

# Chase News



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## It's Summertime and the Bacterial Diseases are Happy!

Now that summer has started you may be seeing some spots on many ornamentals. We are watering more and many bacteria are more active at higher temperatures. Overhead irrigation and crowding can lead to an outbreak of bacterial leaf spot on many ornamentals during production.

The first step to control a disease is to know what diseases occur on your crop, when disease occurs and what cultural controls are most important. If the problem is new to you, samples must be sent to a diagnostic laboratory for culturing or indexing since this is the only reliable way to determine the cause of the problem. When a bacterium is isolated from a plant do not jump to the conclusion that it is causing the disease. Few diagnostic labs have the ability to test bacteria for pathogenicity. Unfortunately, many bacteria can be found on and in ornamental plants but not all are known to cause disease.

Use pathogen-free cuttings, plugs and seeds whenever possible. Several prominent diseases caused by *Xanthomonas* can be seed-borne (*Ranunculus*, *Zinnia*, *Matthiola*). Eliminate overhead irrigation and exposure to rainfall when possible. Splashing water moves bacteria and allows them to infect new leaves. If you must use overhead irrigation try to time it for when the leaves will dry quickly. Scout new crops often and remove plants with symptoms as soon as they are found. Keeping them around makes contamination of new crops possible. Have problems diagnosed by a laboratory and keep good records of problems and what you did to control them. It is NOT easy to tell if a leaf spot is caused by a bacterium or a fungus without a lab

diagnosis.

Once you have done everything possible with cultural controls you may still find use of a bactericide necessary. We have tested many bactericides over the past 30 years on a wide variety of pathogens and plants. Bacteria can rapidly develop resistance to these active ingredients and rotating between different types of products is crucial. Very few bactericides are available and the majority of them contain copper. Streptomycin sulfate is also used in some parts of the country especially on fireblight or *Erwinia* soft rot. A third product that has shown benefits in controlling bacterial leaf spots is Cease which is a bio-pesticide (*Bacillus subtilis*). Our trials with Cease showed good efficacy against *Pseudomonas* and *Xanthomonas* leaf spots on bedding plants and cut flowers. The most effective rate was 1% preventatively or 1.5% once disease has started. Copper containing products including Camelot, Kocide and Phyton 27 have also been effective in our trials. Most recently, work at the University of Florida by Dr. David Norman has indicated very good control of *Xanthomonas* leaf spot on geranium with coppers (Kocide 3000, Camelot, Cuprofix and Phyton 27) and mancozeb (Protect DF).

Use cultural controls to make sure your bactericide dollars are effective. Alternating between your favorite copper product and Cease has been a good way to control leaf spots caused by *Xanthomonas* or *Pseudomonas*. As always – follow the labels – they are the law!



Xanthomonas on peony



Pseudomonas on salvia

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# NEW ROSE RUST FUNGICIDES ON THE HORIZON with Gary Osteen

We completed another field trial on roses recently. This time we were able to test some fungicides that are not currently labeled for ornamental use against rose rust. The trial was started on 16 April on ‘Double Pink Knock-Out’ roses planted the previous fall in Central California. Products were applied after a small amount of rust was found: 1, 13 and 28 May. We included a water sprayed control and some industry standards (Pageant and Cygnus). Products were applied as a spray to drip without any adjuvants. On 8 June we evaluated overall top grade (quality), phytotoxicity and rust severity. About 10 days later we also recorded plant height.



Rust severity was low in this trial and all fungicides provided excellent control. The industry standards—Pageant (pyraclostrobin and boscalid from BASF Corp.) and Cygnus (kresoxim methyl from BASF Corp.) did not affect top grade, cause phytotoxicity or reduce plant height.

Many of the other products included in this trial are sterol inhibitors—MOA group 3—or contain a sterol inhibitor. These products are capable of PGR activity on some crops and we did see that here in some cases.



Trinity (triticonazole from BASF Corporation) has been under development for some time and is due for ornamental

did not cause significant stunting (or phytotoxicity) in this trial at the rates and intervals tested.

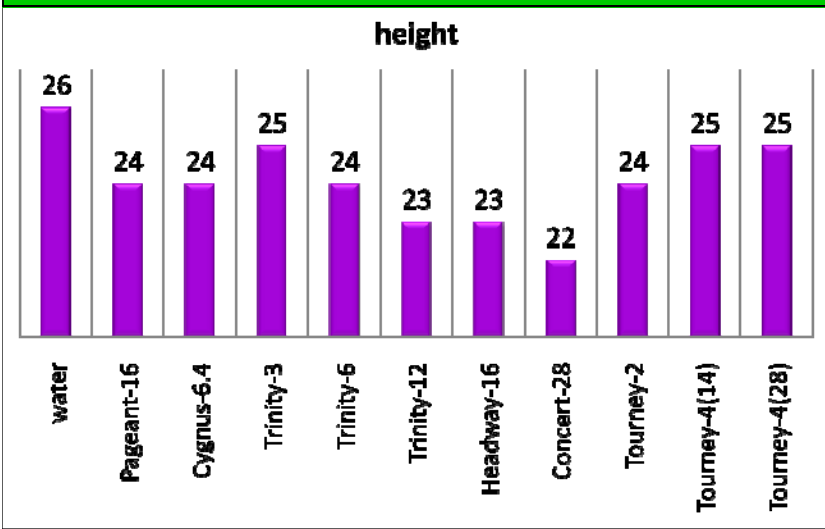
This trial shows that sterol inhibitors can give excellent control of rose rust. Previous trials on many other rust diseases confirm this. It also shows that not all sterol inhibitors result in a PGR effect. In this trial the most severe PGR response was to fungicides containing propiconazole (the active ingredient of Banner MAXX) with a lower response to higher rates of triticonazole (Trinity). These four new ornamental fungicides will be a welcome addition for our rust rotation once they are labeled. Please wait for them to be labeled before using them on ornamentals.

labeling as soon as next year. It has very low PGR activity based on our trials on many crops (herbaceous and woody). In this rose trial we did see some stunting at the 12 oz rate that was significantly different than the water sprayed control.

Headway (azoxystrobin and propiconazole from Syngenta Professional Products) and Concert (chlorothalonil and propiconazole from Syngenta Professional Products) did affect plant growth. Concert caused slight to moderate phytotoxicity and both resulted in significant stunting. The propiconazole component of each product is likely the cause of the stunting as it is a sterol inhibitor.

The final product in the trial was Tourney (metconazole from Valent USA). We included two rates (2 or 4 oz/100 gal) on a 14 day interval and the 4 oz rate on a 28 day interval. Tourney

**Effect of fungicides on rose height (inches).**



**Rates are given in oz/100 gal. Products were applied on a 14 day interval except Tourney-4(28) which was applied on a 28 day interval.**

## PYTHIUM SPECIES AFFECTS FUNGICIDE EFFICACY

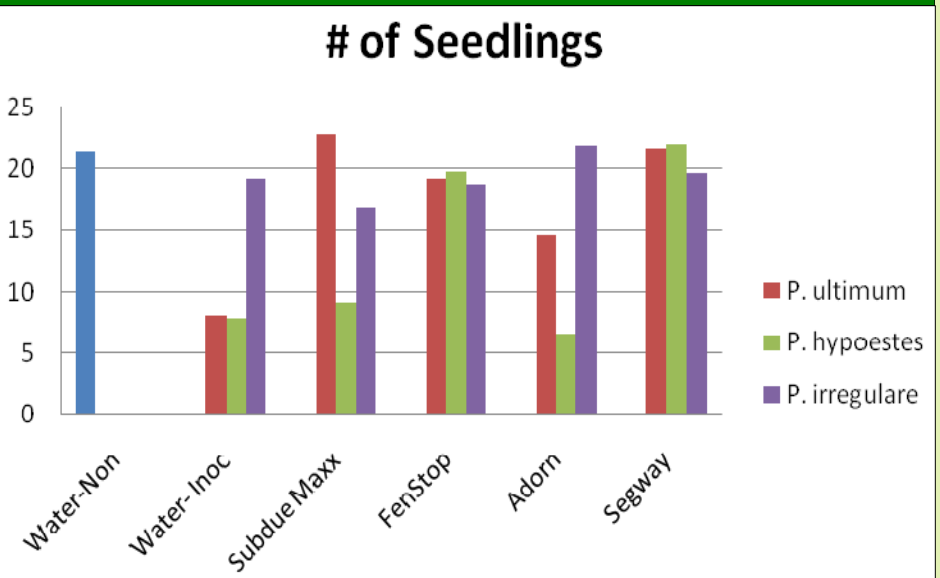
We have been testing several *Pythium* species that can cause damping-off on Celosia. I reported on our first trial in the May issue of Chase News and now am reporting on two additional trials we just completed.

We have settled on three isolates of *Pythium*: *P. ultimum*, *P. irregulare* (originally from geranium and resistant to Subdue MAXX) and *P. irregulare* (originally from *Hypoestes*.) As with the previous test, we weigh the celosia seed, plant it and wait about 1 week for germination. Then we apply the test fungicides preventatively and follow the next day with the inoculation.

The first trial evaluated Subdue MAXX (0.5 oz/100 gal), FenStop (7 oz/100 gal), Adorn (1 oz/100 gal) and Segway (1.5 oz/100 gal). Products were applied a single time on 22 April and final seedling count was made about a month later on 18 May.

The *Pythium irregulare* originally from geranium did not affect stand count (purple bars). The stand counts showed that Subdue MAXX did not control the *P. irregulare* from *Hypoestes* (green bars) but did provide good control of the *P. ultimum* (red bars). In contrast both FenStop and Segway provided control of both *P. irregulare* and *P. ultimum*. Adorn provided some control of *P. ultimum* (red bars) but none for the *P. irregulare* from *Hypoestes* (green bars).

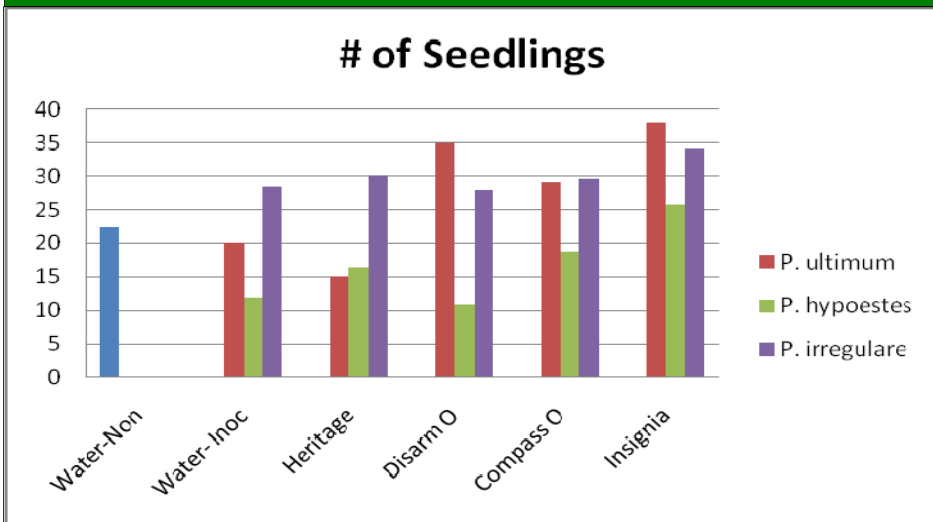
**Trial 1—Effect of fungicides and Pythium species on stand count for Celosia (*Pythium/Phytophthora* fungicides).**



The second trial was performed with several strobilurin fungicides: Heritage (0.9 oz/100 gal), Disarm O (0.6 oz/100 gal), Compass O (0.5 oz/100 gal) and Insignia (8 oz/100 gal). Rates were chosen based on labels for these products. In this trial fungicides were applied a single time on 29 April.

Stand count was once again unaffected by inoculation with *P. irregulare* originally from geranium. One month after treatment, the highest stand counts were found on plants treated with Insignia regardless of inoculation. Heritage did not give significant control of *P. ultimum* or the *P. irregulare* (from *Hypoestes*) in this trial. Disarm O gave control of the *P. ultimum* but not the *P. irregulare* from *Hypoestes*. Compass O was similar but did have better control of the *Hypoestes* (green bar). Insignia gave the best control of Pythium damping-off in this trial and was significantly better than even the noninoculated controls.

**Trial 2—Effect of fungicides and Pythium species on stand count for Celosia (strobilurin fungicides).**



The use rates for these strobilurins are not based on active ingredient amount. Insignia has only 20% ai while Heritage, Compass O and Disarm O are each 50% ai. It is important to remember that none of these products is currently labeled for drench treatment of Pythium root rot.

The control achieved with a single pre-inoculation treatment of these fungicides lasted one month. The best overall products for Pythium damping-off appears to be FenStop and Segway based on these trials. We are conducting additional trials using this Celosia system for IR-4 with some experimental products and will report the results when ready.



# BACTERICIDE UPDATE

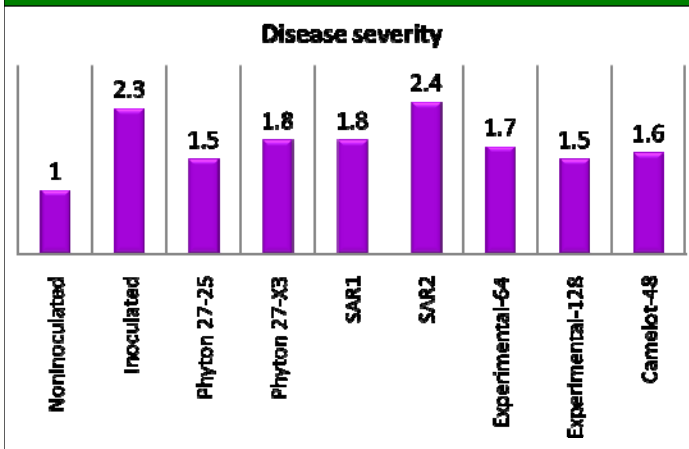
We have been doing a series of trials on some new bactericides on orchids, geranium, Mandevilla, lavender and poinsettia.

The most recent trial was performed on geraniums with *Xanthomonas* leaf spot. *Pelargonium x hortorum* 'Elanos TM Bright Red' were established in 4 inch pots containing Fafard Mix 2B and top dressed with Osmocote Plus 15-9-12 in March 2010. Plants were treated with the bactericides twice on a 7 day interval with the first application made on 24 May. They were inoculated 2 days later with *Xanthomonas campestris* pv. *pelargonii*. They were placed under intermittent mist for the rest of the trial. On 7 June disease severity was recorded.



Phyton 27 (25 oz/100 gal) gave moderate control alone that was slightly reduced when X3 was added (both at 25 oz/100 gal). The SAR products (systemic acquired resistance) caused slight marginal burning and did not provide significant

**Control of *Xanthomonas* leaf spot on geranium with experimental bactericides. Disease was rated from 1 (no disease) to 5 (dead). Treatments are given in oz/100 gal.**



**Summary of some trials on new bactericides for ornamentals (includes some IR-4 trials and some conducted by Dr. David Norman at the U of Florida)**

Actigard	good to excellent—phytotoxicity is a concern
Agri-Mycin	very good Erwinia—excellent in <i>Xanthomonas</i> (Norman)
Camelot	very good
Cease	some
Cg100	very good <i>Pseudomonas</i>
Citrex	none to very good
CuPro	very good to excellent
HM-0736	some
Kasugamycin	none to excellent—phytotoxicity is a concern
Kleengrow	excellent on <i>Erwinia</i>
Physpe	some to good <i>Erwinia</i>
Phyton 27	good to excellent
Protect T&O	very good on <i>Pseudomonas</i> —excellent (Norman)
Regalia SC	some to very good
ReZist	good to excellent
SP 2015	none to excellent (generally very good to excellent)
Taegro	none to excellent (50% of the trials=none)

disease control. The experimental bactericide gave slightly better control when used at 128 oz/100 gal than when used at 64 oz. Finally, Camelot at 48 oz/100 gal. provided control equal to Phyton 27.

The table above is a summary of some trials that have been performed by us and Dr. David Norman at the University of Florida. They include a wide range of products from the biological (Cease and Taegro) to bio-derived (Citrex and Regalia) and a few that are SAR (systemic acquired resistance) including Actigard and ReZist. In all trials the newer “bactericides”

were compared to traditional products such as those containing copper (like Camelot, CuPro and Phyton or antibiotics (Agri-Mycin). The results have not been consistent in some cases but many of the newer products do show promise. I put the pathogen tested when only one or two trials were available for comparison. The future of bactericides for ornamentals looks good.

**Some bacterial samples from our lab since January 2010.**

- *Rhodococcus* (*Corynebacterium*) on sweet potato vine
- *Erwinia* soft rot on dahlia
- Fireblight on pear
- *Xanthomonas* on *Petraeovitex*, Manzanita, verbena, lavender, peony, impatiens and geranium
- *Pseudomonas* on tomato, Penstemon, impatiens and mandevilla
- *Agrobacterium* on blueberry, rose and solidago

# RESEARCH REVIEW—ALTERNARIA

## ALTERNARIA LEAF SPOT CONTROL ON IMPATIENS—

We often use Impatiens to test new products for control of Alternaria leaf spot. Our most recent trial was started on 10 March when plugs of ‘Accent Violet’ were planted in 3.5 inch pots containing Fafard Mix 2B and top-dressed with Osmocote Plus 15-9-12. The fungicide applications were started on 13 May. Some of the treatments were applied a second time about a week later and plants were inoculated 4 days after the first ap-



Special thanks to Marge Daughtrey for the image.

plication. We do our trials with intermittent mist to promote the disease. The table below shows the exact products tested as well as their rates.

The experimental strobilurin proved to be phytotoxic to the Impatiens, causing marginal burning that was worse as rate increased. Other treatments were safe in this trial at the rates tested. The other experimental 2 was safe on the plants as were Heritage and Camelot.

Leaf spot control was significant for all fungicides but best for the Camelot treatment applied weekly. It was almost as good when applied once only as were the two Heritage treatments and experimental 2. The experimental strobilurin was less effective but did give significant control of Alternaria leaf spot on the impatiens in this trial. It is good to know new fungicides are under development for leaf spot diseases such as *Alternaria*.

## ALTERNARIA LEAF SPOT ON MARIGOLD—

Hagan, Akridge and Bowen published their research on use of fungicides for control of Alternaria leaf spot on marigold in the landscape. This disease is very common on marigolds and is caused by *Alternaria tagetica*. Their tests employed both American marigold (*Tagetes erecta* ‘Discovery Yellow’) and French dwarf marigold (*T. patula*



‘Little Hero’). They tested three rates of Heritage 50WG compared to Hoist 40W and Daconil Weather Stik 6F. Trials were conducted in southwest Alabama each summer from 2001 until 2004.

They found that Hoist (8 oz/100 gal) did not provide control of Alternaria leaf spot in their trials but that Daconil Weather Stik (1.5 pint/100 gal) did give good control when used weekly but did not give control when applied every 2 weeks. Heritage provided very good control when applied at 2 or 4 oz/100 gal on a 3 week interval. The researchers found that when disease pressure was light to moderate a monthly interval was effective.

For a complete report see: Journal of Environmental Horticulture 28(2):81-84.

**NOTE—We have found good to excellent control of some Alternaria leaf spots with Hoist.**

### Efficacy of fungicides on Alternaria leaf spot on Impatiens

Treatment	Rate/100 gal.	# leaves with marginal burns/plant 5-21-10	# spots/plant 5-27-10
Water noninoculated	----	0.0 a	0.1 a
Water inoculated	----	0.2 a	58.3 d
Heritage	4 oz 7 days	0.0 a	3.7 ab
Heritage	4 oz once	0.1 a	4.2 ab
Experimental strobilurin	2 oz 7 days	2.5 b	14.8 bc
Experimental strobilurin	4 oz 7 days	3.4 c	15.3 bc
Experimental strobilurin	5 oz once	3.0 bc	22.5 c
Experimental 2	64 oz 7 days	0.0 a	9.3 ab
Experimental 2	128 oz 7 days	0.0 a	7.5 ab
Camelot	48 oz 7 days	0.3 a	1.6 a
Camelot	48 oz once	0.0 a	4.0 ab

Numbers in the same column followed by the same letter are not statistically different (Student-Newman-Keuls Method).

# UPDATED DOWNY MILDEW CONTROL CHART

I have included for reference an updated chart of our downy mildew trials. It is especially critical with downy mildew to follow label directions on rotations. Downy mildew fungi make a tremendous number of spores and rapidly become resistant to many active ingredients (and others with the same MOA number) if a single MOA is used exclusively. The second column shows the MOA for these fungicides including a few that are pre-mixes and contain active ingredients in two MOA groups. Since it appears that not many of us like to read labels and are somewhat numerically challenged I decided to color code these fungicides based on their MOA group. For those of you who like color better than numbers this may help. For the others it will probably end up being very distracting.

Please just try to alternate between at least two MOA groups. And no matter how much you might want to—do not spray more than twice a week. The added water from fungicide sprays more often can end up giving you more downy mildew and not less.

Finally, Subdue MAXX is now legal for use on downy mildew on ornamentals in many states. The label does restrict usage to a tank mix with another product that is labeled for downy mildew. It also has a **48 hour REI**. (The 0 REI still applies to drench applications for *Pythium* or *Phytophthora*.)

**Buddleia downy mildew**



Product	Mode of Action Grouping	Efficacy
<b>Adorn</b>		Very good
<b>Aliette</b>	33	excellent
<b>Alude</b>	33	excellent
<b>Camelot</b>	M1	Poor to very good
<b>Clevis</b>	3 and M3	Very good to excellent
<b>Compass O</b>	11	Good to very good
<b>Cygnus</b>	11	Some to excellent
<b>Daconil Ultrex</b>	M5	Some
<b>Dithane</b>	M3	Good to very good
<b>FenStop</b>	11	Very good to excellent
<b>Fosphite</b>	33	Good
<b>Heritage</b>	11	Very good to excellent
<b>Insignia</b>	11	Good to excellent
<b>Junction</b>	M1 and M3	None to very good
<b>Kocide TNO</b>	M1	Poor to very good
<b>Milstop</b>	nc	None to excellent
<b>Pageant</b>	7 and 11	Very good
<b>Phyton 27</b>	M1	Very good
<b>PlantShield</b>	nc	Poor to fair
<b>Protect T &amp; O</b>	M3	Fair to good
<b>Rhapsody, Cease</b>	nc	Some to good
<b>Segway</b>	21	Excellent
<b>Spectro</b>	1 and M5	None
<b>Stature DM or SC</b>	40	Excellent
<b>Strike</b>	3	Poor to excellent
<b>Subdue MAXX</b>	4	Excellent
<b>Triact</b>	nc	Poor to fair
<b>Vital</b>	33	Very good to excellent

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