

Chase News



Volume 9—Issue 2
February 2010

VIDEOS AVAILABLE FROM CHASE HORTICULTURAL RESEARCH ONLINE

We are pleased to announce that a dozen new videos are now available in our On-line store!

We have had very good response to our PowerPoint summaries of some critical disease topics on ornamentals. We decided to record videos of some of the most popular as well as others. Updated information was used whenever possible and they are available for purchase and direct download in our Online store www.chasehorticulturalresearch.com.



From the homepage, just go to **What's New** and then to the **Informational Videos** page. OR you can go directly to our On-line store and click on the video link. They can be downloaded directly which takes 2-5 minutes depending on your internet server and area. For some of us, however, the best choice is to order the DVD of that video which will be sent out promptly. In order to download you must have a video application on your

computer (Windows Media Player, QuickTime etc.). Prices of individual videos are from \$14.99 to \$29.99.

The best way to learn about diseases and their control is often to attend meetings. Sometimes educational meetings are not scheduled in your area or at a time you can attend. Our videos are an affordable alternative to attending costly meetings and can serve as a training tool for both new and experienced employees. They aid your ability to schedule training at your convenience and can be rescheduled as needed. Most videos run from 15-20 minutes and are information-packed with color images and the most up to date research results from Chase Horticultural Research.

CHASE BASE

We have also completed the most recent update of **Chase Base**—our online resource for product trials on ornamental diseases. We have added 60 new reports including most of those completed as of February 2009 bringing our total to over 330 reports.

There are several reports of field trials conducted on

VIDEO TOPICS AVAILABLE

1. Bacterial Diseases
2. Biological Products for Ornamentals
3. Botrytis Blight
4. Diagnosis of Common Ornamental Diseases
5. Downy Mildews
6. Post-harvest Disease Concerns
7. Powdery Mildew
8. Quarantines and Rust Diseases on Ornamentals
9. Rhizoctonia Review
10. Rust Diseases on Ornamentals and Their Control
11. Sanitation in the Greenhouse

roses and cut flower crops like *Alstroemeria*. There are also several trials on post-harvest control of Botrytis on cut flowers. This is a great way to be able to check trials conducted on a specific fungicide, a troublesome disease and even a new crop for you.

The introductory membership cost is only \$99 for the first year. This allows unlimited access to all reports for the entire year. You can even print the report summaries out if you prefer.

CONTENTS

TOPIC	Pg
Woody Ornamental Focus	2
Tropicals and Foliage Plants	3
Perennials	3
What Fungicides Work on Fusarium?	4
Research Review	5
Non-parasitic Problems	6

WOODY ORNAMENTAL FOCUS

Botryosphaeria canker and die-back—This disease occurs on a number of woody ornamentals, trees and vines. The major pathogen involved is *Botryosphaeria dothidea*. Fungicide research has been done on a variety of crops including pistachio, blueberry and *Protea*.

Von Broembsen and Van der Merwe reported on efficacy of three fungicides (benomyl, captan and mancozeb) over 20 years ago in South Africa. Benomyl and captan were both somewhat effective in field trials when sprayed monthly in combination with some insecticides. Their results indicated that cankers were associated with insect wounds. However, the trial showed that the single best control method was regular removal and destruction of dead and dying plant parts. They suggest that fungicides applied after pruning and harvesting in cut

sprays and sanitation would be needed the majority of the year.

On pistachio, *Botryosphaeria* causes panicle and shoot blight. Ten years ago, Holtz et al., reported on the effect of azoxystrobin, benomyl, tebuconazole and copper as well as pruning in controlling the disease on California pistachio trees. Their work showed that the combination of fungicide and pruning was most effective. The fungicides were

“Pruning and fungicide applications are the key to controlling Botryosphaeria on woody plants”

used in rotation and relative comparisons were not made. FYI—benomyl is no longer registered on any ornamental in the US and tebuconazole has not been registered on ornamental production yet.

Efficacy of fungicides on Botryosphaeria stem blight on blueberry		
Fungicide active ingredient	Fungicide trade name	Degree of control
Azoxystrobin	Heritage	Some to good
Captan	Captan	None
Cyprodinil and fludioxinil	Palladium (not registered yet)	Some to very good
Fenhexamid	Decree	None to good
Pyraclostrobin and boscalid	Pageant	Some to very good
Pyraclostrobin	Insignia	Some

flower woody crops like *Protea* as well as sanitation would be effective in managing *Botryosphaeria* canker. Studies of environmental conditions showed that spores were released most when temperatures were 20-25 C. This indicates that in some growing areas, fungicide

Most recently, Smith reported on cultivar susceptibility and chemical treatments for control of *Botryosphaeria* stem blight on Southern blueberries. Best control was seen with the combination of cyprodinil and fludioxinil (Palladium—not registered to date for ornamentals) and pyraclostrobin and boscalid (Pageant). Heritage, Insignia and Decree were somewhat effective.

Overall—the keys to controlling this serious and widespread disease appear to be use of sanitation with special care to regular removal and destruction of diseased materials combined with use of effective fungicides. The most effective fungicides tested so far appear to be Pageant and Palladium (after registration).

Tolerance of some roses to leaf spot—Mynes, Windham and Windham reported on work performed in Tennessee and Oklahoma on “no spray roses” including Knock-outs. They planted a wide variety in the landscape and monitored them for resistance to a leaf spots including black spot and *Cercospora*. Roses that were resistant (R) or moderately resistant (MR) to

black spot and *Cercospora* are listed as well as tolerant (T). They judged roses tolerant if they continued to bloom well all summer despite development of disease and even some defoliation.

Rose cultivar	Disease reaction	Type of rose
About Face	T	Grandiflora
Bellinda’s Dream	T	Shrub
Bonica	T	Shrub
Carefree Delight	T	Shrub
Carefree Sunshine	MR	Shrub
Crystal Fairy	T	Shrub
Fairy Queen	T	Shrub
Fiesta	MR	Shrub
Golden Eye	R	Shrub
Hansa	R	Shrub
Homerun	MR	Shrub
Knock-out Rose	R	Shrub
Lovely Fairy	T	Shrub
My Girl	R	Shrub
My Hero	MR	Shrub
Palmengarten Frankfurt	MR	Shrub
Pink Knock-out	R	Shrub
Snowcone	T	Shrub
Super Hero	MR	Shrub
White Dawn Cl.	R	Climber
Wild Spice	MR	Shrub
Wild Thing	MR	Shrub
Wildberry Breeze	R	Shrub

TROPICALS AND FOLIAGE PLANTS

Identifying problems based on symptom alone is a difficult job that often leads to the wrong conclusion. If you don't guess correctly what causes a disease, then the chances of you applying the



A—Spathiphyllum (top) and Mandevilla (bottom)



B— Philodendron (top) and Sansevieria (bottom)



right control methods (cultural and chemical) are very poor. Last month we received a number of samples of tropical plants with leaf spots. I worked on these plants for many years but at least half of the samples were unknown to me. As always, we cultured from the samples to make the diagnosis.

“If you don't guess correctly what causes a disease, then the chances of you applying the right control methods ... are very poor.”

So I present you with a little quiz. Each pair of images represent the same disease on different crops. Can you guess which one is which? The choices are *Fusarium*, *Colletotrichum* and *Cercospora*. Are the two images in any of the sets similar looking enough that you would guess they are the same pathogen? The Spathiphyllum leaf spot looked like what we isolated but the Mandevilla leaf spot was unexpected.

Can you tell the difference between the two leaf spots on the philodendrons? The Sansevieria leaf spot is an old favorite of mine from the tropics but the same fungus on the philodendron was a new one on me.

Bottom line—DO NOT GUESS!!! (answers at bottom of page 6)



C— Dracaena (top) and Philodendron (bottom)



PERENNIALS

We often perform trials on diseased plants that we run across. In the past 2-3 months we had a couple of opportunities. The first trial was eradication of downy mildew (*Peronospora parasitica*) on flowering kale and the second was eradication of powdery mildew on strawberry 'Pretty in Pink'.

The strawberry trial was run in December of 2009 using plugs planted in 3.5 inch pots containing Fafard Mix 3B. Plants were sprayed on a weekly interval (or less) up to three times. The exact treatments are shown in the table below.

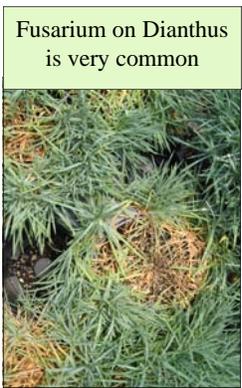
Treatment	Rate/100 gal	No. powdery mildew spots
Water	—	4.1 b
Hoist 40WP weekly	3 oz	0 a
Hoist 40WP every other week	3 oz	1.2 a
Hoist 40WP Once	3 oz	1.2 a
Phyton 27 Weekly	20 oz	0.4 a
Phyton 27 every other week	20 oz	1.8 a
Phyton 27 once	20 oz	0.8 a

The test showed that weekly use of either Hoist or Phyton 27 was a little more effective than less often but that even a single application was very effective.

The test on downy mildew eradication on kale employed the following treatment: water, Segway (3 oz/100 gal), Adorn (2 oz/100 gal) and FenStop (7 oz/100 gal). A single application showed that only the Segway significantly reduced disease. The plants were in poor shape by the end of the trial and additional data did not show anything meaningful. Apparently, kale liners infected with downy mildew can be killed due to lack of viable leaves.

WHAT FUNGICIDES WORK ON FUSARIUM?

Fusarium diseases have been serious problems in ornamental production for many years. The early failure of available fungicides to achieve a high level of control led to exploration and development of alternative methods including clean stock production through tissue



Fusarium on Dianthus is very common

culture, soil steaming and fumigation, resistant cultivars, nutritional management and biological control. Fusarium diseases on ornamentals remain some of the most difficult to control with fungicides.

Cyclamen wilt is caused by *F. oxysporum* f. sp. *cyclaminis*. Trials performed over the past 10 years in California have consistently shown optimal control with preventative treatments of strobilurins (Heritage, Insignia, Pageant and Compass O), sterol inhibitors (Hoist, Terraguard and Trinity) and Medallion. Thiophanate methyl (3336) has provided a lesser degree of control with very little reproducible control achieved with phosphonates (Aliette and Fosphite).

Lisianthus (*Eustoma grandiflora*) is affected by a number of *Fusarium* species including *F. oxysporum*, *F. solani* and *F. avenaceum*. Fungicide trials reported on the wilt disease showed the best results occurred with Medallion applied as a drench once prior to inoculation. Products that were not effective included Heritage and Compass O. In other trials, fungicides were applied once before inoculation and once after three weeks as drenches. Optimal control was achieved with Terraguard and once again Medallion with thiophanate methyl, Hoist=Eagle and Heritage giving significant but less effective control.

Similarly, trials on *Fusarium avenaceum* in California showed a very high level of control with Heritage and Compass O while Medallion was the best treatment (100% effective in crown rot prevention).

Integration of chemical fungicides with other types of products has also been extensively tested. Using biologicals following fungicides in various combinations has resulted in significant decreases in disease development. Medallion paired with various biologicals has given the best results.

Fusarium corm rot on gladiolus is caused by the wilt fungus *Fusarium oxysporum* f. sp. *gladioli*. Gladiolus producers routinely prepare corms with a hot fungicide treatment immediately prior to planting which combines the two methods for greatest effects. Unfortunately, the difference in sensitivity of some cultivars to the heat makes use of this method somewhat difficult.



Fusarium corm rot on gladiolus

Elmer (Connecticut Experiment Station) has reported on a series of trials testing dips on this gladiolus disease. No improvement in plant growth or reduction in the percentage of corms infected with *F. oxysporum* when treated with a corm dip (Medallion or carbendazim) followed by a soil treatment one week after planting (Heritage, Daconil or Compass O) were reported. Thiophanate methyl, Heritage, Medallion or Terraguard used first as a corm soak and later as a soil treatment were also ineffective. A trial evaluating benefits of combining the same active ingredients with acibenzolar-S-methyl (Actigard, a systemic acquired resistance material – SAR) showed best overall results with the combination of Terraguard and Actigard. Unfortunately, Actigard caused phytotoxicity in these trials which sometimes resulted in increased disease perhaps due to stress making it easier for the Fusarium to progress rapidly.

Similar trials have been conducted on Caladium for chalk rot control. This

Fusarium disease is caused by *Fusarium solani* and results in tuber rot and plant death. Fungicide drenches were evaluated in the early 2000's by McGovern and others at the University of Florida. Optimal control was found with combinations of Daconil with either Medallion or Heritage compared to these active ingredients applied singly. The high degree of efficacy of contact fungicides like Daconil and Medallion indicates that in propagule rot as opposed to wilt Fusaria, a systemic product is not critical and the benefit of using a contact and systemic fungicide in a tank mix may be synergistic. Unfortunately, even the best fungicides were only 64% effective in one year and 20% effective in another.

Researchers at the University of Torino, Italy evaluated three strobilurins for efficacy in three Fusarium wilts of ornamentals (Lodovica Guillono et al., 2002). The trials evaluated Heritage, Cygnus and Compass O on Fusarium wilt of *Argyranthemum frutescens* (Paris daisy), cyclamen and carnation. Heritage provided effective and safe control of Fusarium wilt on each crop while Compass O was effective only on carnation. Cygnus was also effective on carnation but failed to control Fusarium wilt and/or caused phytotoxicity on cyclamen and Paris daisy. Of these strobilurins, only the Heritage is upwardly systemic perhaps conferring optimal results on these Fusarium wilt diseases.

Conclusions

The body of literature is small with respect to fungicide control of Fusarium diseases ornamentals. Optimal products include strobilurins, sterol inhibitors, phenylpyrrole (Medallion) and benzimidazoles (like 3336). The exact MOA group or even active ingredient that works best on a particular disease differs. Unfortunately, optimal control is often less than commercially satisfactory and continued use of resistant cultivars, soil treatments and biological agents will be required to control losses due to Fusarium diseases on ornamentals.

“Fusarium diseases on ornamentals are some of the most difficult to control with fungicides”

RESEARCH REVIEW

Botrytis eradication on Gerber daisy—We started a trial on 5 January using Gerber daisy ‘Golden Yellow with Dark Eye’ plants (3.5 inch pots) that had developed some Botrytis over the holiday break. We spaced out the plants in order to spray them and disease was immediately less severe simply due to the improved air movement.

We treated plants on a 7-10 day interval three times, evaluating disease severity once a week. The severity ratings are shown in the table below. We saw the best reduction of Botrytis with Pageant, Chipco 26019 or Medallion. Neither of

Eradication of Botrytis on Gerber Daisy		
Treatment	Rate/100 gal	Disease severity
Water	—	1.5 ab
Medallion	1 oz	1.2 a
X3	10 oz	1.5 ab
ZeroTol	42.5 oz	1.5 ab
Pageant	12 oz	1.1 a
Chipco 26019	16 oz	1.2 a
Experimental	—	2.1 b

Numbers followed by the same letter are not significantly different.

the hydrogen peroxide-based products gave control (X3 and ZeroTol) and the experimental product actually caused phytotoxicity that resulted in more severe Botrytis. Prevention is always more effective than eradication. This trial also showed me once again, that spacing plants out to facilitate drying did more to reduce Botrytis than even the best fungicides.

Evaluation of 3336 rates for prevention of Rhizoctonia damping-off on Celosia seedlings—We often are asked to perform trials using methods that are different than our standard. We have been experimenting with lower inoculum levels of Rhizoctonia damping

-off on celosia as well as product timing. This test evaluated 10% our usual inoculum concentration and products were applied after seeds had emerged instead of right after sowing. We tested 3336 at four rates (4, 8, 12 and 16 oz/100 gal) compared to Medallion (0.5 oz/100 gal). The products were applied on 13 and 20 January after seeding on 7 January. We counted emergence several times and the graph shows the final results. All rates of 3336 and Medallion at 0.5 oz/100 gal were effective in preventing Rhizoctonia damping-off. Even at the lower rate of inoculum, the disease destroyed 90% of the seedlings. In the same trial we included RootShield HC (4 oz/100 gal) which proved ineffective in controlling this disease (data not shown).

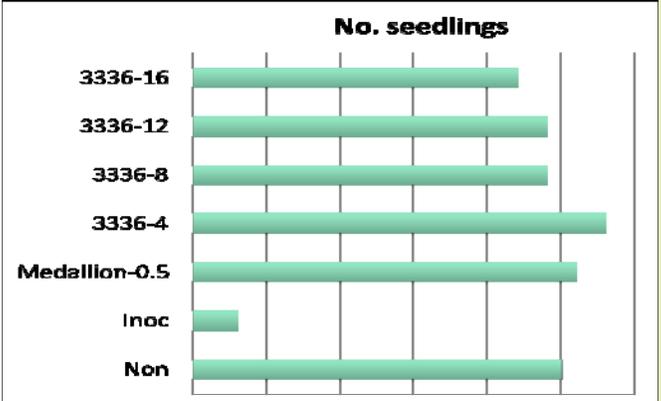
Anthracnose prevention on Cyclamen—Cyclamen anthracnose caused by *Colletotrichum* spp. remains a concern in production of this crop. We had an experimental fungicide to test as well as Disarm 480SC O (new strobilurin from OHP) and a combination of Cease and MilStop. The fungicides were applied on a 7-14 day interval starting in November last year. We applied them a total of six times and inoculated twice. The rates of products tested are shown in the table (right).



The disease was rated a few days after the final fungicide treatment as the number of spots per plant.

All treatments resulted in significant disease prevention with Pageant and the highest rate of the experimental fungicide providing the best control. Disarm

Control of Rhizoctonia damping-off on Celosia



O provided very good control as well, especially at the 4 oz/100 gal rate. Pageant contains both pyraclostrobin and boscalid and Disarm O contains fluoxastrobin. As in previous tests, the strobilurins have worked very well on this anthracnose disease. The combination of Cease (biological control agent containing *Bacillus*) and MilStop (potassium bicarbonate) provided some control but it was not quite as good as that given by Pageant or Disarm O. The rates chosen may not be ideal for a combination treatment and I suggest contacting Bioworks for their input before testing this combination on your crops.

Prevention of Cyclamen Anthracnose		
Treatment	Rate/100 gal.	Disease 12-18-09
Water	----	7.2 b
Pageant	18 oz	0.5 a
Exp. 1	x	1.8 a
Exp. 1	2x	3.0 a
Exp. 1	3x	2.8 a
Exp. 1	4x	0.8 a
Cease and MilStop	1.5% 2.5 lbs	3.7 a
Disarm 480SC	2 oz	2.2 a
Disarm 480SC	4 oz	1.1 a

Numbers followed by the same letter are not significantly different.

NONPARASITIC PROBLEMS AND WET WEATHER

Many areas of the country are experiencing unusual cold and heavy rainfall leading to growth of many organisms that are not the more typical plant pathogens. While we all expect to see more Botrytis blight, bacterial diseases and downy mildew when it is colder and wetter we don't expect all of the fungal saprophytes and algal growth. As a result we have been getting a number of samples in our diagnostic lab in the past month. I thought it might be helpful to show you what some of these look like.

The first was sooty mold on geranium cuttings. These cuttings had black fungal growth that turned out to be *Alternaria* and *Cladosporium*. Once the cuttings rooted and were moved to a drier environment this mold completely disappeared.



Sooty mold on geranium cuttings

The second sample was of a yellowish mold growing on the surface of Elle pots, flats and even on the potting medium. This fungus is one of the most common saprophytes I have seen over the years—it is *Ostracoderma*. When these plugs were removed from the mist,



Ostracoderma on Elle pot surface

the only place the *Ostracoderma* could still be found was in the small portion of the plug that was in contact with the bench (through the flat drainage holes).

The next sample we saw was a white fungal growth on the surface of some seedling/plug flats (right). In this case, we never got to see the fungus since it disappeared during the shipping process. Just the drier environment of shipping wiped out the mold and it did not grow back even when placed in our warm, moist greenhouse. The only thing that was clear, was that fungus was not damaging the tomato seedlings in anyway.



Unidentified white fungus on tomato plug flat

The next interesting saprophyte turned out to be slime mold. This image was emailed to me by one of our clients. These fungi form rapidly on nearly any surface and are not known to cause damage to the surface. These structures are their fruiting bodies.



Slime mold

Algal growth occurs in some parts of the country on a routine basis. In some cases, the algae actually harm their surface while in others, they are truly saprophytes and cause harm in



Algae on Aphelandra

plant quality or by keeping them from receiving sunlight. Since it is not always easy to get rid of or prevent algae, I decided to include a recent report I found on turf grass.

The work was performed in California by Wong and Rios in 2007. They tested the ability of a number of fungicides applied on a 7 or 14 day interval. The ability of the turf to re-grow was used as the measurement of efficacy. The best eradication was seen with the older products Daconil and Fore. Overall, using a higher rate less often was more effective than a lower rate more often.

Efficacy of fungicides in eradicating turf grass algae.

Treatment	Application interval	Algae control
Daconil WeatherStik	14 days	Very good
Daconil Ultrex (low rate)	7 days	Very good
Daconil Ultrex (high rate)	14 days	Very good
Fore	7 days	Very good
Fore	14 days	Very good
Zerotol (high rate)	14 days	Good
Zerotol (low rate)	7 days	Good
Trinity (low rate)	7 days	Some
Trinity (high rate)	14 days	None

Answers to page 3 quiz—
 A-Cercospora leaf spot
 B-Fusarium leaf spot
 C-Colletotrichum leaf spot