

Chase News



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Do You Know What's on Your Crops?



As the winter ends and spring or even summer start you will see a number of diseases disappear while others will start. Over the past month I have visited a number of California greenhouses and ran across some of these transitional diseases. I have seen a fair amount of downy mildew as the winter downy mildews give way to those that are more severe during warmer weather. The *Gaillardia* (upper, right) has downy mildew as does the *Buddelia* (bottom, right). I thought I was looking at another one on basil (upper, left) but a quick microscopic exam showed not downy mildew sporulation but rather foliar nematodes.



On a trip last week, I saw some extensive losses on calla lilies (middle pictures on the left). At first glance it looked like Pythium root rot and then more like Erwinia soft rot. We cultured from the plants and indeed my first guess was right—it was Pythium root rot. Our fungicides trials over the years have shown pretty inconsistent and sometime very poor results in preventing this disease.



On another day I visited some tropical foliage plant producers. I saw Fusarium stem rot on *Aglaonema*, Colletotrichum stem rot on lucky bamboo (*Dracaena*), Phytophthora crown rot on *Spathiphyllum*, pink rot (*Gliocladium*) on areca and *Neanthe bella* palms and the southern blight (*Sclerotium rolfsii*) on the coconut (bottom, left) and dracaena canes.



Don't forget you cannot control what you do not know exists—scout your crops weekly at least!

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Fungicides Can Reduce Losses from Nectria Canker

We have been hearing about and seeing more and more problems with Nectria canker and the related Fusarium cankers on a number of woody ornamental all across the US. In some locations the disease(s) are problems in the landscape and in others the problems are in nurseries. Whether or not the disease appears in a given season or causes significant damage is dependent on the weather. In still other instances the problem arises in cold storage of bare-rooted trees and shrubs. Elm, Gleditsia, -_____ are some of the most frequently attacked by *Nectria* spp. and/or *Fusarium* spp.

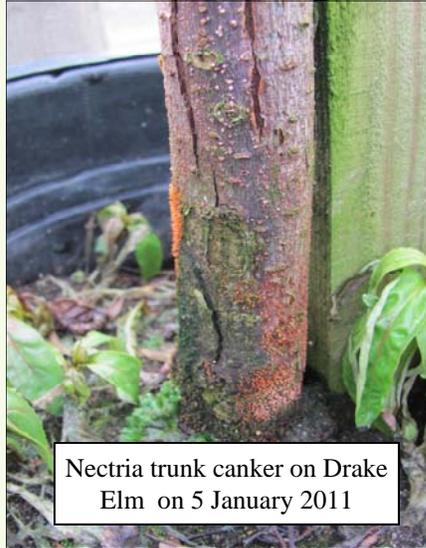
Reviewing the literature for possible therapeutic fungicides was frustrating. It simply tells us that research has concentrated on controlling Nectria canker in apple orchards and that in few other instances have any therapeutic steps been taken or even suggested. In the landscape the suggestion is that the trees will outgrow it unless they are too stressed—clearly not under much control in a landscape. I finally found a place to do a real world trial last winter and Syngenta agreed to provide some support for the trial.

We started the trial in November 2010 at a container woody ornamental nursery in Central California. The crops we evaluated were two elm cultivars: 'Drake Elm' and 'True Green'. We used a block of Drake Elm in 15 gallon pots and another in 24 inch boxes. We also used a block of True Green in 24 inch boxes.

Treatments were applied four times on a roughly monthly interval. (28 October, 22 November, 7 January and 9 February).

- Untreated
- Experimental
- Medallion 50WP and Capsil
- Heritage 50WDG and Capsil

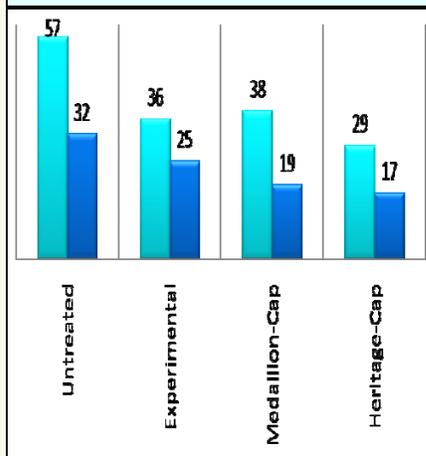
The applications were made by the nursery personnel and consisted of spraying all above-ground portions of the dormant trees. We determined that many of the trees were infected with *Nectria* before the experiment started. By the beginning of January we saw active infection and sporulation of the *Nectria*. Then in the middle of March the trees started to



leaf out and those that had died were becoming obvious. We evaluated all three experiments but the 15 gal Drake elms did not show any consistent response compared to the two sets of 24 in boxed elms.

We rated the degree of leafing out as well as the percentage of dead trees on 14 March, 2011 (graph—blue bars.) The light blue bars are 'Drake' Elm and the dark blue bars are 'True Green' Elm.

Effect of fungicides on percent dead of 'Drake' (light blue bars) and 'True Green' (dark blues).

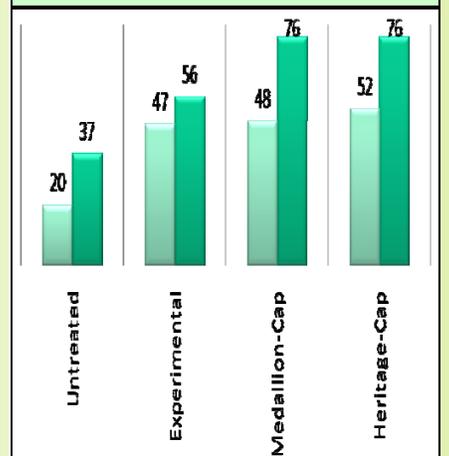


The survival of both cultivars of Elm was significantly improved (about 50% as many died with Heritage compared to the untreated controls) when trees were sprayed monthly with either Medallion or Heritage. The Experimental fungi-

cide was also effective although slightly less so than the Medallion or Heritage treatments.

The final rating was made on 6 April when the grower evaluated salability. That data also showed statistically significant effects with excellent improvement of salability when Medallion or Heritage was applied (graph—green bars). Once again the dark green bars are 'True Green' and the light green are 'Drake'.

Effect of fungicides on percent salability of 'Drake' (light green bars) and 'True Green' (dark bars).



Salability increased by about 100%. This data also showed that 'Drake' elms were more susceptible to Nectria canker at least in this setting than 'True Green'.

I am not reporting the rates of the products tested since they were chosen based on maximum per year for the site and not based on a 100 gal unit as we usually use.

This trial has given me real hope of providing effective fungicide therapy in very wet winters. We are doing another trial at present on peach seedlings that suffered from a Fusarium canker last spring/summer. Unless our spring is drier than the preceding winter we should be able to evaluate the fungicides tested in the elm trial as well as several others.

Special thanks to the nursery and Syngenta for invaluable support in this trial.

Fungicides for Downy Mildew—Efficacy and Safety on Alyssum

Downy mildew on alyssum (*Lobularia maritima*) remains a concern for many growers especially along the Pacific coast. The weather there is ideal for downy mildew and the plant is a relatively common weed that can live year-round in some coastal areas. Preventing downy mildew through fungicide use is also common. I recently received a sample of alyssum for diagnosis and was reminded of the sensitivity of the crop to many effective downy mildew fungicides.



About 10 years ago we performed a number of trials on downy mildew prevention on alyssum. We tested everything available at the time including a number of experimental fungicides that have been registered since then. In conducting the trials we noticed that products often safe on pansy, snapdragon and stock were not always safe on alyssum. We even performed one trial on very young alyssum seedlings in plug flats by spraying them three times a week.

The table to the right summarizes the data from these six trials. We found that there were a wide range of very effective products including Aliette, copper fungicides (Camelot, Junction and Phyton 27) and strobilurins (Compass O and Heritage). The experimental products tested included Stature (now and SC formulation) and FenStop. Protect T&O gave some control but was sometimes damaging to Alyssum depending on rate and interval of use. The same situation appeared common with copper and overall I think they should be avoided on alyssum. Some products like Triact and ZeroTol gave some control. ZeroTol also caused slight damage at 1% (see right).



Summary of efficacy and safety of downy mildew fungicides on alyssum

Fungicide	Rate/	Efficacy	Safety
Aliette	1-2 lb	Excellent	Safe
Camelot	3-5 pint	Excellent	Moderate damage
Clevis	1-2 lb	Very good to excellent	Safe
Compass O	1-2 oz	Some to good	Safe to slight damage
Daconil Ultrex	1.4 lb	None	Safe
FenStop	14 oz	Excellent	Slight damage
Heritage	2 oz	Very good to excellent	Safe to slight damage
Junction	1.5-3 lb	Very good to excellent	Slight to moderate
Kocide 2000	2 lb	Very good to excellent	Slight damage
Phyton 27	10-30 oz	Excellent	Safe to moderate damage
Protect T&O	24-32 oz	Some to good	Safe too moderate
Stature DM	0.2-0.4 lb	Excellent	Slight damage
Strike 25W	2 oz	Excellent	Safe
Subdue MAXX	1 oz	Excellent	Safe
Triact 70EC	0.5-1%	None to some	Safe
ZeroTol	1%	Some	Slight damage

The appearance of phytotoxicity was similar in many cases and often mimicked damage from Pythium root rot and even downy mildew (without the white sporulation on leaf undersides).

We also did a little testing on susceptibility of alyssum cultivars to downy mildew (*Peronospora parasitica*). Most of them were pretty sensitive to downy mildew making the use of fungicides for downy mildew prevention more likely.

Be sure to check all current fungicide labels for use rates, intervals and of course sites. I would consider alyssum a sensitive plant and do testing on a small group of plants prior to broad scale use of new products.

Downy Mildew on Alyssum Cultivars

Low to medium severity

Easter Bonnet Pink

Medium severity

Easter Bonnet White

Easter Bonnet Lavender

Easter Bonnet Violet

Easter Bonnet Mix

Medium to high severity

Easter Bonnet Deep Rose

Snow Crystal White

Wonderland Purple

What Can KleenGrow Do For You?

We started working on a quaternary ammonium product called KleenGrow over five years ago. This product is available from PACE 49 (Burnaby, British Columbia) and is labeled as an algacide, bactericide, disinfectant, fungicide and virucide. The active ingredient in KleenGrow is didecyl dimethyl ammonium chloride.

CLEANING SURFACES

Our first efforts were evaluation of KleenGrow and a cleaning product PACE also produces called Strip-It. We compared the ability of this two step system to eradicate fungal pathogens—*Fusarium oxysporum* and *Thielaviopsis basicola* on concrete, wood and plastic. When compared to bleach and ZeroTol, KleenGrow performed best, especially when used with Strip-It applied first.

SOIL-BORNE DISEASES

We then started to look at KleenGrow for its ability to control soil-borne diseases in an ebb and flood system and as a soil drench. It was interesting to me that when added to Subdue MAXX as a tank mix partner control of *Pythium irregulare* (resistant to Subdue MAXX) was very good. Neither KleenGrow alone or the Subdue MAXX alone were effective in this trial on *Pythium* root rot on Geranium. In a similar trial last year, we found that KleenGrow added to Adorn (fluopicolide from Valent) which is ineffective alone for *Pythium* provided good control of *Pythium* root rot on geranium. It did not improve control of several other fungicides for soil-borne diseases. KleenGrow alone gave very good control of *Fusarium* wilt on lisianthus alone (25.6 oz/100 gal as a drench every two weeks). Similar trials on black root rot (*Thielaviopsis basicola*) showed no control on vinca or pansy.

FOLIAR DISEASES

One of the most interesting results we obtained with KleenGrow came in an IR-4 funded trial for control of *Erwinia* soft rot on orchid a couple of years ago. I was really surprised to see how very effective it was when used on a weekly interval at only 6 oz/100 gal. There



was no phytotoxicity and the control level was excellent. We followed up last fall with a quick trial on *Xanthomonas* leaf spot on poinsettia. In this case we did see some phytotoxicity on the undersides of the leaves, but control of *Xanthomonas* was very good to excellent.

For the past six months we have been including KleenGrow in a wide variety of foliar tests and have continued to obtain very good to excellent results (table below). The product was very effective in preventing fungal leaf spots (*Cercospora* on pansy and *Alternaria* on *Pittosporum*). It was also very good to excellent when used as an eradicator for downy mildew on stock and powdery mildew on rose. In contrast, it did not

give any eradication of sooty mold on three ornamentals.

USING KLEEN-GROW

The use rate is 6 to 38 oz/100 gal on a 14 day interval as a foliar spray and is labeled for a very wide range of diseases. KleenGrow is labeled for preventative drench applications at rates from 6 to 50 oz/100 gal, again on a 14 day interval. Finally, KleenGrow can be used for bulb diseases (15 to 150 oz/100 gal for 30 sec). We have not tested KleenGrow in this manner and cannot say how effective it might be. The REI is 48 hours in almost all use patterns except for cleaning irrigation lines when the crop is not present. We also performed some compatibility trials with KleenGrow and a number of fungicides and bactericides finding only a few that were not compatible. Last year it was registered in California but not for use as an algacide or virucide. In the rest of the US it is registered for all of the above-mentioned uses (check current label to make sure you are using it legally in your state.)

CONCLUSIONS

I would not have guessed that a quaternary ammonium product would provide control of diseases that is equivalent or in some cases superior to chemical standards. This type of chemical is believed to provide no

Summary of KleenGrow efficacy on some foliar diseases on ornamentals.

Disease	Plant	Rate/100 gal	Results
Alternaria leaf spot	Pittosporum	12.5 oz	Very good
Cercospora leaf spot	Pansy	12.5 oz	Very good to excellent
Downy mildew eradication	Stock	12.5 oz	Excellent
Erwinia blight (soft rot)	Oncidium (orchid)	6 oz	Excellent
Powdery mildew eradication	Rose	12.5 oz	Very good
Sooty mold eradication	Euonymus, Gerber daisy, pansy	38 oz	None
Xanthomonas leaf spot	Poinsettia	12.5 oz	Very good

residual activity which should limit its efficacy on plant diseases. Many of our foliar trials are conducted under intermittent mist which should provide a challenge for most products in controlling foliar diseases. I have been pleasantly surprised with the efficacy of KleenGrow under our test conditions and continue to be impressed with each new trial we conduct. Be sure to read the label and follow it carefully for optimal results.

Research Reports

Black Root Rot Control on Pansy— Steddom and Pruitt (Texas AgriLife Extension Service) reported on a trial they performed last year on *Viola x wittrockiana* ‘Matrix Sunrise’. Plants were treated three times on a 14 day interval starting a few hours after they were inoculated on 14 April 2010. Several of the treatments were applied initially at a low rate with subsequent treatments at the higher rate (Medallion, Hurricane and KleenGrow). Disease was rated from 0=healthy to 5=plant chlorotic and stunted with advanced signs of root rot. The table to the right shows the final rating on 19 May 2010.

In this trial, only the Veranda O at the 8 oz rate provided significant control of both the foliar and root symptoms of black root rot. None of the other treatments provided any significant control. Even the industry standard thiophanate methyl (Cleary 3336) failed in this trial. These results mirrored those in tests we conducted in 2010 on black root rot on pansy and vinca with many of the same treatments.

For the complete report see: Plant Disease Management Reports 5:OT010.



Myrothecium Leaf Spot Control on Dieffenbachia—McMillan (Kerry’s Bromeliad Nursery, Inc., Homestead, FL) reported on a trial to prevent *Myrothecium* leaf spot on *Dieffenbachia picta* ‘Compacta’ under commercial growing conditions. Fungicides were applied on a 21 day interval from 10 June through 10 October 2009.

Efficacy of fungicides for control of black root rot on pansy		
Treatment	Rate/100 gal	Disease severity
Noninoculated control	-----	0.4 d
Inoculated control	-----	3.8 ab
Cleary 3336	16 oz	3.3 abc
Veranda O	4 oz	3.6 abc
Veranda O	8 oz	2.9 c
Medallion	1 oz	3.3 abc
Medallion	2 oz	3.6 abc
Medallion	1 oz then 2 oz	3.6 abc
Hurricane	0.75 oz	3.3 bc
Hurricane	0.75 oz then 1.5 oz	3.2 bc
KleenGrow	6 oz then 13 oz	4.0 a
Trinity	2 oz	3.3 abc
Trinity	6 oz	3.7 ab

Numbers in the column followed by the same letter are not statistically different.

Treatments included:

- Untreated
- Chipco 26019(2 lb/100 gal)
- Compass O (1 oz)
- Daconil 2787 (1.5 lb)
- Heritage (4 oz)
- Insignia (4 oz)
- Medallion (2 oz)
- Pageant (6 oz)

All products provided significant control of *Myrothecium* with optimal results



(approximately 95%) with the strobilurins (Heritage, Insignia and Pageant0 and Medallion). Chipco 26019 and Daconil 2787 provided 85-88% control. Compass O only provided 42% control which was not expected based on earlier results on this crop. Perhaps the rate of use was too low (only 25% of the active ingredient in the Heritage treatment but equivalent to that in Insignia treatment). The 21 day treatment interval is longer than I would expect to provide ideal control but clearly some of the products worked very well at this interval. For the complete report see Proc. Fla. State Hort. Soc. 123:302-303, 2010.

Control of Switch Grass Rust—Hagan, Bowen and Akridge

(Auburn University) reported on a trial in 2010 on efficacy of fungicides in Southern Alabama. The trial was conducted on *Panicum virgatum* ‘Dallas Blues’ with a wide range of fungicides.

Treatments included:

- Non-treated
- 3336 4.5F (20 oz/100 gal)
- Banner MAXX (8 oz)
- Daconil Ultrex (1.4 lb)
- Eagle (Hoist) (8 oz)
- Heritage (4 oz)
- Medallion (4 oz)
- Palladium (6 oz)

Fungicides were applied via tractor and hand wand on a 2 week interval from 2 June to 20 September, 2010. Rust was most effectively controlled with Eagle (Hoist) and Heritage in this trial—only 10% of foliage with rust symptoms. None of the other treatments gave any significant degree of control (50-75% leaf mortality).

I would not have expected good results with some of the fungicides included (3336, Daconil Ultrex, Medallion and Palladium). However, it was surprising to me that Banner MAXX was not effective in the trial. For the complete report see: Plant Disease Management Reports 5:OT002.

Experimental Bactericides—Is There Any Hope?

Over the past several years, the IR-4 Project has focused on bacterial diseases. We have performed some trials on some experimental bactericides as well as several non-traditional products. Last year several trials were run by University of Florida researcher Dr. Dave Norman (Mid-Florida Research and Education Center).

Many of the treatments were experimental or at least unregistered for control of bacterial diseases. The spray interval was typically weekly with one treatment applied before the inoculation. The most effective products for prevention of *Erwinia* soft rot on *Phalaenopsis* orchid (Table right, above) were CuPRO (copper), Protect (mancozeb) and the combination of CuPRO and SP2015 (no longer under development for ornamentals). Other products were not significantly effective at preventing *Erwinia* soft rot in this trial. Another trial performed by Dr. Aaron Palmateer, University of Florida (Homestead) found that the same treatments were ineffective in preventing *Erwinia* soft rot on *Oncidium* orchid.

In contrast, the best treatments in the *Pseudomonas* leaf spot on mum trial included:

Results of bactericide trials on <i>Erwinia</i> soft rot on <i>Phalaenopsis</i> and <i>Pseudomonas</i> leaf spot on chrysanthemum (Norman, Univ. of FL)			
Treatment	Rate/100 gal	<i>Erwinia</i>	<i>Pseudomonas</i>
Noninoculated control	-----	0 a	0 a
Inoculated control	-----	13 de	17 ef
Protect	2 lb	3 ab	5 bc
CuPro	2 lb	3 abc	3 ab
Acibenzolar	0.75 oz	10 bcde	16 ef
Citrex	150ml/L	15 de	8 c
HM-0736	14.4 oz	13 de	14 de
Kasumin	45 oz	17 e	3 b
SP2015	12 oz	14 de	19 f
Taegro	3.5 oz	11 bcde	13 d
SP2015 and CuPro	8 oz and 2 lb	4 abc	4 b
CG100	0.3%	9 bcd	23 g
Regalia SC	1%	11 cde	6 bc

Numbers in the same column followed by the same letter were not statistically different.

Product	Active Ingredient(s)	# experiments	% Control
Acibenzolar	Acibenzolar-S-methyl	9	62
Actinovate	<i>Streptomyces lydicus</i> WYEC 108	4	15
Aliette WDG	Fosetyl Al	4	62
Camelot	Copper salts of fatty and rosin acids	3	80
Cease	<i>Bacillus subtilis</i>	10	36
Citrex	Citrus extraction	10	43
CuPro	Copper hydroxide	5	68
HM-0736	Laminarin	10	25
Junction	Mancozeb + copper hydroxide	3	77
Kasumin	Kasugamycin	15	23
Kocide 2000	Copper hydroxide	14	43
K-Phite	Phosphorus acid salts	7	4
Phyton-27	Copper sulfate pentahydrate	8	54
SP2015	Famoxadone + Cymoxanil	10	27
Taegro	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	10	25

CuPRO, Protect, the combination of CuPRO and SP2015, kasumin (kasugamycin—an unregistered antibiotic), and Regalia SC (extract from giant knotweed and a biopesticide). Some products actually resulted in more severe disease than the inoculated controls—CG100.

These results were similar to those we obtained in trials for IR-4 on other crops and pathogens. At the SAF Pest Management meeting in San Diego this past February Cristi Palmer (Ornamentals Coordinator for IR-4) summarized all of the IR-4 trials on bacterial diseases. Many different tests were completed all over the US by 7 or more researchers. The final column in the table to the left shows the average % control. The best products were Camelot, Junction, CuPro, Acibenzolar, Aliette and Phyton 27. The majority of these products contain copper which remains the most consistently effective of the bactericides either labeled or under development. The products that were least effective included K-Phite, Actinovate, Kasumin, Taegro, HM-0736 and SP2015. Thus far the only experimental product with significant levels of control is Acibenzolar which is under development at Syngenta.