

# Chase News



Volume 10—Issue 2  
February 2011

## Botrytis Resistant to Decree in Pennsylvania

This news on Botrytis resistant to Decree fungicide was made public in the past week. I print here the original email from Dr. Gary Moorman of Penn State University. I added a few clarifications in [ ].

“Late in 2010, a commercial greenhouse grower sent the Plant Disease Clinic some plants infected with *Botrytis* and noted that his applications of the fungicide Decree (fenhexamid) had not been controlling the disease (gray mold). I compared the growth of his *Botrytis* in culture plates containing various concentrations of fenhexamid [the active ingredient in Decree] to growth of a *Botrytis* that had never been exposed to fenhexamid (The old *Botrytis* had been in dormant storage from the 1980s when we were testing for benomyl [Benlate] and vinclozolin [Ornalin] resistance). [Neither Benlate or Ornalin are registered for ornamentals in the US any longer].

The grower’s *Botrytis* grew in culture plates with high concentrations of fenhexamid while my old culture was stopped dead; indicating that the grower’s *Botrytis* could indeed be resistant to fenhexamid (but that is not all the proof you need to say it is resistant...read on.).

I then put the grower’s *Botrytis* and the old *Botrytis* on plants with and without Decree at the label spray rate. The grower’s *Botrytis* killed the Decree treated plants and the fungicide-free plants. The old *Botrytis* did not kill the fenhexamid treated plants

but did kill the fungicide-free plants. Bottom line = I am confident in saying that the grower’s *Botrytis* is DECREE or FE-HEXAMID RESISTANT and the old *Botrytis* is not.

Please make growers aware that Decree resistance in *Botrytis* has been detected in PA and they should follow the Decree label directions VERY CAREFULLY! It clearly states on the Decree WDG label information that Decree 50 WDG is a group 17 (FRAC Group) fungicide and that no more than 2 consecutive applications should be made with Decree 50 WDG or any product containing its active ingredient, fenhexamid. The company (SePRO) recommends that after the second application, use an alternative fungicide effective in controlling the labeled diseases for 2 applications before reapplying Decree. [There is a fact sheet that is also available on the web. ]

If any of your growers is using Decree and feels as though it is not effective, please have them either contact me directly or send an infected plant to me via the Plant Disease Clinic.

To my knowledge, this is the first detection of fenhexamid resistance in North America. It was found in Europe a few years ago. Hopefully, Decree resistance is not widespread here.”

Although this is bad news, please don’t jump to the conclusion you have resistance to

Decree without proof such as that provided by Dr. Moorman. His contact information at the Plant Disease Clinic is:  
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# Adjuvants and Powdery Mildew Eradication

We started looking at adjuvants for powdery mildew many years ago. Some of the trials were conducted with fungicides while others were using adjuvants alone. We usually have not conducted a trial with a single fungicide and different adjuvants.

The trial we conducted last month was an outgrowth of the rose powdery mildew trial reported in **Chase News** (January issue). This time we used roses with moderate powdery mildew and compared four adjuvants added to Heritage for their ability to eradicate the disease. Heritage was used at 2 oz/100 gal the first two applications but we increased it to 4 oz/100 gal for the final application. Treatments are shown below:

- Water
- Heritage alone
- Heritage/KleenGrow (12.5 oz/100 gal)
- Heritage/Bond MAXX (4 oz)
- Heritage/Franchise (32 oz)
- Heritage/CapSil (6 oz)

Applications were made on a weekly interval and severity of powdery mildew was rated before the first application and 3-4 days after each application. The graph below shows the first and final ratings only. The difference between the level of disease before and after treatment was highest for plants treated with Heritage and KleenGrow. By the end of the trial, Heritage and KleenGrow, Bond MAXX and CapSil were each statistically lower than the water sprayed controls. This trial indicated that adding an adjuvant was very helpful in improving control achieved with Heritage. It appears that a variety of products can be helpful. Be sure to read fungicide labels for best options in adjuvants.

| Effect of adjuvants on control of powdery mildew |   |                   |
|--|---|-------------------|
| Disease-crop                                     | Fungicide, adjuvant (oz/100 gal)              | Effect on control |
| Powdery mildew on crape myrtle                   | Trinity (1-4 oz), Triton                      | Better control    |
| Powdery mildew on Gerber daisy                   | Insignia (8 oz), Sync (16 oz)                 | Better control    |
| Powdery mildew on hydrangea                      | Compass O (1 oz), Latron (8 oz)               | Better control    |
| Powdery mildew on hydrangea                      | Heritage (1 oz), Latron (8 oz)                | Better control    |
| Powdery mildew on rose                           | Trinity (1-4 oz), Triton                      | Better control    |
| Powdery mildew on rose                           | Insignia (8 oz), Sync (16 oz)                 | Better control    |
| Powdery mildew on rose                           | Insignia (16 oz), Crocker's Fish Oil (256 oz) | Better control    |

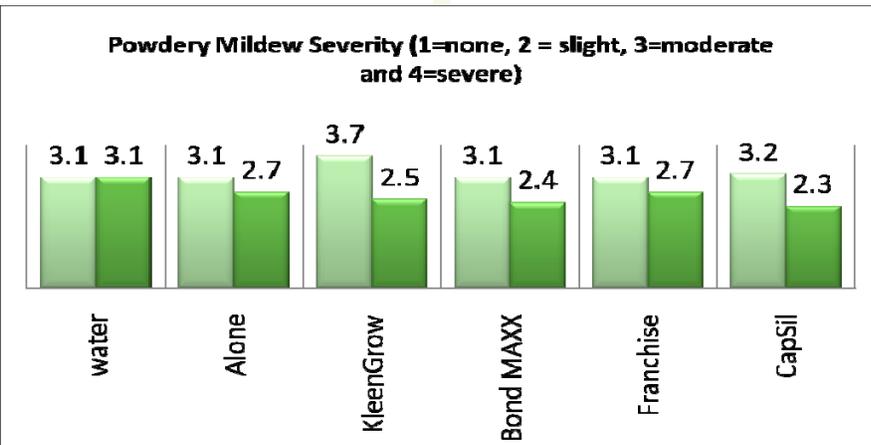
In the past twelve years, we have tested a wide range of wetting agents including Latron B 1956, CapSil, Bond MAXX, Franchise, Silwet, Break-thru, Sync and Crocker's Fish Oil. The table shows results of all of our trials on wetting agents and fungicides for powdery mildew control.

Adjuvants improved control of fungicides for powdery mildew. One interesting aspect of these adjuvants and powdery mildew is that they give varying degrees of control of these diseases when used alone. We have seen this phenomenon on rose, Gerber daisy and rosemary. The products included Capsil, Latron, No-Foam A, Crocker's Fish Oil and Sync. Unfortunately, the wetting agents have not been effective on any



other disease we have tested (downy mildew and rust).

Whether or not the fungicide is a contact product like Daconil Ultrex or Protect or a systemic product like Heritage does not appear to affect potential benefits of adding wetting agents. In addition, the specific type of wetting agent (ionic, nonionic or silicon based) is also less important than the disease target.



# Mozart TR for Prevention of Botrytis Blight

We have been working on total release fungicides for the past 12 years. Our initial work was performed with fludioxinil and sponsored by Whitmire Micro-Gen. When BASF Corporation purchased Whitmire Micro-Gen I wondered if the product would make it to market and I was pleased when this did happen in 2010. The product is called Mozart TR. Over the years we tested it for Botrytis blight a number of times (pansy, geranium and lisianthus), Alternaria leaf spot prevention on Impatiens and downy mildew on snapdragons.

We decided to test alternation of Mozart TR with an experimental TR for prevention of Botrytis on Gerber daisy. We included some wet spray treatments alone or also in an alternation. The exact products and rates of use are shown in the table. Pageant and Palladium are two of the newest fungicides with very good to excellent control of Botrytis blight. We started the trial before Christmas last year and quit after three applications. The plants were moved into a warmer greenhouse and left over the holidays. When we returned I was surprised to see that some Botrytis had finally

| Effect of Botrytis fungicides on development of Botrytis severity on Gerber daisies after four weeks (disease was rated from 1 = none to 3 = moderate) |                    |                 |
|--|--------------------|-----------------|
| Treatment  | Rate/100 gal.      | Disease 1-21-11 |
| Water noninoculated  | -----              | 2.2 c           |
| Water inoculated   | -----              | 1.1 b           |
| Mozart TR  | 17 g/288 sq ft     | 0.1 a           |
| Experimental TR  | 17 g/288 sq ft     | 0.2 a           |
| Mozart TR alternated with Experimental TR  | 17g/288 sq ft each | 0.0 a           |
| Pageant  | 12 oz              | 0.1 a           |
| Palladium  | 6 oz               | 0.0 a           |
| Palladium alternated with Pageant  | 6 oz and 12 oz     | 0.5 ab          |

Numbers in the same column followed by the same letter are not statistically different using Student Newman Keuls method.

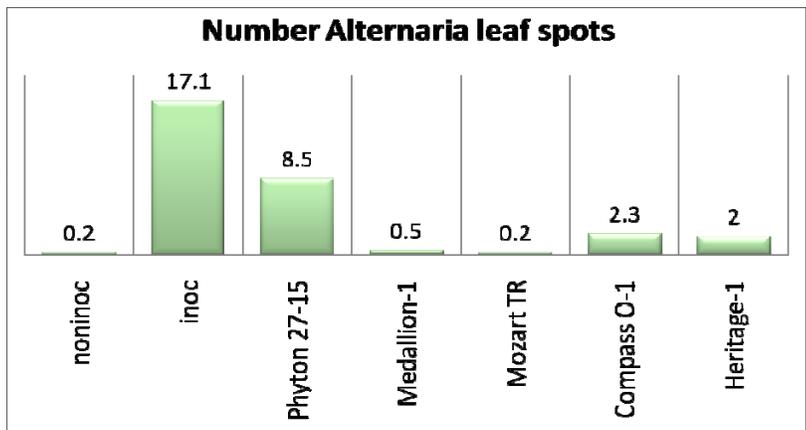


started and it was mainly in the water treated controls.

All of the treatments resulted in excellent prevention of Botrytis on these Gerber daisies. The TR treatments lasted as long as the standard wet sprays. Both Pageant and Palladium prevented development of Botrytis for at least a month after the final application. Palladium contains two ingredients—one of which is fludioxinil (the same as in Medallion and Mozart TR).

I thought it would be good to show one of the original trials from 2000. You can see from the graph to the right how effective Mozart TR was in preventing Alternaria leaf spot on Impatiens. Results were good also for prevention of Botrytis in most trials but we did not get any control of downy mildew with either Mozart TR or Medallion. I would have been really shocked if it had worked since fludioxinil is not recognized to be effective on this pathogen.

The Mozart TR label includes a complicated description of REI which ranges from 12 hr to shorter times depending on what you will be doing and venting/fans. It suggest best control will be achieved if used in early evening when plant foliage is dry and temperatures are between 60 and 80 F. My examination of the label failed to find approved site and did not tell me what it worked on. I would suggest trying the product only on diseases that Medallion is known to work well against. This is a good addition to our arsenal, especially when a wet spray is not desirable. Unfortunately, I cannot say that the label describes how to use the product or what it works on.



# MilStop Controls More Than Mildew

It is an unfortunate fact that we often decide we know what the answer is before we try something. Many of us believe in using products for one purpose but can miss many additional benefits.

MilStop (BioWorks) is known for powdery mildew control but a recent review of our tests and a new trial showed that this fungicide works on many other targets. MilStop is potassium bicarbonate and is registered of use in shade houses, greenhouses, interiorscapes, nurseries and field grown crops. It has a one hour REI and is OMRI listed.

We decided to test some “greener” products for prevention of Cercospora leaf spot on pansy. Products were applied once before inoculation and twice afterward on a weekly interval. Treatments included:

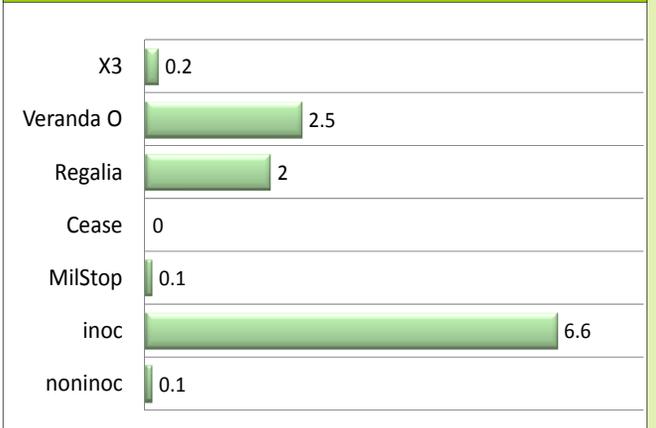
- Noninoculated control
- Inoculated control
- MilStop (2.5 lb/100 gal)
- Cease (1%)
- Regalia SC (1%)
- Veranda O (3.5 oz)
- X3 (1:1500 dilution)
- KleenGrow (12.5 oz)



We counted the number of spots per plant on 4 February (3 days after the final application). The graph to the right shows the data.

Disease was relatively low in this trial but all products provided statistically equivalent control. Optimal control was seen with Cease (*Bacillus subtilis*-also from BioWorks), MilStop and X3 (hydrogen peroxide, peroxy acetate and octanoic acid—Phyton Corp.). KleenGrow (didecyl dimethyl ammonium chloride—Pace 49) also did a very good job. Regalia SC (extract from giant knotweed—Marrone Bio Innovations) and Veranda O (polyoxin D—OHP) gave slightly lower levels of control but were statistically the same as the other fungicides.

**Effect of fungicides on Severity of Cercospora leaf spot on Pansy (number of spots/plant)**



After seeing the excellent results with this new trial, I decided to review all of our trials on MilStop and the results are shown in the table at the bottom of the page. We have seen variable results on Botrytis, Colletotrichum and downy mildew. We also saw good results for Cercospora leaf spot, scab on poinsettia, rust on geranium and powdery mildew on Gerber daisy and rose. In most cases using higher rates resulted in better control.

## Summary of efficacy of MilStop on foliar diseases on ornamentals

| Pathogen       | Plant         | Rate/100 gal       | Interval  | Result                  |
|----------------|---------------|--------------------|-----------|-------------------------|
| Botrytis       | Pansy         | 1.25, 2.5 and 5 lb | Weekly    | None to very good       |
| Cercospora     | Pansy         | 2.5 lb             | Weekly    | Excellent               |
| Colletotrichum | Cyclamen      | 2.5 lb             | Weekly    | Good with Cease at 1.5% |
| Colletotrichum | Cyclamen      | 2.5 lb             | Weekly    | None                    |
| Downy mildew   | Matthiola     | 2.5 and 5 lb       | Ten days  | Very good to excellent  |
| Downy mildew   | Matthiola     | 1.25 and 2.5 lb    | Weekly    | None                    |
| Downy mildew   | Snapdragon    | 2.5 lb             | Weekly    | Some                    |
| Downy mildew   | Rose          | 2 and 4 lb         | Two weeks | None                    |
| Powdery mildew | Gerbera daisy | 1.25, 2.5 and 5 lb | Ten days  | Very good to excellent  |
| Pseudomonas    | Snapdragon    | 1.25, 2.5 and 5 lb | Weekly    | None                    |
| Puccinia       | Geranium      | 1.25, 2.5 and 5 lb | Two weeks | Very good to excellent  |
| Sphaceloma     | Poinsettia    | 2.5 lb             | Ten days  | Good                    |
| Sphaerotheca   | Rose          | 2.5 lb             | Weekly    | Good                    |
| Xanthomonas    | Geranium      | 2.5 lb             | Weekly    | None                    |

Greenhouse use rates are from 1.25 to 3 lb/100 gal and MilStop can be applied using an electrostatic sprayer or a thermal fogger.

For those of you producing greenhouse vegetables or herbs check the label of this product for rates and intervals. The label is not as extensive for agricultural crops in some states. Always follow the label exactly!

# Myrothecium Update

*Myrothecium roridum* causes leaf spots, petiole rots and cutting rot on a number of important horticultural crops. Disease often starts at wound areas. I have seen *Myrothecium* sporulating on un-rooted cuttings of New Guinea Impatiens as early as when the shipment is received. This can be due to rough handling (hard to avoid on some crops like impatiens) and a relatively long shipping time. The dark, moist environment is ideal for development of this fungal disease.

The spores of *Myrothecium* can easily be seen with the naked eye or a hand lens. They form typically on the undersides of leaves and are shiny and black with a white fringe. They also end to form in concentric rings (see fruiting bodies on *Dieffenbachia* leaf below).



Some of the most common *Myrothecium* diseases in my experience are:

- Poinsettia cutting rot
- Pansy petiole/crown rot
- New Guinea Impatiens leaf spot
- Bouvardia stem rot
- Campanula cutting rot
- Syngonium petiole rot and leaf spot
- Spathiphyllum petiole rot and leaf spot
- Gardenia leaf spot
- *Dieffenbachia* leaf spot
- Ficus leaf spot

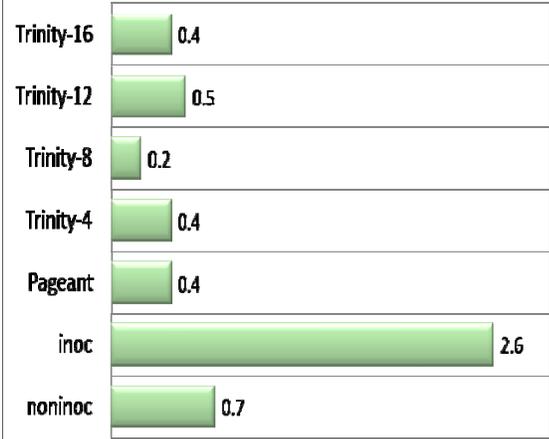
The best products in our trials for *Myrothecium* are listed in the table to the right. Overall, the best products have been Daconil Ultrex, strobilurins (Disarm O, Heritage, Insignia) and fludioxinil (Medallion and Palladium). Note the mode of action groups (MOA group) which helps you limit resistance development. Just rotate between any two groups. The best control of *Myrothecium* is preventative. You might consider a treatment of cuttings the same day they are stuck. Do not drench with products containing fludioxinil or Terraguard since both of these types of products have been shown to delay rooting

on some crops. In an active infection, treatment on a 7-14 day interval (sprays) may be necessary. Avoid wounding always to minimize *Myrothecium*.

We are always looking for new fungicides for control of *Myrothecium*. We just finished a trial on pansy with *Myrothecium* petiole rot. We tested Pageant (12 oz/100 gal) and four rates of Trinity (4, 8, 12 and 16 oz). Disease was not severe in this trial but all treatments were equally effective. The use of Trinity (unregistered sterol inhibitor) on pansy was to cause significant stunting which is not unusual for this MOA group.

BASF will likely register this product for use in nurseries and not greenhouses due

## Control of *Myrothecium* petiole rot on pansy (# infected leaves)



to the PGR effects that are possible on some greenhouse ornamentals.

| Product                      | MOA Group | Myrothecium Control    |
|------------------------------|-----------|------------------------|
| Banner MAXX                  | 3         | Good                   |
| Chipco 26019, Chipco 26GT    | 2         | Very good              |
| Cleary 3336, Fungo, OHP-6672 | 1         | Some to very good      |
| Clevis                       | 3 and M3  | None                   |
| Compass O                    | 11        | Some to good           |
| Cygnus                       | 11        | Good                   |
| Daconil Ultrex               | M5        | Very good to excellent |
| Disarm O                     | 11        | Very good to excellent |
| Eagle, Hoist, Systhane       | 3         | Some to good           |
| Heritage                     | 11        | Very good to excellent |
| Insignia                     | 11        | Very good to excellent |
| Junction                     | M1 and M2 | None                   |
| Medallion                    | 12        | Very good to excellent |
| Pageant                      | 7 and 11  | Some to excellent      |
| Palladium                    | 9 and 12  | Very good to excellent |
| Phyton 27                    | M1        | None to very good      |
| PlantShield                  | nc        | None to very good      |
| Spectro                      | 1 and M5  | None                   |
| Terraguard                   | 3         | Very good              |
| Veranda O                    | 19        | None                   |

## Research Reports

**Evergreen Azalea rooting after hot water treatment**—Copes and Blythe recently reported on studies they conducted to evaluate effects of hot water treatment for control of *Rhizoctonia* web blight. Use of 50C water to eradicate binucleate *Rhizoctonia* from terminal leafy cuttings has been successful but effects on subsequent rooting of the cuttings was unknown. Exposure of 12 cultivars of azalea demonstrated no adverse effects at either 20 or 40 minutes. However, some of the 12 cultivars showed adverse effects when dipped for 60 or 80 minutes. The degree of damage to the leaves was correlated to the ability of the cuttings to root. The authors determined that all 12 cultivars were sufficiently tolerant of the 50 C treatment for 20 minutes. The list below shows the cultivars Dr. Copes tested. I would recommend testing safety on other cultivars before wide scale use in your nursery.

- Conleb
- Fashion
- Formosa
- Gumpo White
- Hardy Gardenia
- Hershey Red
- Macrantha Pink
- Midnight Flair
- Red Ruffles
- Renee Michele
- Roblel
- Watchet

For the complete report see: HortScience 46(1):52-56.



**Verbena cultivar susceptibility to powdery mildew**—Daughtrey (Cornell University) and Hausbeck (Michigan State University) recently reported on results of research conducted to determine susceptibility of verbena cultivars to powdery mildew.

The work was partially supported through a grant from the American Floral Endowment and can be found on their website (report #133). Daughtrey and Hausbeck tested 125 cultivars in Michigan and New York over a two year period. Their results are shown in the

| Verbena cultivars with HIGH susceptibility to powdery mildew |
|--|
| Aztec Peach  |
| Babylon Blue   |
| Babylon Carpet Blue  |
| Babylon Light Blue   |
| Babylon Purple   |
| Babylon Red  |
| Babylon White  |
| Fuego Apricot  |
| Lanai Blue   |
| Lanai Blush White  |
| Napoleon Purple  |
| Quartz Blue  |
| Quartz Burgundy with Eye                                     |
| Quartz Magenta   |
| Sparkler Deep Blue/White                                     |
| Sparkler Purple/White  |
| Sparkler Red/White   |
| Sparkler Sky Blue/Red  |
| Spitfire Violet/White  |
| Superbena Coral Red  |
| Temari Burgundy Improved                                     |
| Tukana Scarlet   |
| Tukana White   |
| Wildfire Purple Improved                                     |

two tables .

Verbena powdery mildew is caused by *Podosphaera xanthii*

which also causes powdery mildew on squash and cucumber. Spacing plants, using fans and other means to encourage lower humidity are recommended to reduce severity of powdery mildew. Now growers can use cultivars with low susceptibility to powdery mildew or at least know which ones to treat preventatively with fungicides.

| Verbena cultivars with LOW susceptibility to powdery mildew |
|---|
| Aztec Grape Magic   |
| Aztec Lilac Picotee   |
| Aztec Magic Purple  |
| Aztec Silver Magic  |
| Aztec Wild Rose   |
| Lanai Royal Purple with Eye                                 |
| Rapunzel Hot Rose   |
| Rpunzel Orchid  |
| Superbena Dark Blue   |
| Superbena Large Lilac Blue                                  |
| Superbena Pink Shades                                       |

**Trilogy Repels Thrips**—Kund, Carson and Trumble (University of California at Riverside) reported on some studies conducted on Western Flower Thrips (WFT). They sprayed tomato leaves with Trilogy (1%), Neemix (4 oz ai/50 gal) or Success (6 oz/50 gal) and watched behavior of WFT. They determined that WFT spent less time actively searching on leaves treated with Trilogy than untreated leaves. The WFT spent significantly longer time searching on leaves treating with Success. The authors suggested that Trilogy might be acting as a repellent and that this could result in reduced transmission of Tomato Spotted Wilt Virus. Further testing is also recommended.

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