Chase News

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Education for Horticulture

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INVASIVE PESTS

Last October, I attended the annual meeting of the California Assn. of Pest Control Advisors (CAPCA) in Reno, Nevada. The final talk was made by Bob Wynn, who is the Pierces Disease Statewide Coordinator at CDFA (California Department of Food and Agriculture). He gave a great overview of the invasive pests we face in California but considering the regulatory environment we are all in, I decided it would not hurt any of us to be reminded of this serious threat to our industry.

The biggest regulatory challenges faced are air travel and shipping. Los Angeles, Long Beach and Oakland are #1, 2 and 4 for incoming cargo in US. In 2003, control of pest entry was switched over to Homeland Security and at least some of us would like to see it returned to USDA-APHIS. International travelers on commercial airlines are a significant risk for introduction of quarantine pests. Vehicle and truck inspection on a 24-7 basis has very effective in stopping movement between states.

The biggest biological challenges include keeping pests out, finding new infestations, the lack of new tools (especially lures) and eradication (it is hard to use tools we still have because of public opinion).

Finally, funding remains a serious challenge since these public funds are limited and the complete lack of understanding of agriculture by the average citizen.

What Can You Do?

1. Alert the state when something is found
2. Prevent pests from spreading
3. Comply with regulations
4. Stay informed about pests
5. Keep current on pest management methods and approaches
6. Conduct outreach on keeping pests

Glassy Winged Sharp Shooter (GWSS) – GWSS is a very strong flier and transmits Pierce's Disease. A quarantine has been in effect 10 years and is described as very successful. GWSS has been found in Southern California since 1990. One of the most interesting approaches is breeding grapes that are resistance to Pierce's Disease.

Asian Citrus Psyllid – the insect that carries citrus greening disease was found in Florida 1997 and in 2005 the disease itself was detected. The disease takes 2-5 years for trees to show symptoms and it has resulted in losses of 200,000 acres of citrus so far. It has also been reported in Mexico in last 18 months. In California, the Asian citrus psyllid has been detected in Los Angeles, Orange, San Diego, Imperial and Ventura counties where eradication efforts have failed to date.

Light Brown Apple Moth This pest was found in 2007 in 16 counties in the San Francisco Bay area. Opposition to applying mating disruption pheromones has been a major problem and there are also legal efforts to get USDA to remove the quarantine of this pest. Unfortunately, it can and can infest over 2000 species of plants so will be very hard to stop from spreading.

Gypsy Moths (European and Asian) – These have been intercepted at border stations and ships (especially). They were discovered in Ojai in 2007. Since they only complete one life cycle per year, proof of eradication takes a number of years to accomplish but is at least feasible. Four sites were found in 2007 and 7 in 2008, with treatments (Bt) in March 2009.

CONTENTS

WOODY ORNAMENTAL FOCUS

AFFECT OF NITROGEN RATE ON CERCOSPORA LEAF SPOT ON CRAPE MYRTLE—Hagan, Akridge and Bowen (Auburn University) conducted a four year study on field-grown crape myrtle in Alabama. This disease causes leaf spots and defoliation which greatly reduces the desired fall color display of crape myrtle. Previous studies have shown that increasing levels of nitrogen resulted in reduced severity of Cercospora leaf spot on flowering dogwood, walnut anthracnose and a number of bacterial and leaf spot diseases on foliage plants.

Cercospora leaf spot on Crape myrtle

The current studies evaluated effects of nitrogen rate (from ammonium nitrate) on untreated trees as well as a set treated with Heritage (applied on a 14 day interval from May through July). Cercospora leaf spot (caused by *Cercospora lythracearum*) was not present in two of the years and only appeared at low levels in the third year. The researchers reported that powdery mildew was light in the years of the study and was not affected by nitrogen rate. Cercospora leaf spot was lower at higher rates of nitrogen.

Heritage application effectively suppressed disease regardless of nitrogen rate. The numbers in the table above show a cumulative disease severity rating for each year (numbers in the same column followed by a different letter are significantly different).

Regardless of Cercospora severity, nitrogen rate did not reduce tree growth. The researchers concluded that increasing nitrogen rate was less effective than Heritage in controlling Cercospora leaf spot. For the full report see: Plant Health Progress doi:10.1094/PHP-2009-1214-01-RS.

Effect of Heritage on severity of Cercospora leaf spot on Crape Myrtle

Treatment	2003	2004	2005
Untreated	3565 a	5115 a	1905 a
Heritage	275 b	1063 b	129 b

FUNGICIDE RESISTANCE IN *PHYTOPHTHORA CINNAMOMI*—Hu, Hong, Stromberg and Moorman reported on studies they conducted on mefenoxam (the active ingredient in Subdue MAXX) resistance in this common pathogen of woody ornamentals. They tested 65 isolates from a Virginia ornamental nursery and found varying levels of resistance to this fungicide based on lab testing. They followed up with a bioassay using lupine seedlings and found that Subdue MAXX was still effective in controlling disease regardless of the lab determination of resistance level of the *Phytophthora* isolate. This makes the use of lab testing for fungicide resistance (at least for Subdue MAXX) of questionable value in determining continued effective use on plants. For a complete report see: Plant Disease 94:39-44 (2009).

NEW FUSARIUM DISEASE ON PALMS IN FLORIDA—University of Florida researchers, Elliott et al. recently described a new Fusarium disease on queen palm (*Syagrus romanzoffiana*) and Mexican fan palm (*Washingtonia robusta*) that first appeared in 2004 in Florida. It has spread throughout the south of Florida in the past five years and results in a rapid decline and death (within 2-3 months of the first signs of disease). Initial symptoms include a one-sided wilt or death of fronds as well as a reddish-brown stripe on the petiole and rachis of the affected leaf. Browning of the vascular system is also present. There has been no evidence of trunk infection in this disease. A similar disease has been present in Southern California on Canary Island Date palm (*Phoenix canariensis*) for the past 30 years. The Fusarium wilt on Canary Island Date palms can take years to develop in California and has been shown to be transmitted via pruning saws. For a complete report see: Plant Disease 94:31-38 (2009).

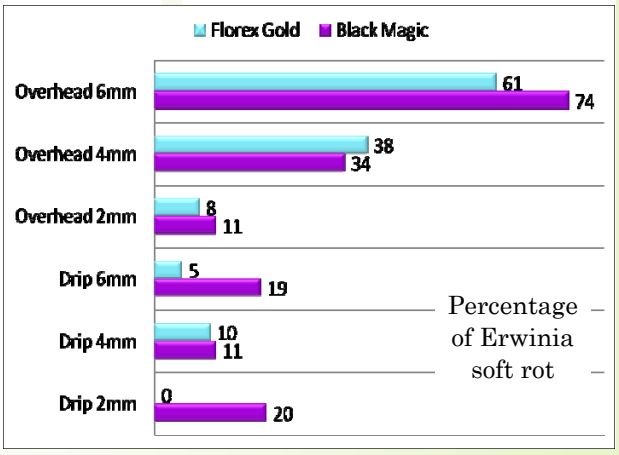
RECYCLED MUSHROOM COMPOST (MC) CONTROLS ARTILLERY FUNGUS IN THE LANDSCAPE– Artillery fungi are found in tropical plant production as well as landscapes throughout the southern states especially. The spores of the fungus detract from the aesthetic quality of the plant as well as attaching to buildings and cars. Fidanza and Davis (Penn State University) performed studies to evaluate the effect of composted mushroom compost on development of *Sphaerobolus*. They incorporated different amounts of MC into commercial landscape mulches. The data shown in the table summarizes the severity of artillery fungus infestation that resulted. The numbers are the area under the disease progress curve (AUDPC). Means followed by the same letter were not statistically different. These results indicate that levels as low as 20% can cut the severity of infestation by 50% and a rate of 40% mushroom compost was more than 80% effective. The researchers suggest that this may be due to beneficial organisms in the MC. For the report see—Journal of Environmental Horticulture 27(4):238-240 (2009).

Percentage of Mushroom Compost	AUDPC
0	12152 a
10	10566 a
20	6713 b
40	1927 c
100	166 c

TROPICALS AND FOLIAGE PLANTS

Erwinia Soft Rot on Calla Lilies—Ngamau, Mugai and Ng'ayu reported on research conducted in Kenya on the effect of irrigation and mulching on severity of Erwinia soft rot on Calla lily. Two cultivars were used ('Black Magic' and 'Florex Gold') and plants were irrigated by drip or overhead at three different rates. They included treatments of no mulch compared to sawdust or woodshavings as mulch. 'Black Magic' (purple bars) was more severely affected by Erwinia than the 'Florex Gold' (blue bars) and as would be expected overhead irrigation treatments had more disease than drip irrigated. Mulching did not affect disease severity but it did reduce flower number and quality. This research was reported in **Acta Horticulturae** (2008).

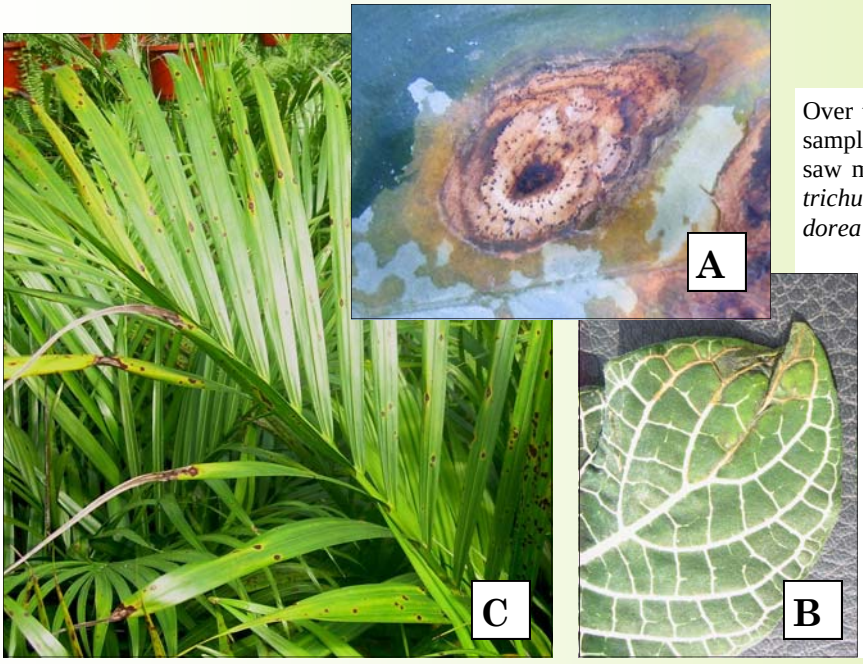
Irrigation method is more effective in reducing Erwinia soft rot than bactericides



Exserohilum Leaf Spot on Tiger Grass—Brunings et al. recently reported on a leaf spot on Tiger grass (*Thysanolena maxima*), a landscape grass grown throughout southern Florida. The disease was found in landscapes in south Florida and the Florida Keys as well as in commercial nurseries. The leaf spot was caused by *Exserohilum rostratum* which is a fungus closely related to *Helminthosporium, Bipolaris* and *Drechslera.* Symptoms appear as soon as 12 hours after infection and can result in extensive necrosis. Infected leaf tips turn light brown and curl with a yellow margin.

I worked on this group of leaf spots on palms and bromeliads when I worked for the University of Florida in the 1980s. Research on the effect of micronutrients on Exserohilum leaf spot on Areca palms showed a that the plant was sensitive to the minor elements themselves. Many fungicides used in the mid 80's contained some of the same minor elements (manganese, iron and copper) as nutritional sprays (like Fe Sequestrene) and both groups actually caused leaf spots that were indistinguishable from the fungal leaf spot without lab culturing. The overall result was that the fungicides, while effective, appeared to fail since more spots formed on treated plants.

Without specific testing on Tiger grass, I would avoid use of fungicides containing these minor elements to control Exserohilum leaf spot on this grass. The newer fungicides which should be very effective include those with chlorothalonil (like Daconil), strobilurins (like Compass O) and fludioxinil (Medallion).



DIAGNOSTICS

Over the past few months, we received quite a few samples of tropical plants in our diagnostic lab. We saw many cases of anthracnose caused by *Colletotrichum* (*Adenium, Aglaonema* (image A), *Chamaedorea elegans, Ficus elastica, Mandevilla*) as well as bacterial diseases like Xanthomonas on Fittonia (image B) and Pseudomonas on bougainvillea. One sample of Bipolaris leaf spot and blight on Areca palm (*Chrysalidocarpus*) (see image C) and pink on Kentia palm and Neanthe bella (*Chamaedorea elegans*) also came in. We found Thielaviopsis stem rot on Kentia palm and both Cylindrocladium root and petiole rot and Phytophthora root and crown rot on Spathiphyllum. With this growth in sample input in tropicals, we will be devoting more space in **Chase News** every month to tropicals including disease control information.

WHY DOES MY CROP HAVE PYTHIUM?

My first concern is always whether or not you have an accurate diagnosis. Without a current diagnosis, many growers guess what is wrong and the most common guess for any root loss is always Pythium. So—what does Pythium look like?

For most of us, Pythium causes root rot. But to tell the truth we have been seeing quite a variety of symptoms including sudden wilt, stem rot, black streaks on stems and even collapsed stem sections well above the potting medium level. Many of these symptoms are not accompanied by the typical root loss we all expect from *Pythium.* We also see yellowing of lower leaves, leaf drop, marginal leaf burning (see bamboo below)

and of course damping-off on seedlings. In some crops, aerial blighting can also occur with a very white cottony growth on stems and leaves (Pythium aerial blight on turf). The Alyssum seedlings below have typical damping-off symptoms.

Many other fungi and some bacteria also cause some or all of these symptoms including *Rhizoctonia, Fusarium, Phytophthora* and *Thielaviopsis.* A further complication is that in some cases, more than one fungus is involved in the disease.

When you are trying to discover the source or cause of a disease, it is critical to know how the pathogen gets around in our industry as well as the conditions that promote its development. The first step is to find out if it has been introduced into your nursery or greenhouse in some way.

> *"In my experience, Pythium root rot is usually a sign of a cultural problem"*

There are many, many, many different ways to get a Pythium problem. The most common means of introducing Pythium into a crop is through **used pots, flats** and on **contaminated benches**. We have seen Pythium carried from crop to crop when flats must be recycled without an effective cleaning and treatment program. Steaming or soaking with quaternary ammoniums are each very effective tools in disinfesting pots and trays. Make sure to clean any surfaces with water before using a disinfectant since they all work better on clean ones (no potting medium or plant debris) than dirty ones.

While it is also possible to bring Pythium in on contaminated plant material (we have seen it on plugs and cuttings at times), I don't think this is very common. I also think that even when Pythium is present, unless you create conditions that favor its development it will not become a noticeable problem. It is remarkably difficult to create Pythium root rot in our experiments even when we inoculate the plants.

If you are growing plants with **recycled water** (ebb and flood or otherwise), Pythium is one of the most likely diseases to be carried from one crop to the next. It is also possible that using ebb and flood systems inaccurately, can result in waterlogged roots that also promotes development of Pythium root rot. It is usually not effective to treat the water with a fungicide and can result in resistance to the fungicide quite rapidly. In contrast, treatment with chlorine, slow sand filtration and a few other methods can be very effective in reducing water contamination.

It is also quite rare to find pathogenic Pythium in un-used **potting medium**. We do find cases of Pythium in recycled (untreated) potting media for obvious reasons.

Not all Pythium isolates are plant pathogens and even when they are pathogens, they may not cause significant damage. The conditions that promote damage include:

- Over-watering
- Salt burn (fertilizer or water sources)
- Using poorly draining potting media
- Growing plants on the ground
- Using recycled water or potting medium
- Reusing pots or flats without cleaning and disinfesting
- Using infested bulbs, corms or rhizomes (we found Pythium in the Oxalis bulbs shown below)

Pythium is no more simple to diagnose, prevent or treat than any other plant disease. It all starts with you and your education. Make sure you know what the real problem is and consider changing some cultural aspects of producing a crop that seems to get Pythium a lot. Many diseases are best controlled with cultural changes. Remember even the best fungicides work better when other changes are made.

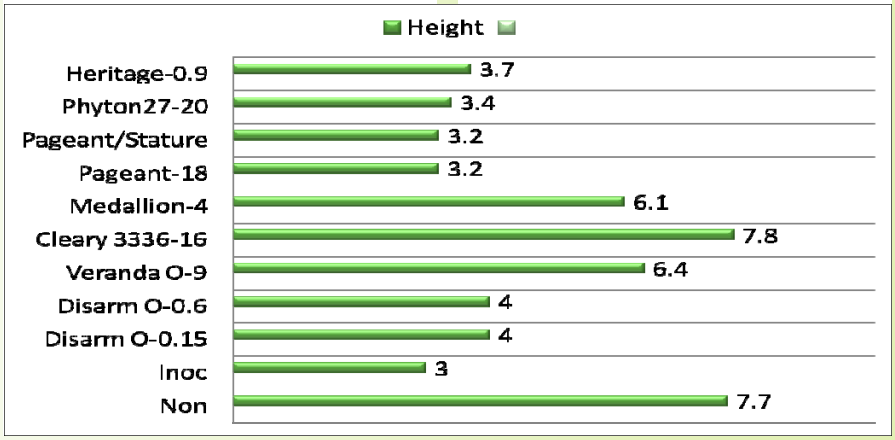
RESEARCH REVIEW

Black Root Rot on Pansy—Right before the holiday break we finalized our first trial in several years on black root rot. On 2 November, 2009 *Viola x wittrockiana* (pansy) 'Crown Scarlet' plugs were planted in 3.5 inch pots containing Fafard Mix 2B. The plants were fertilized with 1/2 tsp. Osmocote Plus 15-9 -12 (8-9 month) the same day. The test was conducted in a heated greenhouse with poly and shade cloth covering the top and sides. Plants were inoculated with a culture of *Thielaviopsis basicola* mixed with sterilized water by dipping the plugs into the inoculum before planting on 2 November, 2009. All treatments were applied as drenches at 35 ml (a little over 1 oz) per 3.5 inch pot as listed above on 3, 17 November and 1 December, 2009.

"Cleary's 3336 remains optimal for black root rot control on pansy"

After one month, top grade was highest for noninoculated controls, Veranda O and Cleary's 3336. Medallion was less effective but better than the inoculated controls. The other products did not give significant control of black root rot on pansy at this rating date. Final top grade was best for the noninoculated controls, 3336 and Veranda O. Medallion treated plants were significantly better than the inoculated controls but not as good as the previously mentioned products. None of the other fungicides gave any significant control of black root rot on pansy in this trial.

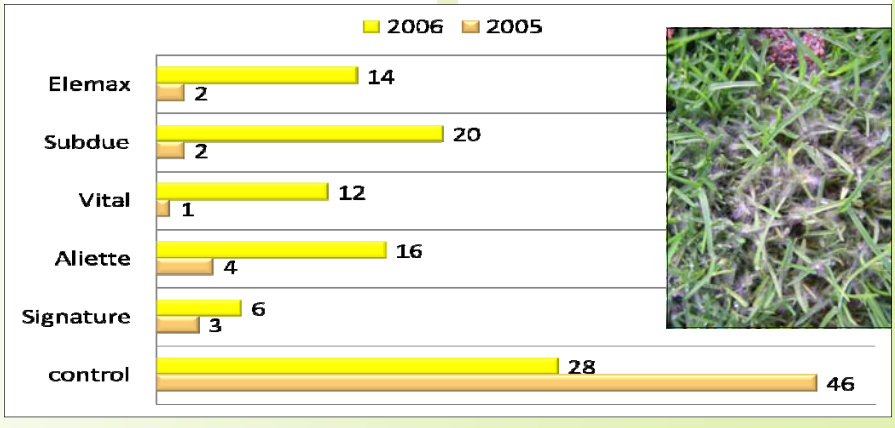
The final height data (in cm) from the 14th of December are shown in the graph below. They clearly demonstrate that the thiophanate methyl fungicide, Cleary 3336, was most effective in controlling stunting from black root rot. Veranda O and Medallion were somewhat less effective but still better than the other treatments. not as good. This test indicates that the most effective fungicides for black root rot on pansy continue to be thiophanate methyl products. Alternating a thiophanate methyl fungicide with either Medallion or Veranda O would be an effective resistance management program for this disease.



Pythium Blight Control on Turf Grass—I have been checking for more information on efficacy of products for Pythium on ornamentals and discovered reports on Pythium blight on turf grass. This disease is usually a problem on turf grown in warmer climates where summer rainfall is plentiful and is not the more typical root rot seen so often on ornamentals. Pythium root dysfunction (sounds like root rot) does occur in some climates during the winter (like Washington State).

McCall and Horvath (Applied Turfgrass Science—19 October, 2009) performed trials in Virginia using several phosphonates including Signature, Aliette, Vital and Elemax compared to an unsprayed control and chemical standard—Subdue MAXX. The graph below shows the results for two years. In 2005 (orange) disease was very effectively controlled with all four of the phosphonates as well as the Subdue MAXX. However, in 2006 (yellow), disease was slightly lower and the level of control achieved differed. In this year, the best treatment was Signature followed by Vital, Elemax and Aliette. Only the chemical standard, Subdue MAXX failed to give significant control in 2006.

These results indicate to me that I should consider recommending phosphonates for use on **Pythium aerial blight** on ornamentals. I also plan to conduct additional trials on the more typical Pythium root rot in the next year with a wide variety of phosphonates as well as newer chemicals and industry standards. Watch for results in coming issues.



FUNGICIDES ON THE HORIZON—Tourney and Trinity

I attended the IR-4 meeting in Cleveland last October and learned more about some of the new fungicides being developed for the ornamental industry. These included a couple of new DMI fungicides (mode of action grouping 3). Examples of this group that are currently labeled include Banner MAXX (propiconazole), Eagle (myclobutanil), Strike (tradimefon), Fungaflor TR (imazalil), Rubigan (fenarimol) and Terraguard (triflumizole).

The two new fungicides are Tourney 50WDG (metconazole) from Valent USA Corp. and Trinity (triticonazole) from BASF Corp. We started working on the active ingredient in Trinity in the late 1990's for Bayer (then Aventis) and have continued with BASF in the past few years. Our work with Tourney has been only during the past few years.

Tourney is labeled for use on turf grass diseases including brown patch (*Rhizoctonia*), dollar spot (*Sclerotinia*), anthracnose (*Colletotrichum*) gray leaf spot (*Pyricularia*) and rust. Trinity is also currently labeled for turf on the diseases listed above plus a few others including Drechslera leaf spot and algae. Both products appear to have been labeled for turf in 2008.

A summary of our work (and other research on ornamentals such as black spot on rose and apple scab) is presented in the table to the right. There is considerably more information available on other crops but the work on ornamentals is limited at present.

Powdery mildew on crape myrtle

As with most group 3 fungicides, efficacy is greatest on foliar diseases, especially powdery mildew and rust. We have been involved in testing Trinity on some soil-borne pathogens including Cylindrocladium and Fusarium with some effect. You can see that we have not compared these new fungicides directly in many cases. More testing in side by side trials for at least a few of the more unusual targets would be enlightening.

One of the side effects of some group 3 fungicides is growth regulation including stunting, thickening of the leaves, shortened internodes and dark green coloration. The degree of this effect is dependent on both the specific active ingredient and the crop. We see the most marked response with propiconazole which is NOT labeled for greenhouse crops. We have historically seen the lowest PGR effect with myclobutanil in our trials. Our experience with Trinity and Tourney do show some of this activity on some crops. Last year, we tested growth response of some woody crops with Tourney showing that it caused significant stunting on dogwood and rose (worse than Banner MAXX) but was safer than Banner MAXX on euonymus. Over the next year, IR-4 will fund phytotoxicity with Trinity and Tourney on a wide variety of crops to better understand which crops may be more sensitive than others.

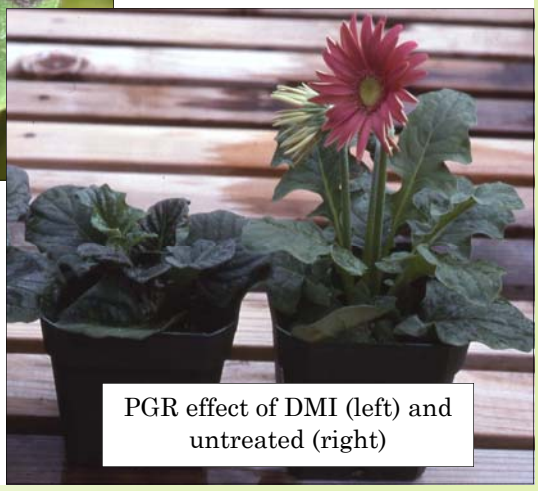
Efficacy of Trinity and Tourney on some ornamental diseases

Disease	Trinity	Tourney
Alternaria	Very good to excellent	
Apple scab		Very good to excellent
Black spot		Very good to excellent
Botrytis	Very good to excellent	
Cercospora		Very good to excellent
Colletotrichum	Some to very good	Very good to excellent
Cylindrocladium	Some	
Downy mildew		Some
Fusarium	Some to good	
Powdery mildew	Excellent	Excellent
Rhizoctonia	Very good to excellent	Very good to excellent
Rust	Excellent	

Alternaria leaf spot on Impatiens

In addition, I will be doing a review of all of the group 3 fungicides in an upcoming article for GMPro including a table of efficacy trials. This is part of a series we are doing this year on getting to know some important mode of action groupings.

Remember that these products are not currently labeled for ornamental use. The final label is the only source of information on the targets that these companies choose as both effective and safe.



PGR effect of DMI (left) and untreated (right)