

CHASE NEWS

Chase Horticultural Research, Inc.

Volume 8—Issue 1

Do Adjuvants Improve Foliar Disease Control?

In the past ten years, we have tested the benefits of adding adjuvants (including Latron B 1956, Capsil, Silwet, Break-thru, Sync and Crocker's Fish Oil) to fungicides. In each test, we included an effective fungicide with or without one of these wetting agents. Trials were completed on plants with Botrytis blight, downy mildew, powdery mildew or rust. The table shows results of all of our trials on wetting agents and fungicides for foliar disease control.

In general, wetting agents improved control of fungicides for powdery mildew and rust. In contrast, wetting agents were often ineffective in improving efficacy of fungicides for downy mildew and sometimes actually reduced control achieved by the fungicide alone. Sometimes, no benefit was seen when a wetting agent was added since the fungicide alone provided excellent control.

One interesting aspect of wetting agents and powdery mildew is that most of them give varying degrees of control of these diseases when used alone. We have seen this phenomenon on rose, gerber daisy and rosemary. The products included Capsil, Latron, No-Foam A, Crocker's Fish Oil and Sync. Unfortunately, the majority of these adjuvants were not effective on any other disease we have tested (downy mildew and rust).

Whether or not the fungicide is a contact product like Daconil Ultrex or Protect or a systemic product like Heritage does not appear to affect potential benefits of adding wetting agents. In addition, the specific type of wetting agent (ionic, nonionic or silicon-based) is also less important than the disease target. So – the answer to the question is that adjuvants (wetting agents) can play a very impor-

Disease-crop	Fungicides tested	Adjuvants tested	Effect on Control
Botrytis blight on geranium	Decree	Latron B 1956	None (excellent alone)
Downy mildew on snapdragon	Protect T&O, Daconil Ultrex	Latron B 1956, Break-thru	Less control
Downy mildew on snapdragon	Protect T&O, Compass O	Break-thru, Latron B 1956	Better control
Downy mildew on snapdragon, stock	Daconil Ultrex, Heritage	Break-thru, Latron B 1956	None (excellent alone)
Powdery mildew on crape myrtle, gerber daisy, hydrangea, rose	Trinity, Insignia, Compass O, Heritage	Triton, Sync, Latron B 1956, Crocker's Fish Oil	Better control
Rust on Bellis, Hypericum, snapdragon	Insignia, Heritage, Pageant, Compass O, Decree	Crocker's Fish Oil, Latron B 1956, Capsil., Silwet	Better control

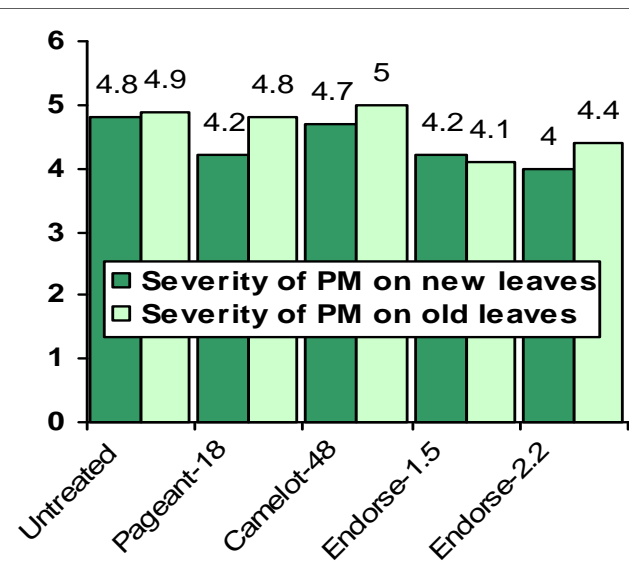
tant and sometimes critical role in getting the most from your fungicide applications. It can be as important as diagnosis of the disease and choosing the right fungicide. Watch for more tests on this important research area in the upcoming year.

(Originally published in GMPro January-2009)

CONTENTS

WOODY ORNAMENTAL FOCUS—Rose Mildews	2
PERENNIAL PLANTS PAGE (ZeroTol for daylily rust control, Some hosts of Phytophthora, and Powdery mildew on <i>Vinca major</i>)	3
RESEARCH ROUND-UP (Rose black spot and powdery mildew control, Alternaria pod rot control, and TMV control with milk)	4
DISEASE CONTROL WITH POLYOXIN D	5
PRODUCTS OF REVIEW—Fungaflor TR	6

We have been doing a series of trials on diseases of roses grown in commercial production with Gary Osteen, our partner in the central valley of California. These garden roses are affected by foliar diseases including powdery and downy mildew. Late last year, we started two trials—the first on tree roses ‘Baby Blanket’ with moderate powdery mildew (*Sphaerotheca pannosa*) and the second on *Rosa* ‘Sunny Knock-Out’ with moderate downy mildew (*Peronospora sparsa*). The roses were sprayed weekly, four times to evaluate ability of the fungicide to both eradicate and prevent new disease. Conditions for both disease were ideal during the trial period.



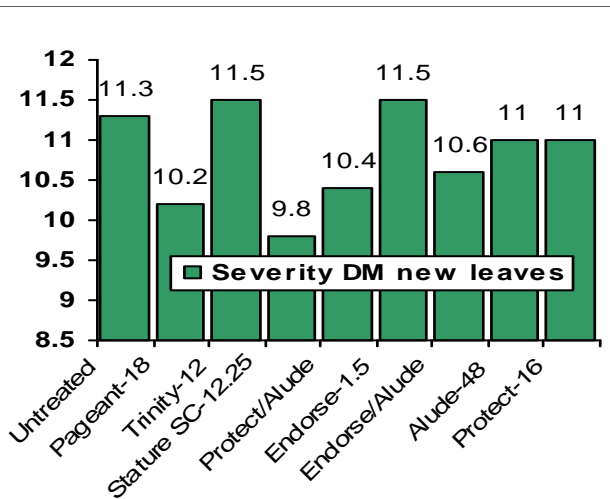
The powdery mildew trial included the following treatments: untreated, Endorse (1.5 and 2.2 lbs/100 gal), Pageant (18 oz) and Camelot (48 oz). One week after the final spray, we rated the severity of powdery mildew on the older leaves to judge eradication and the severity on new leaves to judge prevention (both ratings were on a 1=none to 5 = maximum disease scale). Although disease increased to a very high level on both old and new leaves, we did see a significantly lower level of powdery mildew on the new leaves that were sprayed with Pageant and both Endorse treatments. Eradication was highest with the 1.5 lb rate of Endorse.

The downy mildew trial included the following treatments: untreated, Pageant (18 oz/100 gal), Trinity (12 oz), Stature SC (12.25 oz), Protect DF (16 oz), Alude (48 oz), Endorse and Latron B 1956 (1.5 lb and 4 oz), Endorse and Alude (1.5 lb and 48 oz), Protect DF and Alude (16 oz and 1.5 lb). Disease continued and was very high by the rating date (12-23-08). In this case, disease was rated from 3 (no symptoms) to 15 (100% leaf drop due to downy mildew). Once again, Gary and I evaluated control of the original infection as well as prevention of new infections. Most of the treatments were not able to prevent new infections under the high disease pressure. Only



the Pageant, Stature SC and combination of Protect and Alude reduced new infections. The ability of the plant to retain older infected leaves was also only improved by Pageant and Stature SC.

These trials show that when the environment is ideal for disease development, even the best fungicides may have only a minimal effect.



ZEROTOL FOR DAYLILY RUST CONTROL—One of the ways that diseases are being controlled includes use of disinfectants like quaternary ammonium products, chlorine dioxide and hydrogen dioxide. Dr. Warren Copes, USDA/ARS, Poplarville, MS



has been testing safety and efficacy of these products for the past 5 or 6 years at least. Most recently, Dr. Copes published results of work on controlling daylily rust with hydrogen dioxide (ZeroTol). The ability of this product to prevent rust on daylilies was higher as the concentration of the product increased as well as the frequency of use. When the product was used at the highest labeled rate applied 2-5 times per week, it was equal to fungicide control under moderate disease pressure. Under high disease pressure control was significant but not as good as the fungicide control. The zero re-entry interval makes this product an attractive alternative for low to moderate disease control in some situations. **Crop Protection 28 (2008) 24-29.**

POWDERY MILDEW ON VINCA MAJOR— Dr. Dean Glawe, Plant Pathologist at Washington State University has been identifying new powdery mildew pathogens for a number of years. He has added a great deal to the understanding of these pathogens on ornamentals including *Vinca major*. This crop has been gaining in popularity in the last 4-5 years with the introduction of a large number of color variants. A crop that was for years a simple ground cover is now an important perennial. In 2005, Dr. Glawe working with Steven Koike (Farm Advisor—Salinas, University of California) found powdery mildew on a perennial planting of periwinkle in 2005. The spots form slowly on the older leaves in frosty patches that turn gray with age. The pathogen was identified as *Golovinomyces orontii* and is believed to be the first report of powdery mildew on vinca in North America. Other hosts of this powdery mildew pathogen have not been reported yet. **Plant Health Progress doi:10.1094/PHP-2008-1212-03-BR.**

Some hosts of *Phytophthora* (Chase diagnostics 2005-2008)

- Acorus
- Delphinium
- Dianthus
- Epimedium
- Euphorbia
- Hakonechloa
- Heuchera
- Hosta
- Hydrangea
- Iris
- Lavender
- Lily
- Lupine
- Moraea
- Oregano
- Oxalis
- Phlox
- Polemonium
- Rosemary
- Vinca minor



Phytophthora crown rot on Lavender (left), Polemonium (middle) and Phytophthora root rot on Rosemary (right)



ROSE BLACK SPOT AND POWDERY MILDEW CONTROL—I

always look forward to publication of other researchers trials on ornamental diseases. Dr. Bob Mulrooney (University of Delaware) has been kind enough to share his results on rose diseases for the past few years. Bob evaluated control of both powdery mildew and black spot on rose with Pageant (BASF Corp. at 18 oz/100 gal) and Trinity (BASF Corp., not registered on ornamentals at 12 oz/100 gal) and Eagle 40WP (=Systhane at 4 oz/100 gal). All treatments were applied on a 14 day interval throughout most of the summer. Black spot was most effectively controlled with Pageant but also was significantly reduced with Trinity or Eagle which are both sterol inhibitors. Powdery mildew was only controlled with the Eagle in this trial. Please write me for a copy of the complete report.



Fungicide (active ingredient)	Ornamental product	Degree of Control
Iprodione	Chipco 26019	some
Thiophanate methyl	3336, Fungo	some
Cyprodinil + fludioxinil	Palladium*	some
Copper hydroxide	Kocide	good
Chlorothalonil	Daconil Ultrex	good
Azoxystrobin	Heritage	good
Pyraclostrobin	Insignia	good

ALTERNARIA POD ROT CONTROL—A

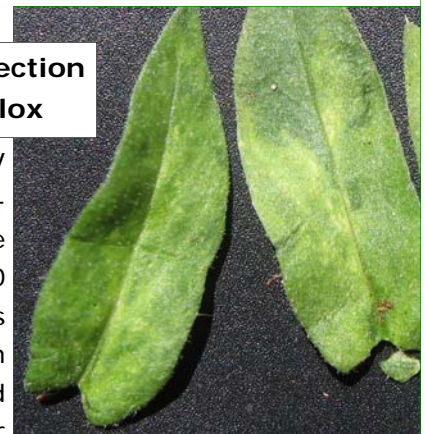
recent report on Alternaria pod rot of snap beans in **Plant Health Progress doi:10.1094/PHP-2008-1212-01-RS**—included efficacy of a variety of fungicides. Since the pathogen (*Alternaria alternata*) is also an ornamental pathogen and the products tested contain the same active ingredients as those used on ornamentals I include relative efficacy here. The result on this pod rot trial showed the same relative level of activity as our ornamental trials with the same pathogen. The strobilurins (Heritage and Insignia), Kocide and Daconil each provided good control. This further supports the observation that the exact host is not as important in determining the efficacy as the exact target pathogen.

***Palladium TM (Syngenta Professional Products) is not currently labeled for use or sale in the United States.**

TMV CONTROL WITH MILK—I

occasionally give talks that include virus disease prevention. My most recent talk on the topic yielded some information I was not aware of on the use of milk to control TMV (tobacco mosaic virus). It pays to ask for questions, since now I know something I did not before the talk. The original research was performed in the 1950's on tobacco for prevention of TMV transmission. TMV survives up to 50 years in dried host tissue and is mainly transmitted by mechanical methods like contaminated hands or tools. Use of milk products has been successful in reducing transmission of TMV. Various recommendations include 1 lb dried milk per gallon sprayed onto transplants immediately prior to handling. Other articles indicate spraying beds with 0.5 gal/100 square feet skim milk. A report from Ontario Ministry of Agriculture Food & Rural Affairs indicates that all milk products are not equally effective. Skim milk is as effective as whole milk but the protein content should be 3.5% or more. Buttermilk and evaporated milk were not as effective. Remember that this method has not been shown to be effective for other viruses.

TMV infection in Phlox



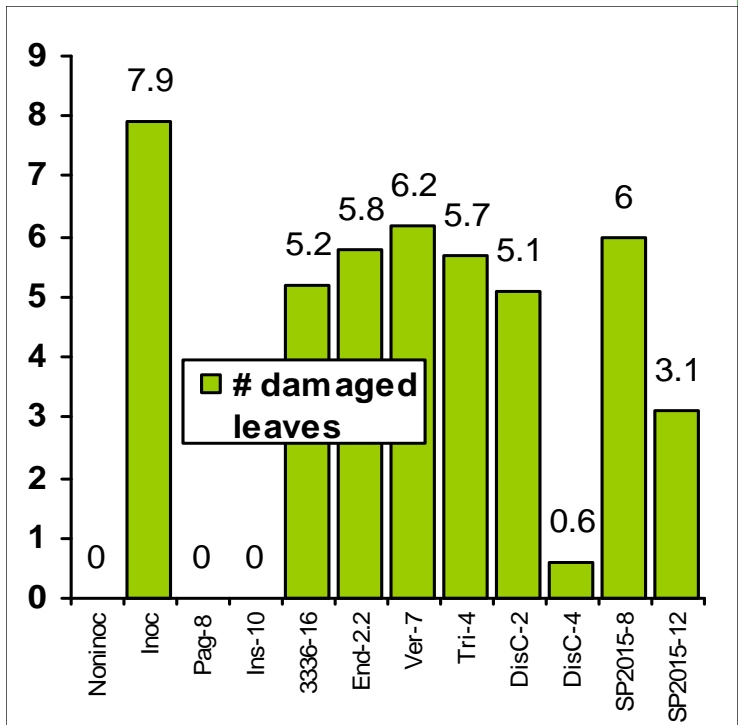
Most of our trials on Rhizoctonia have been performed during the summer when temperatures are highest and Rhizoctonia pressure very high. I recently started to wonder if I could work on the pathogen during the winter and found that I could. We started two trials on two fungicides containing polyoxin D. We are most familiar with Endorse WP a wettable powder formulation available from Cleary Chemical. In the past year, a different formulation has been introduced by OHP, Veranda O. The treatments used in these two trials were: noninoculated control, inoculated control, Medallion (0.5 oz/100 gal - fludioxinil from Syngenta), Endorse (1.5 or 2.2 lb/100 gal) and Veranda O (3.5 and 7 oz). The products were applied as sprays once before inoculation with *Rhizoctonia solani* and again one week later. Seed germination was used to determine control of Rhizoctonia on Celosia and cutting rot (1=none to 5=dead) was used to evaluate disease control on poinsettia 'White Star'. The table above shows results for both trials clearly demonstrating that this active ingredient was effective in preventing Rhizoctonia diseases during the winter. Severity of damping-off on Celosia was as severe as that seen under warmer conditions although slower to develop. Severity of poinsettia cutting rot was lower than we see during the summer when ratings often reach the maximum of 5 for the inoculated controls.

Treatment	Rate/ 100 gal	Celosia # seedlings	Poinsettia cutting rot
Noninoculated	_____	19.0 b	1.0 a
Inoculated	_____	0.4 a	2.5 b
Medallion	0.5 oz	14.9 b	1.1 ab
Endorse	1.5 lb	21.0 b	1.2 ab
Endorse	2.2 lb	22.5 b	1.3 ab
Veranda O	3.5 oz	17.8 b	1.3 ab
Veranda O	7 oz	21.5 b	1.6 b



We tested polyoxin D in a cyclamen anthracnose trial that was started in late November last year. In this case we included many other products. Our most recent outbreak of this disease may manifest as spots but is also causing complete destruction of new leaves. We applied fungicides twice as foliar sprays before inoculation with *Colletotrichum* and twice afterward for a total of four weekly applications.

Treatments included: noninoculated control, inoculated control, Pageant (8 oz/100 gal), Insignia (10 oz), Cleary 3336 (16 oz), Endorse and Latron B 1956 (2.2 lb and 4 oz), Veranda O (7 oz), Trinity (4 oz), Disarm C (strobilurin from OHP at 2 or 4 oz/100 gal) and SP2015 (experimental fungicide from SePRO Corp. at 8 or 12 oz). Excellent prevention of anthracnose was seen with products containing a strobilurin including Pageant, Insignia and the 4 oz rate of Disarm C. In addition, the higher rate of SP-2015 also gave significant disease control. The polyoxin D products were not as effective although some reduction in anthracnose did occur. Further testing with other strobilurins is planned.



Over ten years ago, we started working with Whitmire Micro-Gen to develop information on total release (TR) fungicides. I did not originally have much faith in the method since disease control is very different than insect and mite control where total release and low volume were proven. Pathogens like *Alternaria* and *Pseudomonas* do not move around the leaf surface the way many insects and mites do and coming into contact with the fungicide or bactericide has relied on coverage. We were, however, very pleasantly surprised to see how effective these total release fungicides were for a variety of diseases.

In 2008, we finally have a registered product – Fungaflor TR (Whitmire Micro-Gen). The active ingredient in this product is imazalil which is not labeled for other uses in the greenhouse ornamental industry to my knowledge. Imazalil belongs to the sterol inhibitor class of fungicides which includes Eagle, Banner MAXX, Strike and Terra-guard. The labeled sites are greenhouses on a wide range of plants from bedding plants, to cut flowers, to flowering hanging baskets and foliage plants. The target diseases include *Alternaria* leaf spot, *Botrytis* blight and leaf spot, downy and powdery mildews and rust diseases. The use rates are given in cans per 3000, 1500 and 1000 square feet and the REI is 24 hours.



We performed quite a few trials over the years with Fungaflor TR and they are summarized in the table. We found best control of *Alternaria* leaf spot on *Impatiens*, downy mildew on stock and powdery mildew on gerber daisy. Although we saw good control of *Botrytis*, the product had to be used at the higher end of the labeled rate to insure optimal results. We actually did four trials on *Botrytis* blight to narrow down the rate range and each trial employed a different chemical standard. In each trial the Fungaflor TR performed as well as the fungicide standard which was applied as a wet spray. Unfortunately, none of our trials sought to evaluate

Disease	Plant	Application interval	Degree of control
<i>Alternaria</i> leaf spot	<i>Impatiens</i>	Weekly	Very good to excellent
<i>Botrytis</i> blight	Pansy, Salvia, Hydrangea	Once on pansy flowers, weekly on salvia and Hydrangea	Some to very good
Downy mildew	Snapdragon, stock	weekly	Some to very good
Powdery mildew	Gerber daisy	weekly	Very good eradication

Botrytis on pansy



the possibility that the Fungaflor TR could control disease better than an imazalil wet spray.

We also worked on another active ingredient and in that case, the TR product was directly compared to a wet spray of the same active ingredient. The target diseases have been *Alternaria* leaf spot, *Botrytis* and *Rhizoctonia* for this product. Results have shown consistent and equivalent control of the two foliar diseases when the TR product was compared to the wet spray. We

did not see any benefits from using the TR method over the wet spray but efficacy was very high. We have even looked at a TR copper product that showed a high degree of efficacy. If the application method does not result in better control than a wet spray we will still have achieved benefits in reducing worker exposure and costs of labor in applying



Contact Us:
www.chasehorticulturalresearch.com or
archase@chaseresearch.net.

these products. In the future, we hope to see more TR products available.

