

One of the newest classes of fungicides for ornamentals is called strobilurin. The original compound, strobilurin A, was isolated from a mushroom called *Strobilurins tenacellus* found growing on decaying wood in a European forest. The products that have been developed were synthetically derived by Zeneca (then ICI) in 1982 and BASF in 1983, with Novartis (then Ciba Geigy) following soon thereafter. We have been researching several fungicides in this chemical class including kresoxim-methyl (Cygnus), trifloxystrobin (Compass O), azoxystrobin (Heritage) and most recently pyraclostrobin (BAS500).

Cygnus 50WDG is described as a surface-systemic (low translaminar movement) with redistribution by the air. This means that a small amount of the chemical moves into the leaf, but it is redistributed via air (it volatilizes). Practically speaking, it means that active ingredient reaches areas on the same leaf that were not directly sprayed. This is a big help in controlling powdery mildew especially. BASF developed kresoxim-methyl but the product is marketed in our industry by Scotts Horticultural Products.

Heritage 50WG (Syngenta Crop Protection) was the next strobilurin to reach the ornamental market. The active ingredient has systemic activity with upward movement. This means when sprayed onto the base of a leaf Heritage will move out to the edges (tip). If drenched, it will move into the root system and throughout the plant. However, if it is sprayed onto leaves it will not move downward into the stem and roots.

Compass 50WDG is more like Cygnus than Heritage. Compass was originally devel-

oped and marketed by Novartis Crop Protection. With the merger of Novartis and Zeneca in 2000, Compass O was sold (factory and all) to Bayer. Olympic Horticultural Products now markets Compass O to the ornamental industry. Compass is described as mesostemic to indicate both protectant and curative capacity. Compass molecules redistribute via air in a similar fashion to Cygnus.

The newest strobilurin is pyraclostrobin from BASF Corporation. This product has been developed for control of turf grass diseases but we started extensive testing on ornamental diseases in 2002. The product will be recommended primarily as a protectant although the turf product is described as preventative and curative. Pyraclostrobin molecules are not redistributed by air making it more similar to Heritage than to Cygnus and Compass.

There are several other fungicides in this group that have been developed for agricultural uses. In addition, we have worked on a related compound called fenamidone (Bayer). This fungicide is not a strobilurin but closely related and cross-resistance to strobilurins is known to occur. We have checked fenamidone against *Pythium* root rot, *Phytophthora* aerial blight and downy mildew (page 4).

An excellent review of strobilurins was recently published in *Pest Management Science* (58:649-662) by Bartlett, et al. (2002). The authors summarized efficacy of the strobilurins against the major fungal diseases.

Azoxystrobin is reported to have good efficacy for everything listed from powdery mildew, rust and downy mildew to leaf spots caused by *Alternaria* and *Helminthosporium* and *Pythium* blight on turf. In contrast, kresoxim-methyl is listed as providing good control of powdery mildew alone.

Trifloxystrobin is listed with a broad spectrum of good efficacy with the exception of rust (poor control) and downy mildew (moderate control).

Finally, pyraclostrobin looks identical in activity level and degree to azoxystrobin. This is especially interesting when you consider that it does not have the systemic action of azoxystrobin.

I have found that testing ornamental diseases encompasses a broader range of fungal pathogens than the worldwide fungicide markets (grains, vines, bananas and tomatoes). Keep reading for some in depth comparisons of strobilurins as well as our current summary of efficacy.

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# SOME DIRECT COMPARISONS OF STROBILURIN FUNGICIDES

Although the strobilurin fungicides have some things in common, they are not interchangeable. It is easiest to see their differences when comparing them side by side for a variety of diseases. This year we did some trials to simply satisfy my curiosity. The graphs and table to the right are a few of the most recent trials.

In the scab-poinsettia trial we saw all four of the fungicides give excellent prevention of the disease (dark green bars). There were no obvious differences in the plants until you checked out how red the Freedom Red had become. BAS500 (pyraclostrobin) significantly reduced the development of bract color in this trial.

We have been testing Heritage (and occasionally Compass) for rust control on Hypericum and snapdragon. Heritage has proven excellent at prevention and also eradication when used with a wetting agent such as Latron B 1956. Our trials have also shown that Compass provides good preventative control in some cases. The trial we report here was started to see if the strobilurin fungicides would perform similarly when used to eradicate geranium rust. We inoculated the geraniums and waited for the first pustules to appear. Then we started spraying.

The differences between the products were immediately apparent. Heritage stood head and shoulder above the others in the trial. This was probably since Heritage is the only one of the group with systemic action. Cygnus and BAS500 were moderately effective but Compass failed completely.

In the final comparison, we tested Sclerotinia blight control on petunias. Best control was achieved with Heritage, Com-

pass and BAS500 (8 oz/100 gal). Top grade was low for the Cygnus treatment since the product failed to give disease control thus resulting in poor top growth. There were no signs of phytotoxicity in this winter test but later in the spring we did find that the products caused some stunting and delay of flowering.

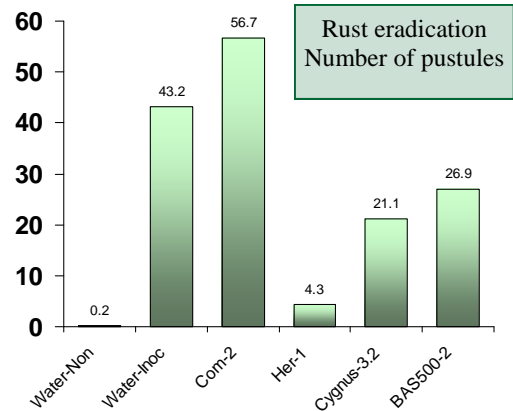
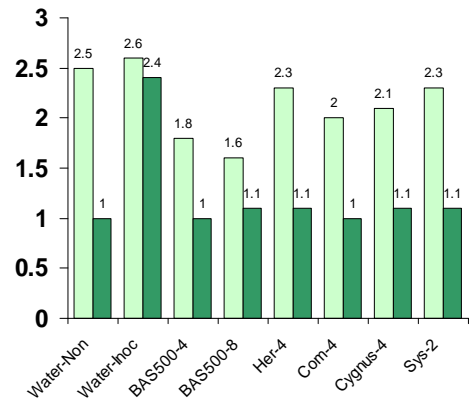
Checking the summary table on the next page shows a relative comparison of these fungicides in many other ornamental disease trials. Keep in mind that they were not always tested in the same trial. You should also remember that results are variable and those reported here are simply the average of our trials alone.

Overall, our trials are showing Heritage to have the widest range of good activity and Cygnus the most narrow. Tests next year will include BAS500 in many more trials compared to Heritage at least. We are currently planning one on Cercospora leaf spot on pansy.



Geranium rust is caused by *Puccinia pelargonii-zonalis*. Zonal geraniums are the most sensitive to this rust fungus. The concentric rings of pustules give the fungus its name "zonalis."

Poinsettia scab control—dark green bars are for disease and light green are for degree of bract color.



## Relative efficacy and safety of Strobilurin fungicides for Sclerotinia blight on Petunia

Treatment	Rate/100 gal	Disease	Top Grade
Noninoculated	---	1.0 a	4.5 c
Inoculated	---	3.0 c	3.4 a
BAS500	4 oz	2.5 c	4.1 bc
BAS500	8 oz	1.5 ab	4.1 bc
Compass O	4 oz	1.3 ab	3.8 ab
Cygnus	3.2 oz	2.8 c	3.3 a
Heritage	4 oz	1.1 ab	3.8 ab
Decree	16 oz	3.0 c	3.9 b

A disease rating of 1 = no disease and 5 = dead plant.

A top grade of 5 = excellent and 1 = dead plant.

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

## SUMMARY OR EFFICACY OF STROBILURIN FUNGICIDES 1996-2002

## Field Notes Keith Hunderfund

Disease	BAS500	Compass	Cygnus	Heritage
Alternaria leaf spots		B+	C	B+
Botrytis blight	A-	A-	Not tested	B-
Cylindrocladium cutting/root rot		B	Not tested	B
Downy mildew	A	B+	C	A
Fusarium leaf spot	Not tested	B	Not tested	B+
Fusarium wilt		B	Not tested	B+
Myrothecium leaf spot	Not tested	A	Not tested	A
Phytophthora root rot/aerial blight	A-		Not tested	A-
Powdery mildew	A-	A	A-	A-
Pythium root rot	B+	C	Not tested	B-
Rhizoctonia damping-off/stem rot	B		Not tested	A
Rust	A prevent C cure	A prevent C cure	C cure	A prevent A cure
Scab-poinsettia	A	A	A	A
Sclerotinia blight	A-	A-	D	A
Thielaviopsis black root rot	Not tested	F	Not tested	F

KEY to grades—A = excellent control , B = good to very good control, C = Some control and F = No control.. Rust control was tested preventatively and curatively.

### Eradication of Algae on Soil Surfaces with Coppers

Working with plug producers can be very interesting and is ever changing and challenging. One problem we all face is algae control. It can be especially critical to plug producers since the initial absence of a competitor for the algae and abundant water and fertilizer make algae grow great in plug flats. Algae causes many problems by attracting fungus gnats, limiting water movement in the cells and robbing the plants of needed nutrients.

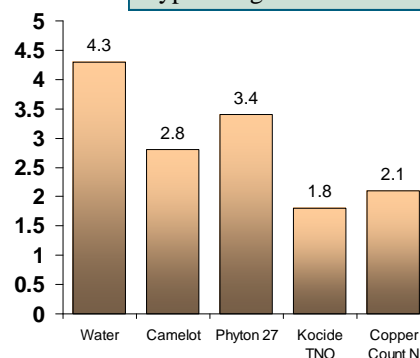
We have been trying some disinfectants like bleach and hydrogen peroxide as well as an old standby— copper. Early tests showed that although a weekly spray of 10% bleach did a great job of controlling algae it also resulted in severe damage to the seedlings. Hydrogen peroxide on the other hand was somewhat safer but also less effective in controlling the algae.

In the same trials, we found that Camelot gave excellent control of the algae without damaging the seedlings (wax begonia and lisianthus). It was applied as a weekly spray of 1 pint/100 gal.

Since then we have tested a few other coppers for their ability to eradicate algae on a typical plug medium. The graph to the right summarizes the reduction in algae after a single application of one of the four copper fungicides. Pots were rated on a scale from 1 = no algae growth to 5 = severe algae growth (all pots were rated 4 or 5 at the beginning). Products were used at 16 oz/100 gal.. Best control occurred with Kocide TNO. Phyton 27 gave the poorest response.



Typical algae on soil surface

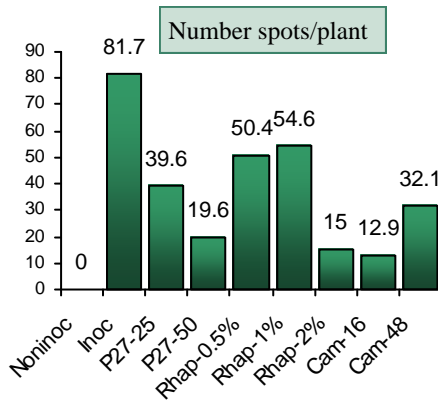


## BIOLOGICAL CONTROL OF XANTHOMONAS BLIGHT ON GERANIUM!!!!

Here is a quick report for a trial we just finished on Xanthomonas blight on geraniums. We looked at a couple of copper products (Phyton 27 and Camelot) as well as a biological product called Rhapsody. This is *Bacillus subtilis* made by Agraquest. We treated once before inoculating and then kept treating on a weekly interval.

In earlier trials on Pseudomonas leaf spot we saw very good results with all three products. The Xanthomonas trial was similar. Best control was found with Rhapsody at 2% or Camelot at 1 pint/100 gal. One of the most exciting aspects of using this biological control agent is that it is resistant to copper. You do not need to worry about killing Rhapsody if you follow up with a copper application.

Thanks to Goldsmith Seeds for supplying the beautiful plants we mercilessly destroyed in this trial.



Xanthomonas blight on zonal geraniums can start in propagation. Be sure to check plants for watery spots.

## INTRODUCING FENAMIDONE

We have been researching a new active ingredient for the past 4 years. The common name for the product is Fenamidone and it is related to the strobilurin fungicides. It is currently part of the Bayer product group and we are expecting to see an ornamental registration sometime in the next two years.

The product is specific for the "water mold" fungi and their close relatives the downy mildews. We have tested it against Phytophthora aerial blight of vinca (twice), Pythium root rot on geranium., and downy mildew on alyssum, snapdragon and pansy. The table directly below shows the results of the vinca trials

Phytophthora aerial blight trials with Fenamidone

Treatment	oz/100 gallons	1999	2000
Noninoculated	—	1.0 a	1.0 a
Inoculated	—	3.8 b	2.6 bcd
Fenamidone	14	1.0 a	1.4 ab
Fenamidone	28	1.0 a	1.2 ab
Fenamidone	42	1.0 a	1.1 a
Aliette	48	1.4 a	1.4 ab
Subdue Maxx	0.6	1.0 a	1.6 ab

The results from both seasons show very good to excellent prevention of Phytophthora aerial blight on vinca. Fenamidone was used as a drench on a 30 day interval. We saw similar control of Pythium root rot on geranium.

We have also tested these Fenamidone rates against downy mildew as a foliar spray every 14 days. On alyssum and snapdragon the fungicide was 100% effective in prevention.

Last season we tested Fenamidone for pansy downy mildew with much lower rates and different application methods. We included a 5 and 7 oz/100 gal drench, 7 oz/100 gal sprench and 7 oz/100 gal spray. All rates and application methods were, yet again, 100% effective in preventing this downy mildew.

This is a real breakthrough in downy mildew management. If we can apply Fenamidone as a soil drench at a low rate we will see much improved control of downy mildew. Simply getting rid of the water on the leaves from a fungicide spray will be a huge improvement.

Do you have a copy of **CHASE'S FUNGICIDE ROTATION GUIDE**? This handy tool allows you to choose the very best products in a safe and successful rotation for disease control. Why frustrate yourself by trying to learn chemical classes when we have done the work for you. Order yours today![www.chaseresearchgardens.com](http://www.chaseresearchgardens.com) or call (530)620-1624.



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### CHASE RESEARCH GARDENS, INC.

8031 Mt. Aukum Rd., Suite F, Box 529

Mt. Aukum, CA 95656-0529

Phone/FAX (530)620-1624

[mtaukum@directcon.net](mailto:mtaukum@directcon.net)

