



Last month, I attended the Society of Florist's Pest Management Conference in Los Angeles. I had a bad cold and found I could not sit in on many of the talks so I am more pleased than normal to have the proceedings from the meeting.

There were quite a number of talks on new pests including one by Margery Daughtrey (Cornell University Plant Pathologist). Margery highlighted downy mildew diseases of several plants including Coleus, Marguerite daisy and Impatiens. Margery gave host ranges for two of these downy mildew.

A partial host list for two species of *Peronospora*

<i>P. lamii</i>	<i>P. radii</i>
<i>Coleus</i>	<i>Achillea</i>
<i>Lamium</i>	<i>Anthemis</i>
<i>Mentha</i>	<i>Argyranthemum</i>
<i>Plectranthus</i>	<i>Chrysanthemum</i>
<i>Rabdosia</i>	<i>Dendranthema</i>
<i>Salvia</i>	<i>Leucanthemum</i>
<i>Stachys</i>	<i>Matricaria</i>

Margery also mentioned finding *Cercospora* leaf spot on *Molucella laevis* (Bells-of-Ireland) in New York last year. The disease has been found in California since 2000. We have been busy doing a few small trials on it as well (see p. 3).

Dr. Mary Hausbeck (Michigan State University Plant Pathologist) gave an overview of stem and root rot diseases including Phytophthora, Pythium, black root rot and Rhizoctonia. Mary presented results of a fungicide trial on Phytophthora stem rot on snapdragon with a large number of unregistered products. The best control with a registered product was seen with Biophos (1%) or Stature M (6.4 oz/100 gal). Two of the unregistered products appear to be good candidates for control of this devastating disease.

Steve Tjosvold (University of California Farm Advisor) gave an excellent review of Sudden Oak Death or Ramorum Blight. Steve has been conducting many trials on the nursery phase of this disease. He has been testing methods of spread, effects of the environmental and fungicides for control.

Margery came back later in the day with a talk on Botrytis. She gave a listing of the most sensitive crops to *Botrytis cinerea* as well as other species including *B. tulipae*, *B. elliptica* and *B. paeoniae*. (see p. 2). She then reviewed diagnosis, cultural controls, chemical control,

and biological control. Humidity management tips are listed below.

- Don't generate puddles.
- Don't irrigate until necessary.
- Use drip-tubes rather than overhead irrigation or sub-irrigation via ebb/flood tables.
- Don't irrigate late in the day.
- Anticipate weather changes to schedule irrigations.
- Remove water vapor when RH is too high by heating slightly before venting.
- Focus on humidity management 30-60 minutes before and after sunrise and sunset.

Shelton, Scott. 2005. Sweating high humidity. Greenhouse Product News 15:30-36.

Mary's second talk presented information on downy and powdery mildews. For downy mildew she made the following recommendations:

- Don't forget to look under the leaves.
- Look for the disease.
- Keep the production area clean.
- Limit wet leaves.
- Apply fungicides preventatively/rotate.

Dr. Hausbeck presented results of several fungicide trials for powdery mildew control on verbena and gerbera. Excellent control was seen with quinoxifen (Quintec) and boscalid (BAS510) which are unregistered at this time as well as industry standards Eagle and Terraguard. Best curative control was seen with Eagle in her trials. She also gave a listing of "resistant" verbena cultivars (see p. 2.)

Watch for a review of the insect and mite talks from this great meeting next month in *Chase News*.

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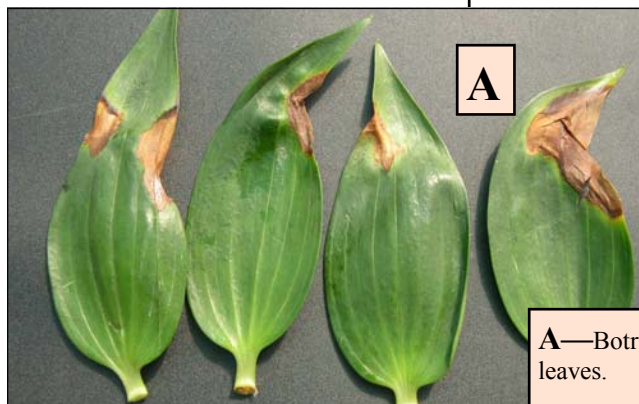
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Watch Out for Botrytis!

We all know it is winter and that Botrytis is a serious problem especially during the winter. But have you inspected your plants lately for Botrytis infections? Some of the nicest looking plug flats are hiding an awful infection in their under story. I know plug flats probably do not have a real under story but you must consider that under the top layer of leaves, the conditions are ideal for Botrytis to run rampant (B).

Sometimes, nutrients or fungicides can cause slight damage that becomes perfect starting sites for Botrytis infections (A). Checking the centers of cut flower and cut foliage beds is also advisable since At other times, cold can damage rapidly growing tissues like the buds on the peonies (D) and Botrytis will colonize them. Botrytis might not have started the problem but it will certainly finish the problem and kill the plant if not stopped with cultural and chemical controls.

Remember that if you don't find the disease or fail to obtain an accurate diagnosis you will not be able to control losses. Right now, Botrytis is a common problem and not always easy to recognize. Get help if needed from a diagnostic lab.



A

A—Botrytis leaf spot on lily leaves.



B

B—Botrytis infection in Petunia plug under story.

C—Botrytis lesions on Ruscus petioles looks a lot like Rhizoctonia.

D—Botrytis bud blight on Peony.



C



D

Some Hosts of Botrytis species—Daughtrey

Botrytis cinerea

anemone, bacopa, cyclamen, dahlia, exacum, fuschia, geranium, gerbera, lily, lisianthus, marigold, mum, peony, petunia, poinsettia, rose, snapdragon, tulip, vinca and zinnia

Botrytis elliptica

Colchicum, Erythonium, Gladiolus, Lilium, Polianthes

Botrytis paeoniae

Convallaria, Paeonia

Botrytis tulipae

tulip

Verbena cultivars with less than 25% powdery mildew infection—Hausbeck

Aztec Peach

Bablyon Blue

Escapade Bright Eye

Fuego Apricot

Lascar Hot Rose

Lascar Violet

Napoleon Purple

Napoleon Red

Quartz Blue

Quartz Burgundy with eye

Quartz Magenta

Quartz Red with eye

Quartz White

Sparkler Deep Blue/white

Sparkler Purple/white

Sparkler Red/white

Sparkler Sky Blue/red

Sparkler Violet/white

Tapien Pink

Temaria Burgundy Improved

Wildfire Lavender Pink

Cercospora Leaf Spot on Molucella

A few years ago, Dr. Steve Koike (University of California) described *Cercospora* leaf spot on the cut flower crop, *Molucella* (Bells of Ireland). The spots are large (up to 1/2 inch wide) and are really obvious in the centers of beds where conditions are often wet. I saw the disease a couple of times but could not isolate the pathogen. Then a couple of months ago I visited a cut flower grower and collected a sample and this time I was able to isolate *Cercospora* sp.. A week or so later we received a sample of plugs with a similar leaf spot and found the same *Cercospora* causing leaf spot and blight.

So I started wondering if the fungus is seed borne and also what the best fungicide might be for control. The first question was remarkably easy to answer. We checked two different batches of *Molucella* seed and found a very high degree of contamination with *Cercospora* in both lots.

We started a fungicide trial by treating the plants once before inoculating. We were surprised to find that even the non-



inoculated controls had leaf spots within a week or so. Fungicides were applied twice on a 10-day interval. We rated disease twice to see what the fungicide could do in eradication. It turned out that once infected, only 3336 could stop spots from forming. All other products (listed in the table) were ineffective.

Once the spots started from our inoculation, we rated them one final time to check what they were able to do in prevention (Table to the right). In this case, all fungicides were 100% effective with the excep-

tion of Chipco 26019.

In a situation where some *Cercospora* leaf spot is present, one could treat with 3336 (or another thiophanate methyl) first to eradicate the disease and follow-up with one of the others for prevention.

Fungicide	Rate/100 gal	Degree of disease control
Chipco 26019	16 oz	Some
Eagle 40WP	4 oz	Excellent
Daconil Ultrex	1.4 lb	Excellent
Compass O	2 oz	Excellent
Protect T&O	16 oz	Excellent
Medallion	2 oz	Excellent
Phyton 27	25 oz	Excellent
3336	16 oz	Excellent

Mycocentrospora Leaf Spot on Pansy

I recently found a very old fungal leaf spot—*Mycocentrospora* leaf spot—on pansy. I was touring a local box store and found a six pack of mixed pansies with some leaf spots. I thought I was looking at anthracnose but it turned out to be *Mycocentrospora* (this used to be called *Centrospora acerina*). I first saw this disease in a landscape near Berkeley, CA in 1978 while I was a graduate student. I was excited to find this disease again and we set about doing a trial in the lab and one in the greenhouse to see what fungicides would work best to control this disease.

The lab trial showed best control with Chipco 26019 (16 oz/100 gal), Terraguard (8 oz/100 gal) and Medallion (4 oz/100 gal). Each of these fungicides were 100% effective in stopping growth in Petri dishes. Phyton 27 was next best at 25 oz/100 gal followed by Heritage (4 oz/100 gal). Daconil Ultrex (1.4 lb/100 gal) and 3336 (16 oz/100 gal) were less than 50% effective in this lab test. Lab test don't always translate into real

world control so we followed up with a greenhouse trial and got some unexpected results.

In this case, pansies were sprayed three times on a weekly interval and were inoculated a few days after the first fungicide application. In a more natural setting, the most effective fungicides were Compass O and Insignia (Table below) both strobilurins. Heritage is the most systemic of the three strobilurins we included and apparently that is not desirable for control of this leaf spot. The difference between the two formulations of iprodione (Chipco 26019 and 26GT) was also unexpected since the WP gave very



Fungicide	Rate/100 gal	Degree of disease control
Medallion	2 oz	Good
Chipco 26019	16 oz	Very good
Chipco 26GT	32 oz	Poor
Daconil Ultrex	1.4 lb	Good
Compass O	2 oz	Excellent
Heritage	2 oz	Good
Insignia	5 oz	Excellent

good control while the flowable was poor. Finally, the rate of Medallion may be critical since 4 oz/100 gal in the lab was excellent while 2 oz in the greenhouse was only good.

The final word on this story is that once I started looking for the disease I began finding it in landscapes around Sacramento too. Just because we are not looking for something does not mean it is not out there happening anyway!

Mycorrhizal Products in Review— A. R. Chase and Su Harris

Mycorrhizae fungi (MF) were first discovered in 1923 and their role was first understood in 1943. There are two types of MF—endotropic (also called VAM) where they live in the host roots and ectotropic where the fungi form a covering over the roots (especially common in forest plants).

MF improve plant uptake of nutrients, especially phosphorus. MF may use surplus carbohydrates, secrete antibiotics, favor development of beneficial organisms around roots and create biochemical changes in plant roots. Plants colonized by these fungi are less sensitive to water and temperature stress due to the improved root system they help create. Over 90% of all plants have a mycorrhizal fungus symbiosis in their natural environment. When natural soil is sterilized MF are killed and subsequent plantings can show nutrient deficiencies.

Over the past five years I have been interested to see publication of a number of studies on efficacy of mycorrhizal products on ornamentals under production or in the landscape. We present here a summary of these six pieces of research.

In 2000, Davies et al. presented research on efficacy of Mycorise (Premier-Tech, Quebec, Canada) on *Nandina*, *Loropetalum*, *Salvia* and *Photinia*. The commercial preparation of *Glomus intraradices* enhances growth of *Nandina* only. This study did prove that MF can survive in commercial nursery containers.

A 2003 study by Carpio et al. tested EndoNet, Mycorise and BioterraPLUS for *Acacia*, *Chilopsis*, *Diospyros*, *Platanus*, *Ipomoea* and *Plumbago* growth in container sand survivability in the landscape. These MF were able to colonize roots of some crops in the container. In the landscape, MF treatment was generally not

beneficial since plants were irrigated regularly and nearly all established well.

Corkidi et al. reported on 10 different MF inoculants ability to colonize corn plants in commercial potting media. They found a range of 0-50% colonization but none of the treatments resulted in improved growth of the corn. Some of the products established best in Sunshine No. 5, while others established best in a nursery mix and still another was best in a soil-based medium. The clear interaction between the specific MF inoculant and the potting medium makes choice critical and difficult to predict. In a subsequent study, the same authors found that Earth Roots, MycoApply and VAM80 were effective on *Liquidambar* (Sweet gum). The authors recommend testing infectivity as well as plant growth response for successful use of MF.

Finally, in 2005, Abbey and Rathier reported on a variety of non-traditional means to improve establishment of four ornamentals in the landscape. The plants were Japanese holly, arborvitae, Japanese spirea and Bradford Callery pear cultivars. They found that routine application of a pine mulch was as effective as MF, transplant gels (to retain water in the root zone) and biostimulants.

This research ends up asking more questions than it answers which is unfortunately, all too common. The interaction between specific MF products, each crop and the potting medium is critical and can spell the difference between success and failure. Most often a blend of MF is recommended to make the chance of a viable combination more likely. If you are interested in using MF in your nursery it is a good idea to enlist the help of a lab to check infectivity of the product before investing in large adoption of this interesting biology.

Some References

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