EPA registration.

Companion. 0.03% *Bacillus subtilis* strain GB03. EPA Reg. No. 71065-3.

DES-X insecticidal soap. 47% potassium salts of fatty acids. OMRI listed. EPA Reg. No. 67702-22-70051.

Double Nickel 55 LC and WDG. *Bacillus amyloliquefacinens* strain D747, 98.8% and 25%, respectively. OMRI-listed. EPA Reg No. 70051-107 and 108, respectively.

EcoSwing Botanical Fungicide. 82% extract of *Swinglea glutinosa.* OMRI-listed. EPA Reg. No. 10163-357.

ECOWORKS EC. 70% cold pressed neem oil. OMRI-listed. EPA Reg. No. 89152-4.

EF400. 8.2% clove, 8.1% rosemary, and 6.7% peppermint. Exempt from EPA registration.

FungOUT. 1.07% citric acid. OMRI listed. Exempt from EPA registration.

GreenFurrow BacStop. 2.0% thyme, 2.0% clove & clove oil, 1.5% cinnamon, 1.0% peppermint & peppermint oil, and 1.0% garlic oil. Recommended used with EF400. Exempt from EPA registration.

Howler. 50% *Pseudomonas chlororaphis* strain AFS009. OMRI listed. EPA Reg. No. 91197-3-92488.

Organic JMS Stylet-oil. 97.1% paraffinic oil. OMRI-listed. EPA Reg. No. 65564-1.

Kaligreen . 82% potassium bicarbonate. OMRI-listed. EPA Reg. No. 11581-2.

KeyPlex 350 OR. 0.063% yeast extract hydrolysate from *Saccharomyces cerevisiae*. Combination of defensive proteins (alpha-keto acids) and secondary and micronutrients. EPA Reg. No. 73512-4.

KOPA insecticidal soap. 47% potassium salts of fatty acids. OMRI listed. EPA Reg. No. 67702-11-59807.

LALSTOP G46 WG. 93.0% *Gliocladium catenulatum* strain J1446. OMRI listed. EPA Reg. No.: 64137-13.

LifeGard WG. 40% *Bacillus mycoides* isolate J. Biological Plant Activator. OMRI-listed. EPA Reg No. 70051-119.

Mildew Cure (formerly GC-3 Organic fungicide). 30% cottonseed oil, 30% corn oil, 23% garlic extract. OMRI-listed. Exempt from EPA registration.

MilStop. 85% potassium bicarbonate. OMRI-listed. EPA Reg. No. 70870-1-68539.

M-Pede insecticidal soap. 49% Potassium salts of fatty acids. OMRI-listed. EPA Reg. No. 10163-324.

Organocide. 5% sesame oil. OMRI-listed. Exempt from EPA registration.

OSO. 5% polyoxin D zinc salt. OMRI-listed. EPA Reg No. 68173-4-70051.

OxiDate 2. 27% hydrogen dioxide. OMRI-listed. EPA Reg. No. 70299-2.

PerCarb. 85% sodium carbonate peroxyhydrate. OMRI listed. EPA Reg. No. 70299-15.

Prestop. 93% *Gliocladium catenulatum* strain J1446. OMRI listed. EPA Reg. No. 64137-13.

Problad Verde. 20% Banda de Lupinus albus doce (BLAD). OMRI listed. EPA Reg. No. 84876-2.

Procidic. 3.5% Citric acid. NOP compliant; registered for use in organic agriculture with Washington State Dept of Ag. Exempt from EPA registration.

Promax. 3.5% Thyme oil. OMRI-listed. Exempt from EPA registration.

Rango. 70% cold pressed neem oil. OMRI listed. EPA Reg. No. 88760-10.

Regalia. 5% Extract of *Reynoutria sachalinensis*. OMRI-listed. EPA Reg. No. 84059-2.

Romeo. 94.1% cerevisane (cell walls of *Saccharomyces cerevisiae* strain LAS117). OMRI listed. EPA Reg. No. 91810-2.

Serenade ASO. 1.34% *Bacillus subtilis* strain QST 713. OMRI listed. EPA Reg. No. 264-1152.

Serenade Opti. 26.2% *Bacillus subtilis* strain QST 713. OMRI-listed. EPA Reg. No. 264-1160.

Serifel. 9.9% *Bacillus amyloliquefacinens* strain MBI 600. OMRI-listed. EPA Reg No. 71840-18.

Sil-Matrix. 29% potassium silicate. OMRI-listed. EPA Reg. No. 82100-1.

Sonata. 1.38% *Bacillus pumilus* strain QST 2808. OMRI-listed. EPA Reg. No. 69592-13.

Sporan EC^2. 16% rosemary oil, 10% clove oil, 10% thyme oil, 2% peppermint oil. OMRI-listed. Exempt from EPA registration.

Surround WP. 95% kaolin. OMRI listed. EPA Reg. No. 61842-18.

Taegro 2. 13% *Bacillus subtilis* var. *amyloliquefaciens* strain FZB24. OMRI-listed. EPA Reg. No. 70127-12.

Thyme Guard. 23% thyme oil extract. Determined to be NOP compliant by Washington State Dept of Ag. Exempt from EPA registration.

Thymox Control. 27% thyme oil. OMRI-listed. Exempt from EPA registration.

Thyme Guard. 23% thyme oil extract. Exempt from EPA registration. Determined to be NOP compliant by Washington State Dept of Ag.

Timorex Act. 12.5% tea tree oil. OMRI-listed. EPA Reg. No. 86182-3-88783.

Triathlon BA. 98.85% *Bacillus amyloliquefaciens* strain D747. OMRI listed. EPA Reg. No. 70051-107-59807.

Trilogy. 70% clarified hydrophobic extract of neem oil. OMRI-listed. EPA Reg. No. 70051-2.

TriTek. 80% mineral oil. OMRI-listed. EPA Reg. No. 48813-1.

Before purchase for organic production, confirm product is acceptable for agricultural use with your certifier or your NYS DEC regional office.

In summary, to manage powdery mildew effectively in cucurbit crops: 1) select resistant varieties, 2) inspect crops routinely for symptoms beginning at the start of fruit development, and 3) apply targeted fungicides weekly with protectant fungicides and alternate amongst available chemistry based on FRAC Group code, starting at the action threshold of 1 affected leaf out of 50 older leaves. Add new fungicides to the program when they become available; substitute new for older product if they are in the same FRAC group.

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Check labels for use restrictions. Confirm approval with certifier for organic products. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.

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