

Controlling Xanthomonas Leaf Spot on Poinsettias

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We saw quite a bit of Xanthomonas leaf spot on poinsettias in September and October. It caught a lot of growers by surprise since it rarely (first time in the 31 years I have been a plant pathologist) has been so wide spread. Since we had a chance to do a trial for prevention of this disease, we went ahead and started in early September. Treatments were started on 8 September and applied on a weekly interval in most cases and we inoculated twice—once on 17 September and again on 12 October. The specific treatments are shown in the table below. We evaluated disease and plant response (top grade and height and phytotoxicity) throughout September and October. The final ratings were made on 21 and 29 October and are shown in the table.

SAR is an experimental systemic acquired resistance product that has been under development by Syngenta for a number of years. It is not labeled for ornamental use yet. We tested it as a one time drench and also

as a weekly spray at two rates. We included Phyton 27 as an industry standard and also KleenGrow (a quaternary ammonium product registered for use on ornamentals by PACE 49).

All of the products significantly controlled Xanthomonas leaf spot development. The SAR applied as a one time drench or a weekly spray at the lower rate did not adversely affect the poinsettias. However, at the upper rate we did see some stunting and loss of overall top grade. I noted that bract color was developing about the same in all treatments (data not shown). Phyton 27 also provided excellent control of the leaf spot and was safe at the rates and intervals tested. KleenGrow was very effective as well but unfortunately did cause speckling on the leaves to a slight-moderate degree that was very easy to confuse with Xanthomonas leaf spot. Perhaps use of a slightly lower rate would have been safe as well as very effective.

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Bactericides affect on growth of poinsettia and severity of Xanthomonas leaf spot

Treatment	Rate/ 100 gal.	Height (cm) 10-21-10	Top grade 10-21-10	# Xanthomonas leaf spots 10-29-10	Phytotoxicity 10-29-10
Water Noninoculated	-----	20.1 c	3.7 b	0.0 a	1.0 a
Water Inoculated	-----	19.4 bc	3.6 ab	13.2 b	1.0 a
SAR Drench once	0.25 oz	17.8 abc	3.5 ab	0.8 a	1.0 a
SAR Spray weekly	0.5 oz	16.8 ab	3.4 ab	1.2 a	1.0 a
SAR Spray weekly	0.75 oz	15.3 a	3.1 a	1.5 a	1.0 a
Phyton 27 Spray weekly	20 oz	18.8 bc	3.5 ab	1.8 a	1.0 a
KleenGrow Spray weekly	0.1%	17.3 abc	3.4 ab	0.6 a	2.7 b

Top grade was rated on the following scale (1=dead, 2=poor, 3=moderate, 4=very good and 5=excellent)
Numbers in the same column followed by the same letter are not significantly different based on Student-Newman-Keuls Method

Woody Ornamental Diseases to Watch For

I have been working on lab reports and decided to highlight a few of the most recent ones on woody ornamentals. There are quite a few with anthracnose diseases—mainly *Colletotrichum*—some blighting caused by *Phytophthora* and unfortunately even some rose downy mildew already.

Colletotrichum diseases are often called anthracnose. We have seen spot anthracnose on dogwood (from the East Coast), *Colletotrichum* leaf spot on *Aucuba* and *Colletotrichum* leaf spot on blueberry. We also had a sample of mandevilla from a propagation greenhouse with a combination of *Colletotrichum* leaf spot and *Corynespora* leaf spot. This mixed infection on mandevillas is actually rather common.

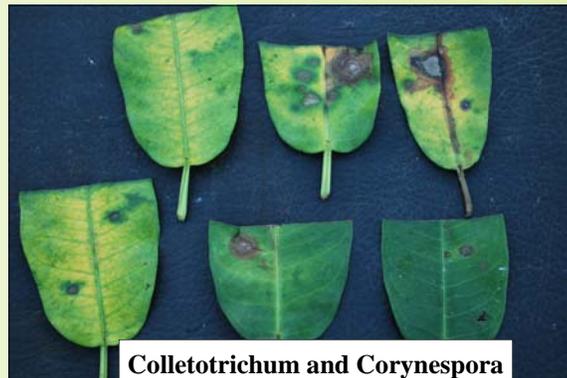
In a consulting visit during September I saw my first pitch canker on pine. Pitch canker is caused by *Fusarium circinatum* and is easily spread by rainfall. In this case, the nursery was located in coastal California and the disease was obviously present on the native pines surrounding the nursery.

I also saw quite a bit of *Rhizoctonia* blight in propagation and in woody production in September and October. I saw *Vinca minor* as well as herbaceous perennials in propagation and also received the sample of *Calluna* shown to the right.

Finally, we saw several samples of woody ornamentals with *Phytophthora* tip blight or crown and root rot. It should be getting too cool for a lot of *Phytophthora* in much of the US but in the deep southern regions it can be problematic longer as their temperatures can stay warm well into the fall. This is the most typical time of year for rapid death caused by *Phytophthora* on many plants.



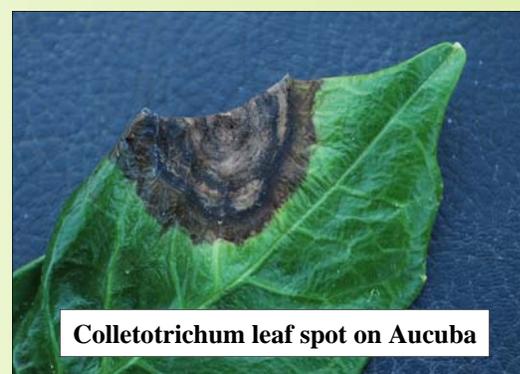
Spot anthracnose on dogwood



Colletotrichum and *Corynespora* leaf spots on mandevilla



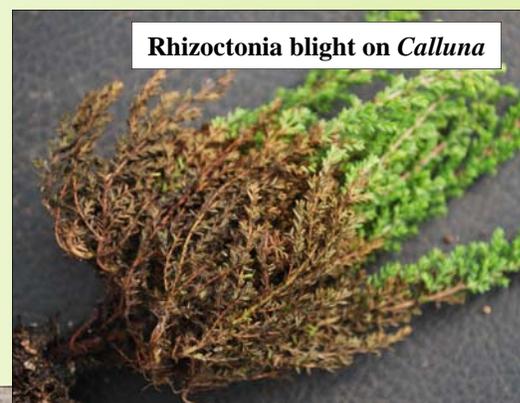
Colletotrichum on blueberry



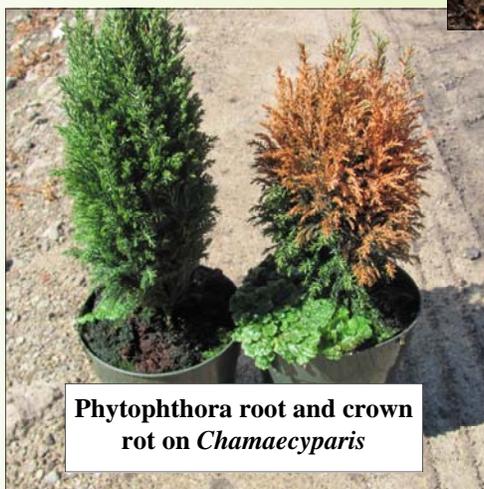
Colletotrichum leaf spot on *Aucuba*



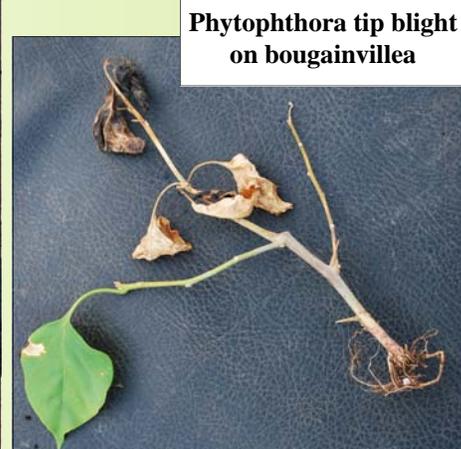
Pitch canker on pine



Rhizoctonia blight on *Calluna*



Phytophthora root and crown rot on *Chamaecyparis*



Phytophthora tip blight on bougainvillea

Fusarium wilt on Lisianthus and Powdery Mildew on Gerbera

We have been working on Fusarium wilt control on lisianthus in the past few months. We found a new isolate of *F. oxysporum* and started two trials. I reported on the first one last month and now I report on the second one. In this case, we used 'Echo Yellow' planted in Fafard Mix 2B on 27 July. Plants were treated with an experimental fungicide (4 oz/100 gal) or Heritage (4 oz/100 gal) on a 14, 21 or 28 day interval. Fungicides were applied up to six times as a spreng at the rate of 0.66 oz/3.5 inch pot. They were inoculated with *F. oxysporum* one week after the first fungicide application. We started seeing symptoms about 6 weeks after inoculation. The picture below shows the rating scale used for disease severity.

The color grade on 5 October showed a significant level of Fusarium wilt on some of the lisianthus. The only treatment

Fusarium wilt severity scale: 5=dead (far left) to 1=healthy (far right).



Effect of fungicide interval on severity of Fusarium wilt on lisianthus.

Treatment	Color grade	Disease severity 10-20-10	% good roots
Water Noninoculated	5.0 c	1.0 a	76.7 a
Water Inoculated	4.0 a	2.4 b	59.2 a
Heritage 14 day	4.1 ab	1.8 ab	62.5 a
Heritage 21 day	4.7 bc	1.6 a	75.0 a
Heritage 28 day	4.9 c	1.3 a	67.5 a
Experimental 14 day	4.7 bc	1.4 a	70.0 a
Experimental 21 day	4.7 bc	1.5 a	71.7 a
Experimental 28 day	4.7 bc	1.2 a	76.7 a

that did not show prevention of the chlorosis was the Heritage used at 14 day interval. When the disease severity was rated about 2 weeks later, advanced symptoms of wilt and lower leaf loss was evident. At this point, all fungicides gave statistically significant control with the exception of the Heritage used on a 14 day interval. This appears to be due to high use of the 4 oz rate which is not legal. This was dictated by the protocol but clearly resulted in some damage that mimicked the Fusarium wilt symptoms. The roots were also evaluated and we did find that experimental product used at a 28 day interval was best, closely followed by Heritage at a 21 day interval.

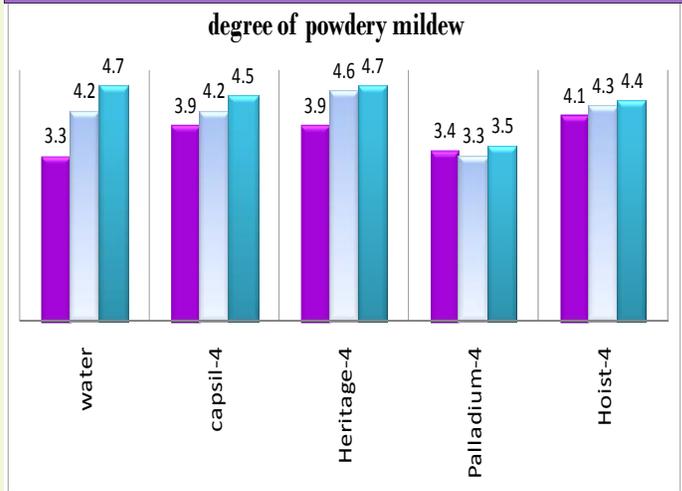
This is a very good demonstration of the less is more principle. The use of the excessive rate of Heritage on a 14 day interval would be twice as costly as if used on a 28 day interval with the result of plant damage as well.

Powdery Mildew Eradication on Gerbera



We had some gerber daisy plants that suddenly came down with a bad case of powdery mildew. Since I hate throwing plants out without learning something, we set up a quick trial to see if we could eradicate the mildew or at least slow its progress. Fungicides were applied three times on a weekly interval with powdery mildew rated 6 days after each application. Capsil was added to each treatment at the rate of 4 oz/100 gal. We compared water, Capsil alone, Heritage/Capsil, Palladium/Capsil and Hoist/Capsil. The data show that only the Palladium/Capsil spray stopped further development of powdery mildew in this trial. The failure of Heritage and Hoist to affect the progress of this powdery mildew was unexpected since we have seen good to excellent with both in previous trials.

Severity of powdery mildew on Gerber daisy taken one week after each of the applications. Disease was rated from 1 (none) to 5 (100% leaf coverage). Numbers after the product are oz/100 gal.



Pythium Root Rot Prevention on Poinsettia

One of the most common problems in poinsettia production is *Pythium* root rot. It first can appear during the rooting process and then can appear to be cured only to show up again at the end of production, when plants are sometimes overgrown and may be over-watered due to winter conditions. The picture below shows typical signs of *Pythium* root rot on cut-



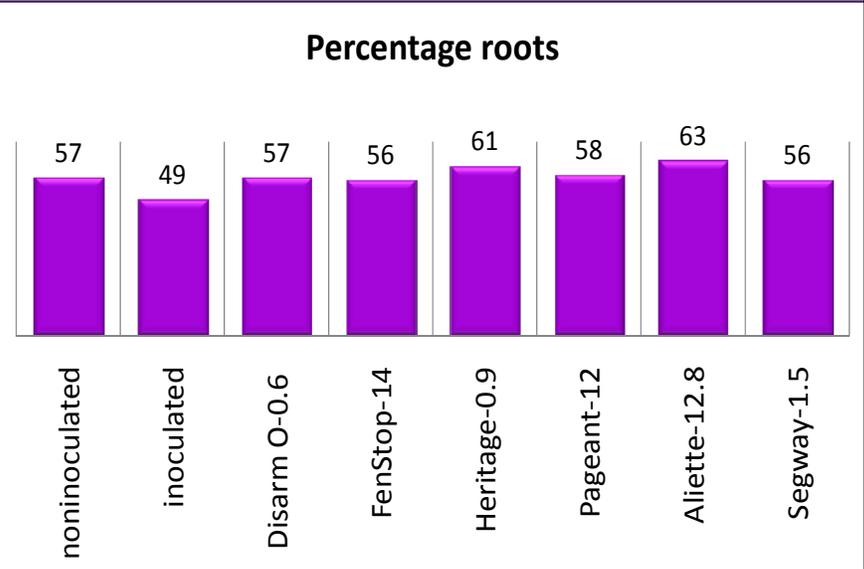
Typical *Pythium* root rot on poinsettia cuttings.

tings. *Pythium* in general can be very hard to control mainly since it usually causes significant root loss well before any signs are seen in the leaves or tops of the plants.

We have been working with the IR-4 program on some fungicides for *Pythium* root rot on ornamentals. New fungicides have been registered or are under development for this important pathogen group. In some cases, IR-4 trials have found that different species of the same fungus (like *Phytophthora*) respond differently to these new fungicides. For this reason IR-4 is funding a series of trials with as many species of *Pythium* as possible. This month we tested a variety of experimental products and others for prevention of *Pythium* root rot on poinsettia caused by *P. aphanidermatum*.

We started this trial by potting up poinsettia liners in 4 inch pots containing Fafard Mix 2B on 29 July. They were then treated on a 14 day interval four days

Effect of fungicide treatment on percent of healthy-appearing roots on Poinsettia. Rates are given in oz/100 gal.



later. Treatments were applied as drenches at the rate of about 2 oz/pot.

- Noninoculated control
- Inoculated control
- Disarm O—0.6 oz/100 gal (14 day interval)
- FenStop—14 oz/100 gal (once only)
- Heritage—0.9 oz/100 gal (once only)
- Pageant—12 oz/100 gal (14 day interval)
- Aliette—12.8 oz/100 gal (14 day interval)
- Segway—1.5 oz/100 gal (14 day interval)

We rated top grade and height every month but never saw any significant effect on the plant growth. At the end of the trial on 12 October we evaluated the rooting and presence of root rot. The root growth data are shown in the graph above. The numbers are the percentage of the surface of the potting medium with healthy appearing roots. We do this by inverting the plant and carefully removing the pot. We did not have statistically significant results but you can see that all fungicide treatments had more roots than the inoculated controls (49%). Heritage and Aliette were slightly better than the noninoculated controls.

We have found that failure to develop roots is one way to monitor root damage by *Pythium*, *Fusarium* and *Phytophthora*. In addition, the more common root rot symptoms may be present. Unfortunately, root rot was slight in this trial and not even found in all of the inoculated control plants. We noted which plants showed root rot and summarized this in the table below. The only treat-

Treatment	Percentage of Plants with Root Rot
Noninoculated	20
Inoculated	20
Disarm O	20
FenStop	60
Heritage	0
Pageant	20
Aliette	10
Segway	40

ment that showed no root rot at all was Heritage. In contrast, the FenStop treatment had 60% of the plants with very slight root rot.

Pythium Damping-off Prevention in Celosia

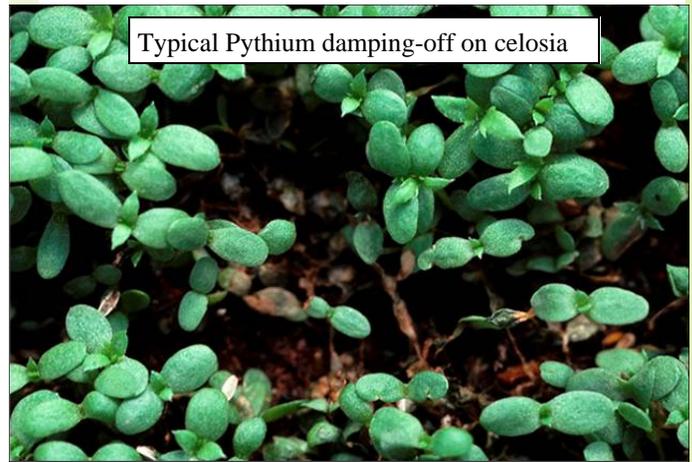
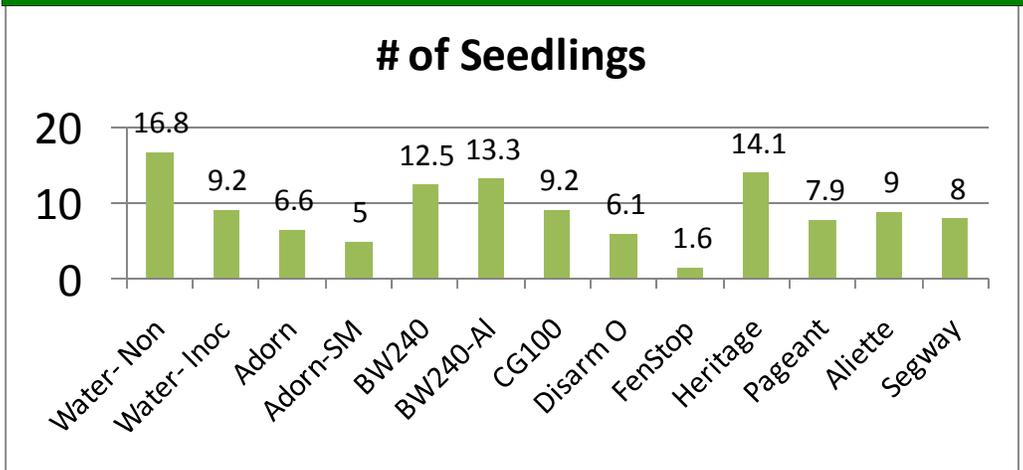
The same treatments we included in the Pythium root rot trial on poinsettia were used in two trials to prevent damping-off on celosia seeds. We did the first trial with *Pythium irregulare* and the second with *Pythium ultimum*. In each trial, we used Sunshine No. 1 potting medium in 3.5 inch pots. They were planted (0.05 g seeds/pot) and then treated with the fungicide one day later. We did include several other treatments in these two trials:

- Noninoculated control
- Inoculated control
- Adorn—2 oz/100 gal
- Adorn and Subdue MAXX—2 oz and 1 oz
- BW240—6 oz/100 gal (once only)
- BW240 and Aliette alternated—6 oz and 12.8 oz/100 gal
- CG100—0.6 pint/100 gal (once only)
- Disarm O—0.6 oz/100 gal (14 day interval)
- FenStop—14 oz/100 gal (once only)
- Heritage—0.9 oz/100 gal (once only)
- Pageant—12 oz/100 gal (14 day interval)
- Aliette—12.8 oz/100 gal (14 day interval)
- Segway—1.5 oz/100 gal (14 day interval)

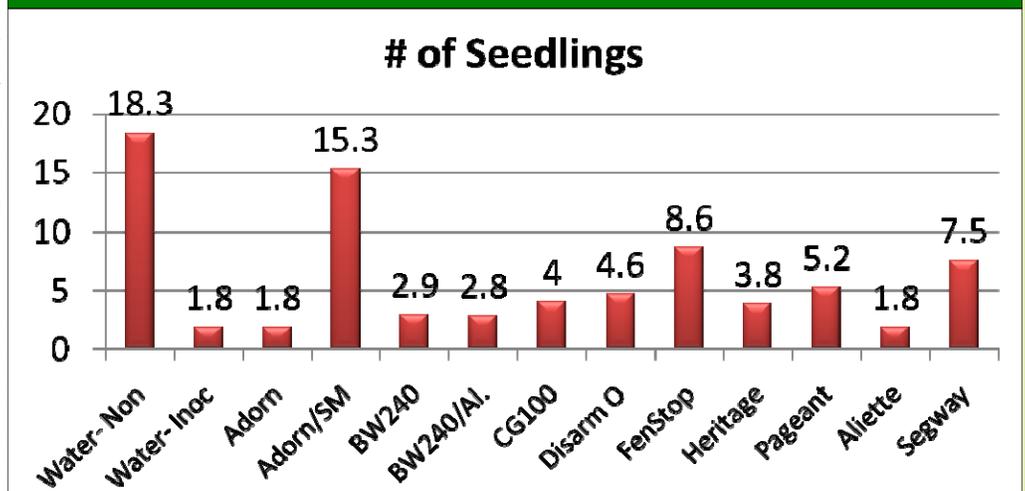
BW240 is a new biological control agent being researched by BioWorks. CG100 is another product included in the IR-4 research protocol. The drench/sprenc volume was set at 20 ml per pot to simply penetrate the level of early seedling growth. Pots were inoculated with the pathogen 5 days after original seeding.

For the *Pythium irregulare* trial—the first rating was made about 2 weeks after the original seeding date. I show the data in the graph at the top of the next column. At this rating, the best treatments were Heritage, BW240 alone and BW240 alternated with Aliette (at this rating date, the Aliette had not been applied). Unfortunately, by the end of the trial about a week later none of the fungicides were providing any prevention of the damping-off at all. The second trial was done with *P. ultimum*.

Effect of fungicides on damping-off on Celosia caused by *Pythium irregulare*.



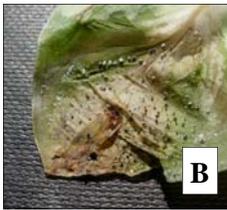
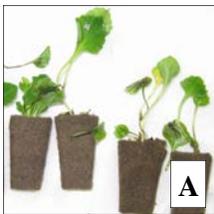
Effect of fungicides on damping-off on Celosia caused by *Pythium ultimum*.



The early rating (above) showed only the Adorn/Subdue MAXX treatment (due to the Subdue MAXX) provided any control of the damping-off. Under severe disease pressure nothing appears to work in Pythium damping-off.

Research Reports

Myrothecium Hosts—A new plant has been added to the long list of Myrothecium hosts—*Hydrangea macrophylla* (Garden Hydrangea) by researchers in Tennessee (Mmbaga, Li and Kim) (Plant Disease Note 94:1266). The pathogen is *Myrothecium roridum* which was first found causing petiole rot on pansies around 1900. The fungus causes leaf spots, fruit rot and stem rot on many crops. Myrothecium leaf spot is often thought to be a “wound” pathogen and not able to infect leaves or other tissues without a wound but I have not found this to be strictly true. The list below shows a partial list of plants often infected with this fungus. Many foliage plants and herbaceous perennials and potted flowering crops are susceptible.



- African violet
- Aglaonema
- Anthurium
- Basil
- Begonia
- Bird's next fern (*Asplenium*)
- Bougainvillea
- Bugleweed (*Ajuga*)
- Campanula (A)
- Cape primrose (*Streptocarpus*)
- Coneflower
- Dieffenbachia (B)
- Ficus
- Chrysanthemum
- Gardenia
- Gerber daisy
- Ginger
- Hydrangea
- Jasmine
- Lantana
- Larkspur
- Mandevilla
- Mint
- New Guinea Impatiens (C)
- Pansy
- Petunia
- Poinsettia
- Purple coneflower
- Salvia
- Snapdragon
- Spathiphyllum
- Staghorn fern
- Syngonium (D)
- Verbena

Myrothecium causes leaf spots on most of the plants listed but we routinely see stem rot on some plants in propagation (salvia and poinsettia for example). We also mainly see petiole rot on pansies, campanula and foliage plants like Spathiphyllum and syngonium when plants are small. Look for the black fruiting bodies usually on undersides of leaves. They are irregularly shaped and have a white fringe.

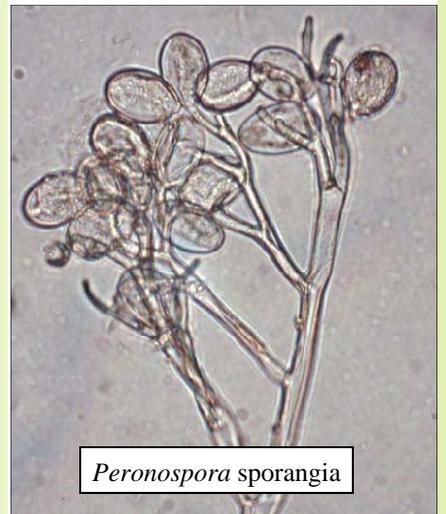
I also include a brief summary of fungicides for Myrothecium diseases. The most effective MOA groups are the strobilurins (11) which have a number of possibilities although in our trials, Heritage and Insignia have performed best. Medallion and Palladium (MOA 12) are also very effective. Terraguard and other MOA group 3 triazoles have been very good as has Daconil Ultrex (MOA M5). Be sure to alternate between two MOA

Fungicide	MOA	Efficacy
Banner MAXX	3	Good
Chipco 26019, Chipco 26GT	2	Very good
Cleary 3336, Fungo, OHP-6672	1	Some to very good
Compass O	11	Some to good
Cygnus	11	Good
Daconil Ultrex	M5	Very good to excellent
Eagle, Hoist, Systhane	3	Some to good
Heritage	11	Very good to excellent
Insignia	11	Very good to excellent
Medallion	12	Very good to excellent
Pageant	7 and 11	Some to excellent
Palladium	9 and 12	Very good to excellent
Terraguard	3	Very good

groups to minimize chances of resistance development.

Basil Downy Mildew Update—Downy mildew on basil (*Ocimum basilicum*) is caused by *Peronospora belharia* and was first reported in 2009 by University of Florida researchers, Roberts, Raid, Harmon, Jordan and Palmateer. In 2009, this new disease was reported from 17 (primarily Eastern States) and Canada. Outside of the East Coast and Mid-West only California reported this disease in 2009. The type of basil of concern has been the edible product although there is no reason not to assume the ornamental types are not also susceptible to this downy mildew.

In September, Wyenandt, Simon, McGrath and Ward reported on trials conducted in New Jersey with as many species and cultivars of basil as they could collect. They found that all *O. basilicum* cultivars were very susceptible to downy mildew while *O. americanum* and *Ocimum x citriodorum* were far less susceptible showing slight chlorosis and light sporulation only. The researchers suggest that breeding for resistance in basil to downy mildew may be possible. For the complete report see: HortScience 45(9):1416-1419.



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