

CHASE NEWS

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What You Should Know About Using the New Fungicides

Last month I started a brief overview of the newest fungicides for ornamentals and/or greenhouse vegetables and/or greenhouse vegetables. I limited myself to those registered since 2010. I asked the following questions concerning which fungicides/bactericides had labels that included:

Greenhouse vegetable and herbs

Regalia, RootShield Plus, Micora, Affirm and Veranda O and Phyton 35 are each labeled for at least some greenhouse grown herbs and vegetables.

Organic certification

The new products that have organic labeling are RootShield Plus, Regalia and Camelot O.

Products with two active ingredients

Orvego, Palladium and RootShield Plus each have two active ingredients. Orvego is a mixture of

dimethomorph (ai in Stature) and ametoctradin (a new ai for ornamentals). Palladium consists of fludioxonil (ai in Medallion) and cyprodinil (a new ai in ornamentals). RootShield Plus is a combination of *Trichoderma harzianum* T-22 and *Trichoderma virens* G-41. The new diseases mentioned for control include *Phytophthora* and *Fusarium* (additions to *Pythium* and *Rhizoctonia*).

Tank-mixing only requirements

Adorn has a mandatory statement requiring tank-mixing for all uses.

Greenhouse use only

KleenGrow

Nursery and landscape only

Tourney

Downy mildew and Phytophthora only as target diseases

There are several new products that work on these two diseases including Orvego, Adorn and Micora.

The table to the right shows the MOA groups and REI for these new products. Both facts are useful in deciding how to incorporate them into an existing disease prevention program.

Each of these new products has special features from those that make them easier to use (like organic certification) to those that make them more difficult to use (tank-mixing for any use of Adorn). We have even seen some new labeling for the previously ignored crops like greenhouse grown vegetable transplants and herbs. Now it is up to each of us to read the labels completely and follow them carefully.

PRODUCT	REI	MOA
Adorn	12 hr	43
Affirm	4 hr	19
Camelot O	4 hr	M1
Disarm O	12 hr	11
KleenGrow	48 hr	nc
Micora	4 hr	40
Orvego	12 hr	40 and 45
Palladium	12 hr	9 and 12
Phyton 35	48 hr	M1
RootShield Plus	4 hr	44 and nc
Regalia	4 hr	nc
Torque	12 hr	3
Tourney	12 hr	3
Veranda O	4 hr	19



Daylily Leaf Streak Control

Efficacy of fungicides on daylily leaf streak

TREATMENT	OZ/100 GAL	DISEASE SEVERITY
untreated	-----	3.7 ab
Heritage	8 oz	2.3 bcdef
Daconil 82.5 WDG	24 oz	2.0 abc
Medallion	10 oz*	3.3 abc
Hoist 40WP	2.3 oz	1.3 ef
Contrast	3 oz	3.0 abc
Contrast	6 oz	2.7 bcde
Terraguard	2 oz	1.7 ef
Terraguard	4 oz	2.7 bcde
ZeroTol	12 oz	2.3 bcdef
Banner MAXX	8 oz	3.0 abcd
Cleary 3336	4 lb*	1.0 f

*-off label rate for ornamentals

Leaf streak was evaluated on the following scale: 1=less than 5%, 2=5-10%, 3=10-20%, 4=20-50% and 5=50-100% defoliation.

Numbers in the same column followed by the same letter are not statistically different. 1=no disease and 5=severe disease.

One of the most common diseases of daylily is leaf streak caused by *Aureobasidium microstichum*. It occurs throughout the country usually soon after leaf emergence in the spring. It can continue throughout the summer where rainfall occurs or plants are irrigated overhead.

A trial was conducted in 2002 by Kirk, Schafer and Berry (MSU). They used a variety of fungicides for prevention of daylily leaf streak on 'Stella D'Oro'. Fungicides were applied as sprays on a 14-day interval for a total of four applications.

By the end of the trial, leaf streak was severe. Daconil, Terraguard (2 oz/100 gal), Cleary 3336 (4 lb/100 gal) and Hoist 40WP (2.3 oz/100 gal) treatments had significantly less severe disease than the untreated controls. Be sure to follow current fungicide labels at all times.

Organic Fungicides for Control of Apple Scab

Apple scab is caused by the fungus *Venturia inaequalis*. The fungus attacks both leaves and fruit of apples and ornamental crab apples and a closely related fungus *V. pirini* attacks pears. Spots start yellow but as they age become dark and olive-colored on leaves and fruit, and sometimes stems. Undersides of leaf spots sometimes look velvety due to fungal growth. Infected leaves twist or pucker and severely affected leaves often turn yellow and drop.

Controlling the disease in organic production is a special challenge. In 2011, researchers from the University of Vermont (Cromwell, Berkett and Darby) published on evaluations of some organic fungicides for this disease. They used: potassium bicarbonate (Armicarb), neem

oil (Trilogy) and *Bacillus subtilis* (Serenade MAX). These were compared to a standard treatment of organic sulfur (Microthiol Sulfur)/lime sulfur (Miller Lime Sulfur). The apple cultivar tested was 'Empire' in both 2007 and 2008. Initially applications were weekly (end of April through end of June) finishing with every two weeks (until the end of July).

The best control of apple scab was with the standard organic sulfur/lime sulfur treatment in both years. Neem oil also reduced scab severity and had some insecticidal activity as well in one year. Unfortunately, both the neem oil and standard treatments resulted in significant russetting of fruit at harvest. It was interesting that the researchers also saw increased severity of insect damage

compared to the untreated controls when *B. subtilis* was used.

The authors conclude that the alternatives are not as effective as the standard treatments with sulfur/lime sulfur and may even result in increased insect damage.



Control of Hollyhock Rust

One of the most common rust diseases across the country is found on hollyhocks (*Alcea*) and is caused by *Puccinia malvacearum*. It is also known to occur on common cheese weed (*Malva*). The rust appears as tiny sunken yellowish spots on the tops of affected leaves with the gray to brown rust spores obvious when the leaves are turned over. The rust can also attack the stems of the hollyhocks. Other hosts include:

- Althaea* (= *Alcea*)
- Hibiscus syriacus* (Rose-of-Sharon)
- Lavatera* (tree mallow)
- Malvastrum* (false mallow)
- Sphaeralcea* (Globe mallow)

The IR-4 program helped to support quite a bit of fungicide research on rust diseases in the past few years. There were two trials performed on hollyhock rust in the north east.

In 2002, Giesler reported on efficacy of Trinity (triticonazole). Trinity is a sterol inhibitor (MOA 3) and under development at BASF. The treatments included:

- Untreated
- Trinity - 2 oz/100 gal alone
- Trinity - 1 oz plus sticker
- Trinity - 2 oz plus sticker
- Bayleton - 5.5 oz plus sticker
- Orthenex - (retail product with acephate)

Disease severity was rated on a scale of 1 to 10 (1=about 10%, 5=about 50% and 10=100% with symptoms). As you can see from the number disease severity was high with around 75% infection in the untreated control. The best treatment was Orthenex which has triforine (no longer available for production ornamentals).

Addition of a sticker did not improve efficacy of Trinity. These very low rates for Trinity were increased to 4 oz/100 gal by 2010.

Becker performed the second trial in New York in 2010. Numbers with the same letter are not statistically different.

TREATMENT	RATE/ 100 GAL	NUMBER OF PUSTULES
Untreated	-----	91 ab
Cleary 3336	16 oz	77 bc
Acibenzolar	0.75 oz	57 c
Banner MAXX	8 oz	70 bc
Bayleton	3 oz	3 d
Compass	4 oz	6 d
Eagle 2EW	12 oz	47 c
Heritage	4 oz	1 d
Insignia	8 oz	12 d
Pageant	12 oz	2 d
Prostar 70WP	6 oz	18 d
Protect	2 lb	71 bc
Rubigan	4 oz	102 a
Tourney	2 oz	14 d
Trinity	4 oz	22 d

The best products in this trial were Heritage, Pageant and Bayleton. Compass, Insignia, Tourney, Prostar and Trinity were statistically equivalent but did have a higher disease rating. It was interesting that MOA group did not dictate how well a product would work since some MOA 3 were excellent and others poor. In contrast all MOA 11 were very good to excellent.

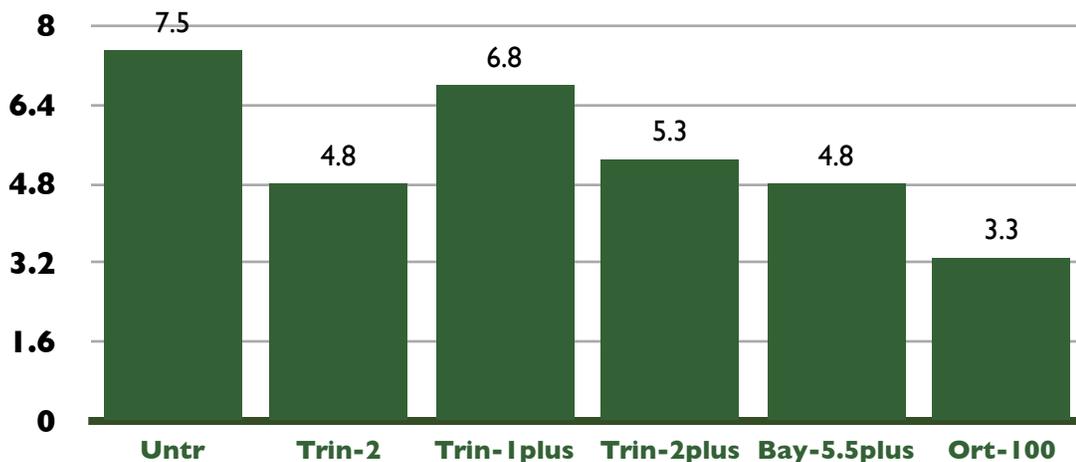


Hollyhock rust on hollyhock leaves. Top view (above, right) and undersides (above, left).



Hollyhock rust on cheese weed (*Malva*) - above and stem infection on hollyhock (below).

Control of Hollyhock rust with Trinity (Giesler, 2002)



Control of Impatiens Downy Mildew in a Landscape

Downy Mildew Is Forcing Growers and Gardeners to Change

by Marge Daughtrey
LIHREC Cornell University

More and more questions are pouring in from growers, landscapers and retail garden center operators asking for a plant pathologist's crystal ball prognostication relative to impatiens downy mildew. The green industry here in New York has been asking tough questions for months already, because the dreadful effects of the disease in the landscape were evident back in early June.

At this point we are hearing that the Big Box stores are ordering impatiens the same as usual, essentially forcing growers to produce them even if they are scared to do so. They are banking on the public not being aware of the disease, or not being afraid of it if they are. They are confident that there will be customer demand for impatiens, since gardeners are so addicted to the historical dependability of this bedding plant.

Growers' smaller retail customers probably haven't formulated their buying plans for next year yet, but growers need to place their seed and cutting orders soon.

Landscapers are in many cases not planning to utilize impatiens next year. Here on Long Island, some of the landscape jobs are so BIG that having to replace failed impatiens is an unthinkable huge expense.

The growers who don't service big box stores are trying to figure out 1) whether there will be NY state quarantine actions leading to contaminated crop disposal as there have been this summer 2) whether garden centers will want to stock impatiens and 3) whether the public will want to buy impatiens again in spite of widespread disease this year.

Crop choice decisions have to be made now without knowing whether the impatiens downy mildew will be spread via the industry next year—or how weather factors may affect the return of the disease in beds where it overwintered—or how rainy and stormy it will be next year, fostering disease development and spread.

Growers tell me they are growing 20% fewer, 50% fewer, or NO impatiens next year, depending on their strategy. It's a gamble; there is no way to help them make this decision through the application of scientific information, other than to make sure that they don't dismiss the importance of this problem.

Growing New Guineas is safe from these downy mildew challenges, but growers would certainly prefer a seed-grown option that would allow lower cost to the consumer. Begonias also do well in shade, but there are groushings about the color range not being as good as that of impatiens. We have been growing a garden monoculture; we should have known better. My main message is to encourage the industry to help the public understand how to be successful with New Guineas or other plant genera: this will be hard for gardeners, though, because they are SO addicted to impatiens!

Longterm Control in a Landscape

Dr. Aaron Palmateer (TREC - Homestead, University of Florida) performed a very important trial last winter in south Florida. He evaluated several rotations of very effective downy mildew fungicides during the "production" phase of impatiens culture. He then evaluated the effect of treating the landscape ground beds before planting with Subdue granules.

Plants were grown and treated for four weeks with one of the rotations (weekly) shown below. They were then planted into the landscape with some in ground treated with Subdue granules (30 oz/1000

sq ft). There were no additional fungicide treatments made.

Rotation 1

Adorn and Subdue MAXX (SMAXX)
Dithane
Micora
Experimental (Exp) and SMAXX

Rotation 2

SMAXX and Aliette
Dithane
Exp.
Exp.

Rotation 3

Adorn and SMAXX
Dithane
Heritage and Capsil
Micora

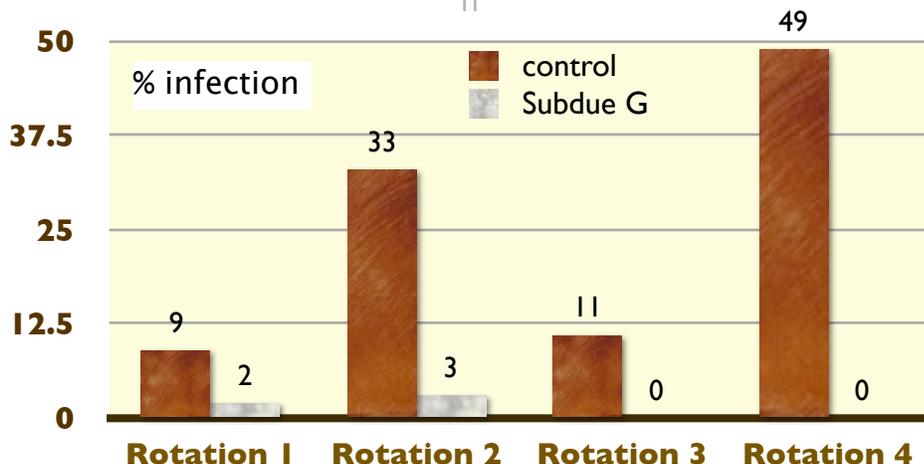
Rotation 4

Micora
Micora
Heritage and acibenzolar
Micora

The graph at the bottom shows the final disease data (% infection on May 9). I did not show the data from the untreated plants as they were 100% infected throughout the trial.

The most effective rotation was 1 and 3, although if the impatiens were planted in beds treated with SMAXX G, the rotation was not important. In every case, the presence of SMAXX G kept plants free or almost free of downy mildew for 2 months.

This is great news for landscapers who wish to grow impatiens. They can improve the appearance of their planting for up to 2 months after the plants leave the production facility. What's more, the benefit will be seen with a variety of rotational schemes that the producer may employ.



Research Reports

Fusarium Root Rot Control on Delphinium - Kirk

In 2010, Kirk (Michigan State University) reported on a trial to control Fusarium root rot on *Delphinium*. The results are shown in the table below.

The best control was seen with Hurrincae and Medallion, each of which contain fludioxonil (one of the best active ingredients for Fusarium). The lower rate of acibenzolar and Pageant and RootShield Plus were also moderately effective. Acibenzolar is an experimental product that is being developed by Syngenta. It is an SAR (systemic acquired resistance) chemical.

The only treatment that did not give any significant control of Fusarium root rot in this trial was Tourney which may be due to the very low rate that was employed. This fungicide belongs to the sterol inhibitor group and which is not typically used as a rot disease fungicide. The single exception to this is Terraguard which is one of the most effective fungicides available to control of Fusarium diseases on ornamentals.

TREATMENT	OZ/100 GAL	ROOT DEATH RATING
Noninoculated	----	2.3 f
Inoculated	----	7.7 a
Acibenzolar	0.125 oz	3.9 e
Acibenzolar	0.25 oz	4.6 cd
RootShield Plus	6 oz, 3 oz	4.4 cde
Hurricane	12 oz	2.6 f
Medallion	2 oz	2.7 f
Pageant	12 oz	4.2 e
Tourney	2 oz	7.6 a
Trinity	6 oz	5.0 bc

Root death was rated from 0-10 where 0 = none (healthy) and 10 = 100% dead. Numbers in the same column followed by the same letter are not statistically different. 1=no disease and 5=severe disease.

Control of powdery mildew on trailing petunia - Hausbeck and Harlan

Hausbeck and Harlan reported on a trial performed in 2011 to evaluate different rates of Trinity for efficacy and safety on petunia powdery mildew. They also included Terraguard as a standard spray and compared results with a Heritage drench. Heritage is upwardly systemic and has been evaluated periodically for efficacy as a drench. Fungicides were applied twice on a 14 day interval, except Heritage was applied only once.

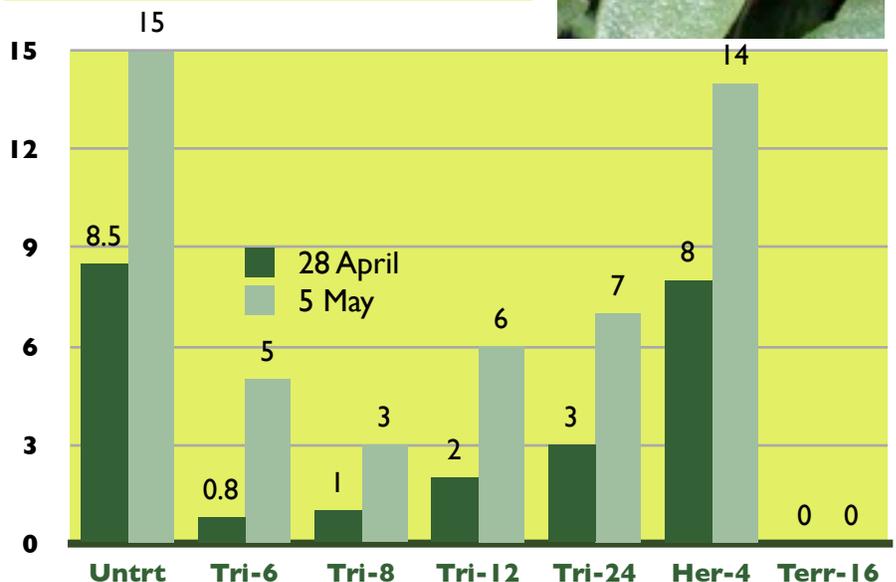
Disease was severe with all spray treatments giving significant control (graph, below). The Heritage drench was not effective although previous trials using Heritage as a foliar spray show good control of powdery mildew. The industry standard, Terraguard was 100% effective. Trinity (also a sterol inhibitor, MOA 3) was not as effective and showed about the same level of control regardless of the rate used.

The researchers also reported that even the 24 oz rate of Trinity did not cause phytotoxicity in this trial. Some of our trials using sterol inhibitors do indicate that on some plants they can cause stunting after repeated use. Trinity has not caused this reaction as often as some MOA 3 fungicides.

MOA	FUNGICIDE	EFFICACY
3	Banner MAXX, Hoist, Rubigan, Strike, Terraguard, Torque, Tourney,	Very good to excellent
5	Pipron	Very good to excellent
11	Compass O, Cygnus, Heritage, Insignia, Pageant	Very good to excellent
9 and 12	Palladium	Very good to excellent
M1	Camelot, Kocide, Phyton 27	Poor to excellent
nc	Milstop	Excellent
nc	Regalia, Cease	Fair to very good



Control of powdery mildew on trailing petunia (number of infected leaves/plant)



Sanitation for Diseases of Ornamentals-Part 2 (OFA talk 2012)

I started this review last month with cleaning surfaces. It continues below with cleaning living things and water to complete this review of sanitation.

Cleaning living things

Cleaning tools, hands and feet - This is usually critical in propagation but a good standard to set in the entire production cycle. Since people will be directly affected by the method chosen - you cannot use heat or caustic products like those based on chlorine. Alcohol and quaternary ammoniums are routinely used for foot baths, hand washing stations and tools used for cutting since they are effective and human friendly. Make sure everyone knows how to use them and does not bypass these sanitation steps. Untrained workers cannot effectively participate in sanitation steps.

Cleaning seeds and cuttings - The things that can be used here are much the same as those used for our workers. Plant cuttings cannot tolerate much more toxic products than humans making use of chlorine based products unlikely. They can, however be used to treat seeds since these structures are somewhat resistant to oxidants (including peroxides and chlorine). My experience with fungicide dips for cuttings is not good. The act of immersing cuttings (some healthy and some infected) into the same solution does result in disease outbreaks. I have seen this with *Cylindrocladium* and *Fusarium* especially. If you must use a fungicide to prevent diseases, either spray the stock plants the day before cuttings are taken or treat the cuttings after sticking.

Testing the safety of seed or cutting disinfection before broad scale use is critical. Be aware that applying a seed treatment may affect whatever "warranty" the seed supplier makes regarding germination.

Cleaning Water

Recirculating water is more and more common. The reasons for recycling are many and depend to some degree on the

state you live in. You may be a nursery that must capture and contain run-off or a greenhouse operation that is using ebb and flood methods for irrigation. You may have plentiful water but be regulated to contain all runoff or you may be in an area where water is scarce and must be reused. You may only be recycling water to save money on labor by using a recirculating system. Whatever the case, you must consider water treatment.

I recently reviewed many research studies on water-borne pathogens like *Phytophthora* and *Pythium*. It turns out that if you have these fungi causing crop losses and you recirculate your water, you will likely be infecting new plants with these diseases. So the question appears to be not should you treat your recirculated water but how.

A great deal of research has focused on water treatment for our industry and I won't go into details here. Methods range from slow sand filtration to ultra-violet light, ozonation, copper ionization and chemical disinfectants (like chlorine). Whatever system you choose to employ, be sure to seek unbiased research opinions in addition to the literature supplied to you by the product sales force. Recent research is indicating that in the case of chlorine, the amount needed to kill *Phytophthora* zoospores is not as low as we thought. Now it appears that 2 ppm free chlorine may be more effective and still be safe for the crops being treated. And remember that there is a difference between cleaning the water before re-use and treating water on a constant basis (such as in propagation). The rates of product used will not be the same or at least not have the same safety to the crop.

Conclusions

Sanitation is not accomplished in a single step. It is a commitment to an ongoing series of steps that require a change of mindset for all of the employees. Periodic training is critical, especially when you adopt a new method.

**Remember that if it looks clean
it is more likely to be clean.**



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Thoughts from Mike

Well another month gone and before you know it we'll be celebrating Christmas again. I had to make a run to Costco about a week ago, as I was making my way around I saw a few Halloween items.... that made me stop in my tracks and take another look! Wow, what's the rush? School is just starting again!

This last Friday I was down in Phoenix at the annual SHADE (Southwest Horticulture Annual Day of Education) conference. I was happy to see attendance pick up from last year. I am on the Arizona Nursery Association committee for the education part this conference.. It is a good conference to bring your tabletop and do sponsorship and a great place to do some networking and catch up on important issues faced by all ornamental producers. Dr. Karen Robb (pictured here) of Target Specialty-Products gave a talk on nursery pests.

For those who don't know, we now have a YouTube channel. **Chaseagricultural**. We plan on having around 20 videos on it before the end of the year, please take a look and let me know what you think.

Mike

