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CHASE RESEARCH GARDENS, INC.

CHASE NEWS

The Farwest Show was Far Out!

By Marianne Waindle

Oh, so many plants and so little space…. We just returned from the 33rd Farwest Show in Portland, Oregon where there were more than 855 exhibitors covering 280,200 square feet of booth space. Yes, this is primarily a woody ornamental trade show, but there were over 30 greenhouse or foliage growers exhibiting the latest and greatest new perennials and bedding plants for the upcoming 2006 season. In addition to the show, there were nursery tours, Open-Houses and 44 hours of CEU opportunities for California, Oregon, and Washington chemical applicators plus ISA credits.

One of the most interesting growers Ann and I visited was Terra Nova Nurseries in Canby, Oregon. TNT was started in the homes of Ken Brown and Dan Heims in 1992 and has grown to encompass 2.5 acres of greenhouses, 18 acres of performance gardens and a state of the art tissue culture laboratory today.

Terra Nova has won over 61 International Horticultural awards for plant introductions or improvement. All of these plants are created by genetic crosses and then processed using tissue culture techniques for purity and consistency. Plants are produced thru Stage 4 and then shipped to finish growers in 1x3" pots. New perennial varieties from the following genera are available to name just a few: *Athyrium, Actea, Begonia, Coreopsis, Farfugium, Heuchera, Mukdenia, Podophyllum,* and *Tricyrtis*!

Seminars of interest included a discussion on fungicide resistance as part of the Powdery Mildew presentation by Dr. Jay Pscheidt, Ext Plant Pathologist, OSU. There are 4 groups of fungicides that are documented as resistant to specific fungi. All of these groups have been used extensively for years, and as a result of varying tolerances among pathogens, the Fungicide Resistance Action Committee (FRAC) has provided guidelines to prolong effectiveness of "at risk" fungicides.

Tricyrtis

Benzimidazoles (group 1) <thiophanate methyl>

- Avoid products where resistance is widespread and stable (botrytis). Tank mix with fungicides with other mode of action

Dicarboximide (group 2) <iprodione, vinclozolin>

- No more than 2 applications per season or crop cycle. Use when disease pressure is highest. Tank mix with fungicides with other modes of action.

Demethylation-inhibiting (DMI) (group 3) <mycobutanil, propiconazole, triadimefon>

- Avoid DMI use alone when disease pressure is high. Use block or sequence alternation and/or tank mix with other MOA's. Do not vary rates on the label (under or over).

Phenylamide (group 4) <metalaxyl, mefenoxam>

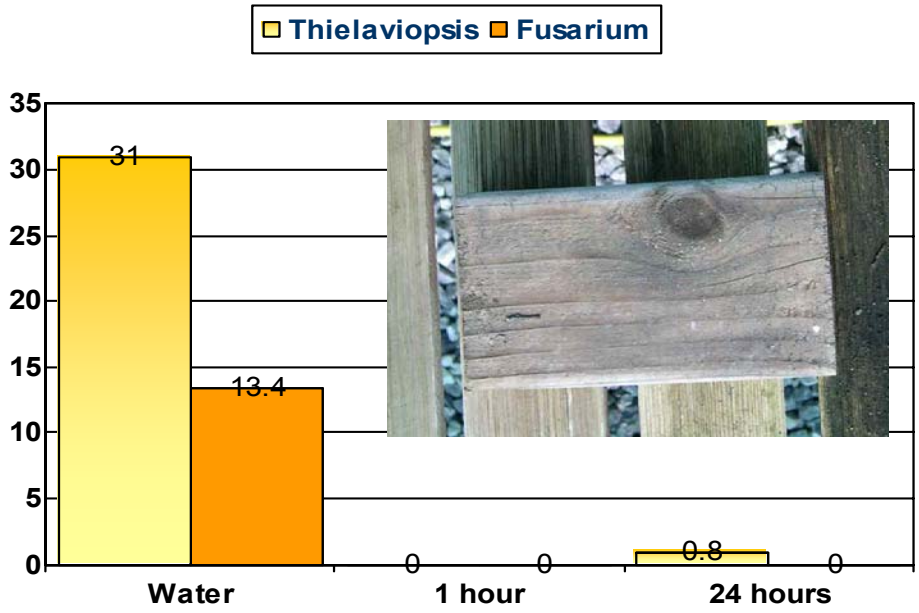
- Use only as preventative. When tank mixing, partner can be 0.75-1.0 of the full rate. Do not use soil applications as foliar sprays. Limit applications to 4 per season, intervals not to exceed 14 days. Use early in the season or during active vegetative growth.

Inside this issue:

Surface Sterilization After Cleaning

We have been testing some new products in a one-two punch program for pathogen control on greenhouse surfaces. Previous work has centered on P.A.C. or Strip-It (cleaners) followed by a disinfectant for both *Thielaviopsis basicola* and *Fusarium oxysporum* fsp. *cyclamensis* on plastic, wood and concrete. Our follow-up trial was to evaluate the effect of treatment timing on longevity for both pathogens on wood.

Wood was inoculated with either *T. basciola* or *F. oxysporum* one hour before cleaning with Strip-It. This was followed an hour or a day later with Micro-Bloc Ultra. We then attempted recovery of the fungal pathogens using selective media one day after this treatment and again one week later. The graph to the right shows the results of the recovery at the one day sampling.



This test shows that delaying the disinfecting treatment by 24 hours did result in a very low recovery of Thielaviopsis but not Fusarium. When the treatment was one hour apart no recovery of either fungus occurred. After one week, there was less Thielaviopsis recovered but more Fusarium on the water treated controls than was found after a single day. Apparently, Fusarium survived better under these conditions than the Thielaviopsis. Ability of the Strip-It and Micro-Bloc Ultra to kill these organisms was about the same after one week as it was after one day indicating that there was little re-growth over the course of the interim period.

Our next plans are to test the safety of these products on typical ornamentals that might inadvertently come in contact with either one or both during a disinfesting process. We will also be checking the ability of Micro-Bloc Ultra to control plant diseases directly since this is a registered use in Canada at this time. I tested Greenshield for disease control on some foliage plants in the early 1990's with moderate results when it was used on a weekly interval. I am looking forward to seeing what Micro-Bloc Ultra can do as well.

Effect of Fungicides on Growth of *Botrytis in vitro*

Since opening our diagnostic lab to growers from all over the country, we have been asked to check a variety of fungal pathogens for resistance to fungicides. The first request came for *Pythium* resistance to popular soil fungicides. Most recently, we have been looking at the effect of fungicides for *Botrytis* on growth of a variety of isolates *in vitro*. This means we test the fungal isolate in Petri dishes with culture media amended with various fungicides. The cost of such a trial is minimal and very rapid compared to testing on plants. Obviously, using a fungicide that is not effective is more costly still.

We tested most of the best Botrytis fungicides against four isolates of *B. cinerea* from ornamentals. The fungicides, rates used and reactions of the isolates are given in the table below. The numbers are the percent growth reduction compared to no treatment. We collected these four isolates over the past two years from California growers.

It was interesting to see the very high degree of control afforded by Medallion. Not only did this fungicide control nearly all growth on the medium but it actually resulted in death of the pieces of Botrytis that were placed on the plates. This was not true of the other fungicides tested even when they provided 100% growth control. Chipco 26019 provided the next best control.

This test showed only some control with either Decree or Daconil Ultrex. It may be that testing these product in this fashion was not a good indicator of their potential under normal conditions since we have had very good to excellent results with them on plant material infected with Botrytis. Our results do show that it is unlikely any of the Botrytis isolates tested were resistant to these four fungicides.

Product	Rate/ 100 gal	Mum	Vinca	Lily	Crossandra
Medallion	4 oz	100	100	80	100
Chipco 26109	16 oz	100	100	90	59
Decree	16 oz	100	40	41	35
Daconil Ultrex	1.4 lb	56	26	53	53

Research Highlights and New Diseases

I collect reports of new diseases as I find them to keep up with the wide world of ornamental diseases. The following is a brief summary of some of these reports.

Phytophthora ramorum is the cause of Sudden Oak Death and Ramorum Blight. It has an increasingly long host list with Solomon's seal (*Maianthemum racemosum* = *Smilacina racemosa*) the most recent addition. The infected plant was found in 2003 in a state park in Sonoma County, CA showing cream to brown colored spots with a yellow border on leaf tips. Other hosts at the same site included wood rose, redwood and California bay laurel. For a more complete report see Plant Disease 89:204.

In 2004, Verticillium wilt was reported causing a problem in *Osteospermum* sp. The pathogen was identified as *V. dahliae* and was previously reported on *O. fruticosum* from California (listed in the state host index published in 1989). Wilt symptoms included vascular streaking (brown to black) and stunting. This pathogen has been rare on *Osteospermum* since in my experience but since we transport cuttings of many ornamentals all over the world we must not forget it is possible. You can see Plant Disease 89:688 for a full report.

Rhizoctonia solani has been reported on Canadian lupine grown as a grain crop (*Lupinus angustifolius*) and a similar disease is reported from Australia. It is likely that at least some of the species of lupine grown for ornamental purposes are also susceptible to Rhizoctonia stem rot (Plant Disease 89:685).

Armillaria gallica was found in a South Carolina garden attacking daylily. The garden was also home of infected trees such as dogwood. While Armillaria, or mushroom root rot, is known to attack many woody plants the list of herbaceous plants is not as long. The white mycelial fans and rhizomorphs typical of this fungal pathogen were present on or near the daylilies (Plant Disease 89:683).

Watch these plants for Downy Mildew

Downy mildew on Basil (*Ocimum basilicum*) caused by an unidentified *Peronospora* sp. (Plant Disease 89:683) was reported recently in France. *Peronospora lamii* was previously reported on basil in Italy and Uganda and was found to be seed transmitted.

Downy mildew on Coleus (*Peronospora lamii*) has been found on the East Coast in the past 6-9 months. The pathogen is the same as that attacking *Salvia* spp.

Peronospora obducens causing downy mildew on Impatiens was first reported over a year ago throughout the US we have seen the disease California this summer.

Fusarium cutting rot on Christmas cactus

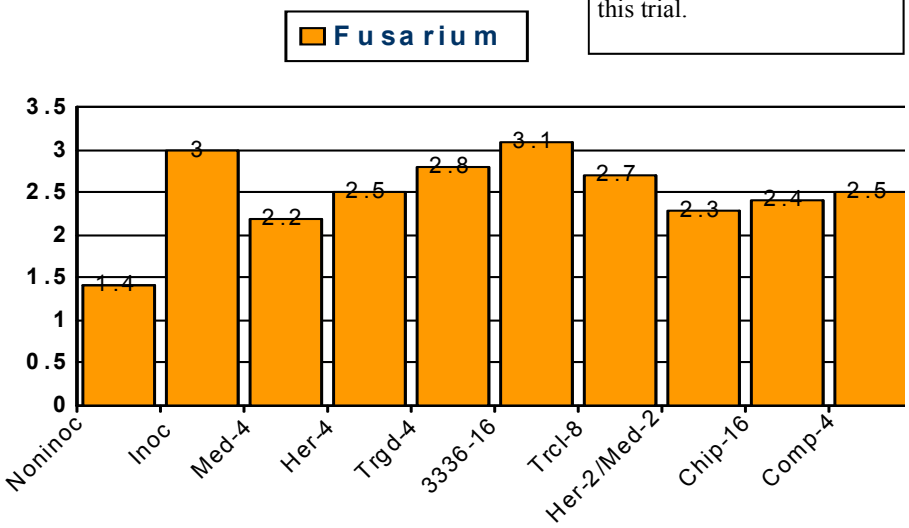
I recently visited a Southern California foliage plant grower and was reminded of many diseases that I have missed working on since leaving Florida. The grower agreed to donate plant materials for a trial on Fusarium cutting rot on Christmas cactus. (*Schlumbergera truncata* 'Thor Alise').

It has been at least 10 years since any fungicide work has been reported on this disease on holiday cacti and we decided to do a trial on the most effective fungicides for Fusarium. Many of these products have come along in the past fifteen years. The graph to the right shows the products and the rates tested (in oz/100 gal). We applied the fungicides on August 10 and 17 and inoculated with spores of the pathogen on August 15.

The products included: Medallion (Med), Heritage (Her), Terraguard (Trgd), 3336, Terraclor 75WP (Trcl), a combination of Medallion and Heritage (Med/Her), Chipco 26019 (Chip), and Compass O (Comp).

I was disappointed to see the poor control we achieved with the BEST *Fusarium* fungicides. We wounded the bases of the cuttings to make sure that the pathogen could attack them but this was probably unnecessary in this trial. We even used the maximum rate of the products. The best control was not acceptable but it was significantly better than nothing.

Medallion and the combination of Medallion/Heritage were best in this trial. Little, if any, control was seen with Terraguard, 3336 or Terraclor. We are planning to repeat some of this work with different rates of Medallion without wounding the cutting bases. Hopefully, results will be more impressive than they were in this trial.



Disease Can Start with Cuttings, Plugs and Liners

Since we started our diagnostic lab about a year ago I have been pleasantly surprised at how much fun it can be. It is like a little CSI without the glitz and glamour (and of course no blood either).

I have also been surprised about the type of diseases we are finding in rooted cuttings for a wide variety of ornamentals. Indeed, the most likely source of many diseases is the seeds, cuttings or plugs they are started from. This has been the case on flowering potted crops (like geranium), perennials (like *Dianthus* and *Erysimum*) and woody ornamentals (like *Mandevilla* and *Chitalpa*). The pathogens we have been finding include *Fusarium, Phytophthora* and *Xanthomonas,* to name a few.

The main reason I bring this up is to remind you that if you start with diseased planting materials you will probably end up with a diseased crop later on that will at least cost more money to produce. It is easy to think that all you have to do is to apply enough fungicides or bactericides and all of your worries are over but the hardest diseases to control are those listed above. We do a wide variety of product trials on ornamentals for control of most diseases but even under our highly controlled conditions some diseases defy 100% control. Some of the reports in this issue of *Chase News* illustrate this lesson.

The first step in any disease control strategy is to identify a problem early. This means you must check your cuttings, seedlings and plugs when you receive them or when they are transplanted. If you don't check early you will surely be fighting an uphill battle for the entire crop cycle. If you are not sure what the problem is then by all means have it diagnosed by a competent lab.

Fusarium crown rot and wilt on *Dianthus* plugs—Root loss, necrosis (right) and Fusarium spores and mycelium (below)

Phytophthora stem rot on *Chitalpa*

Some Other Recent Isolations

Wax flower—Phytophthora, Fusarium and Cylindrocladium crown and root rots

Leucodendron—Pythium and Fusarium root rots

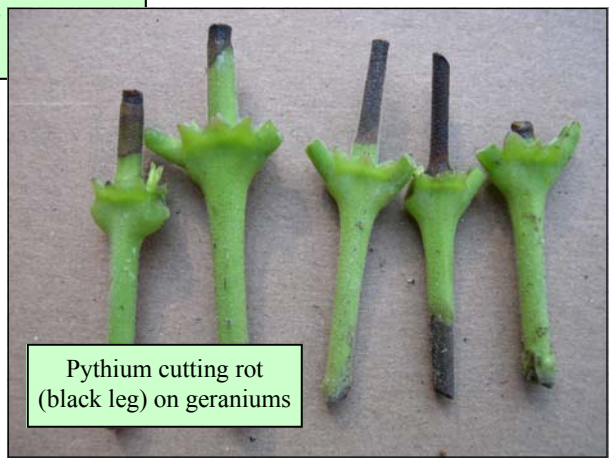
Forsythia—Phytophthora crown rot

Boronia—Phytophthora and Fusarium root and crown rots

Chrysanthemum— Pythium root rot

Strelitzia (Bird-of-Paradise)—Xanthomonas leaf spot

Bougainvillea—Phyllosticta leaf spot



Pythium cutting rot (black leg) on geraniums

Chase Research Gardens
Education for Horticulture

Key to Woody Ornamental Diseases	Bougainvillea	Buddleia	Camellia	Ceanothus	Chaenomeles	Cornus (Dogwood)	Cotoneaster	Forsythia	Gardenia	Hibiscus	Hydrangea	Nerium (Oleander)	Paeonia (Peony)	Pyracantha	Raphiolepis	Rhododendron	Rosa (Rose)	Syringa (Lilac)
Anthracnose (*Glomerella cingulata*)			x			x					x		x	x		x		
Armillaria - mushroom root rot			x				x	x		x	x		x			x	x	x
Black Spot (*Diplocarpon*)																	x	
Botryosphaeria canker/dieback			x				x		x					x		x		
Botrytis Blight	x									x	x		x			x	x	
Botrytis Flower Blight			x							x	x						x	x
Briosa flower blight																x		
Cercospora leaf spot					x					x	x					x	x	
Choanephora flower blight										x								
Ciborinia petal blight			x															
Coniothyrium canker																	x	
Corynespora leaf spot											x							
Crown Gall (*Agrobacterium)*					x			x									x	x
Crytosporella canker/dieback																	x	
Cucumber Mosaic Virus	x	x																
Cylindrocladium cutting rot																x	x	
Downy Mildew		x															x	x
Entomosporium leaf spot					x		x							x	x		x	x
Exobasidium leaf galls			x													x		
Fabraea leaf blight					x													
Fireblight (*Erwinia amylovora*)					x		x							x	x			
Fusarium/Verticillium root rot										x			x	x				
Oleander and other leaf Scorch (*Xylella)*												x						
Powdery mildew (*Microsphaera)*																		x
Ovulinia flower blight																x		
Pestalotia twig blight																x		
Phomopsis dieback																x	x	
Phyllosticta leaf spot							x		x		x					x		
Phytophthora dieback and root rot	x			x		x	x	x	x	x	x			x		x	x	x
Powdery mildew	x			x	x						x			x		x	x	x
Pseudomonas gall (Olive knot)												x						
Pseudomonas leaf spot	x									x	x							x
Pseudomonas/Xanthomonas wilt	x									x	x							x
Pythium root rot				x							x					x		x
Rhizoctonia aerial (web) blight or root rot	x								x	x	x	x				x	x	
Ring spot virus		x																x
Rose (apple) mosaic virus														x			x	
Rust					x		x			x	x				x	x	x	
Scab					x									x				
Sclerotinia cankers/dieback (white mold)			x					x		x						x		x
Septoria- Early Blight						x					x					x		
TSWV (tomato spotted wilt virus)											x							
Verticillium wilt																	x	x
Virus variegation			x															

Key to Woody Ornamental Pests	Bougainvillea	Buddleia	Camellia	Ceanothus	Chaenomeles	Cornus (Dogwood)	Cotoneaster	Forsythia	Gardenia	Hibiscus	Hydrangea	Nerium (Oleander)	Paeonia (Peony)	Pyracantha	Raphiolepis	Rhododendron	Rosa (Rose)	Syringa (Lilac)
Aphids			x	x	x		x			x	x	x			x	x	x	x
Blister Mites - pear leaf							x											
Borer-misc						x	x										x	x
Bud Mite			x															
Bud Moth															x			
Budworm																x	x	
Caterpillars		x	x							x		x			x	x	x	x
Cucumber Beetles																		x
Cyclamen Mite																x		
Deer																	x	
Flathead Borers															x			
Four-Lined Plant Bug						x		x			x					x	x	
Fuller Rose Beetle			x														x	
Gall Midge																x		
Grasshoppers										x								
Hibiscus Beetles										x								
Japanese Beetles										x					x	x	x	
Lace Bugs				x			x									x		
Leaf Cutting Bees																	x	
Leaf Hoppers																	x	
Leaf Miners															x	x		x
Leaf Roller			x		x						x				x	x	x	
Lygus Bug								x			x						x	
Mealybugs	x		x	x					x	x		x						x
Mealybugs - root																x		
Midges - general																x	x	
Mites (general)			x					x										
Mites - Southern Red																x		
Nematodes									x	x			x		x	x	x	
Rose chafers											x		x				x	
Rose curculios																	x	
Sawflies - rose slugs															x		x	
Scales- cottony			x								x			x		x		
Scales - general	x			x	x			x	x	x		x	x		x		x	x
Scales - oystershell				x		x	x											x
Scales - San Jose							x											x
Slugs & Snails										x	x						x	
Spider Mites	x	x					x		x	x	x				x	x	x	x
Stem Gall Moth				x														
Thrips									x	x			x			x	x	x
Webworm							x										x	
Weevils		x	x					x	x		x				x	x	x	
Whiteflies	x	x	x	x					x							x	x	x