Chase News

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Biological Control is Alive

I made a recent trip to Carpinteria, California where a large number of cut flower growers still do business. I spent the morning touring greenhouses and then presented some information from the Bedding Plant Alliance (led by Dr. Michael Parella at UC Davis). Mike is on sabbatical in Chile, so I stepped in to present our most recent findings on biological controls.

I saw an array of products in use for insect and mite control including predatory mites, parasitic wasps and even some pathogenic fungi.

On the disease side some growers are using a product called EM (effective microorganisms) for control of powdery mildew. They report good control of the disease when it is used every 1-2 weeks as a spray. Some very susceptible cultivars are not 100% protected but everyone I spoke with was very pleased. Rates of use and application interval varied between growers.

Dr. Lucia Villavicencio performed a trial at the Center for Applied Horticulture Research in Vista, CA on gerbera powdery mildew. She found that early control was significant with EM (1:500 dilution applied weekly) but at the end of the trial control was only about 40% compared to Regalia (1%) which was nearly 95% effective. We did hear at the meeting that using a silicon surfactant improves powdery mildew control with EM. This is to surprising since many wetting agents alone will control powdery mildew.

EM can be purchased in a 55 gal drum. It is mixed with water and molasses and incubated for 7-10 days (different growers are doing slightly different things). The mixture is heated slightly using a waterbed heater . I saw two different methods. According to the growers and the manufacturer, the activated EM can now be stored for a month or so. Most use rates are between 1:250 and 1:1000 depending on the way it will be used. I will bring you more field trial results as they come in.

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A Message from Mike

One of the areas Ann and I will be investigating and hopefully contributing to next is the fast paced world of apps. It seems like there's no end to what kind of apps pop up every month from a focus app to improve images taken with our mobile devices to the more common map, directions and weather apps found on most smart phones. With an app (or several) for just about everything, I'll start looking into the possibilities for the horticultural industry as well. I do know that not all growers walk around with a smart phone or tablet although these seem to be our only choices anymore when we go to buy a new cell phone.

As a resource company for you, we will supply you with information via the new technology and for those who have not yet upgraded we will still supply you with information from our website, Chase News, DVD's, etc. We are working now to develop our popular Chase's Guide to Ornamental Fungicides for use on a tablet as well as improve its use by linking it to the actual trials (thanks to a long-time customer and friend in San Diego County for this idea). If anything occurs to you that we could pursue, please feel free to contact me or Ann.

Have a safe and warm holiday season!

Efficacy of Pre-emergent Herbicides in a Landscape Setting

We started working more on herbicide research in 2011. One of our trials was conducted in Mt. Aukum using a simulated landscape planted with Photinia, Lilac and juniper planted on 26 April, 2011. Plots were 22 square feet and there were 4 replications per treatment. The test was irrigated with overhead sprinklers once daily. All existing weeds were removed before treatments were applied.

Treatments included:

- Water - untreated
- Indaziflam SC (9 oz/100 gal)
- Indaziflam G (150 lb/acre)
- Dimension 2EW (32 oz/A)
- Gallery and Dimension 2EW (454 g and 32 oz/A)
- Snapshot 2.5G (150 lb/A)
- Freehand (150 lb/A)

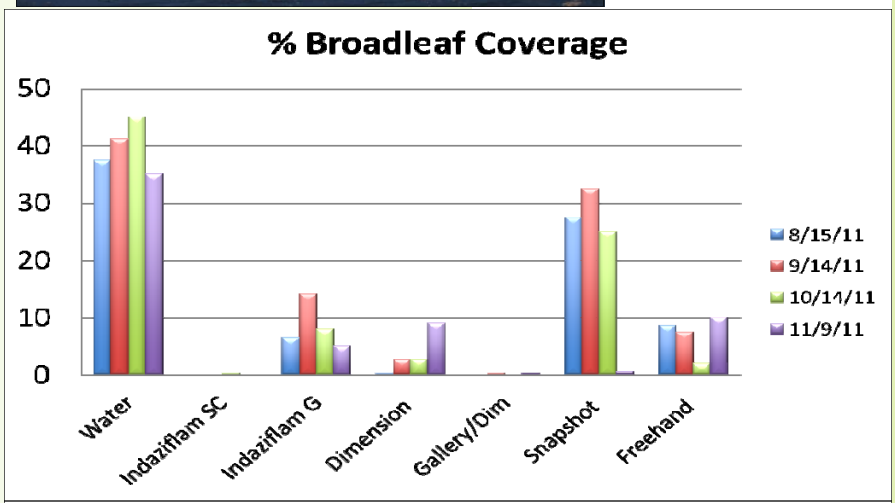
All treatments were applied as a soil surface spray (to wet) or granular broadcast as listed above on 9 (granular treatments) and 10 (spray treatments) May, 2011.

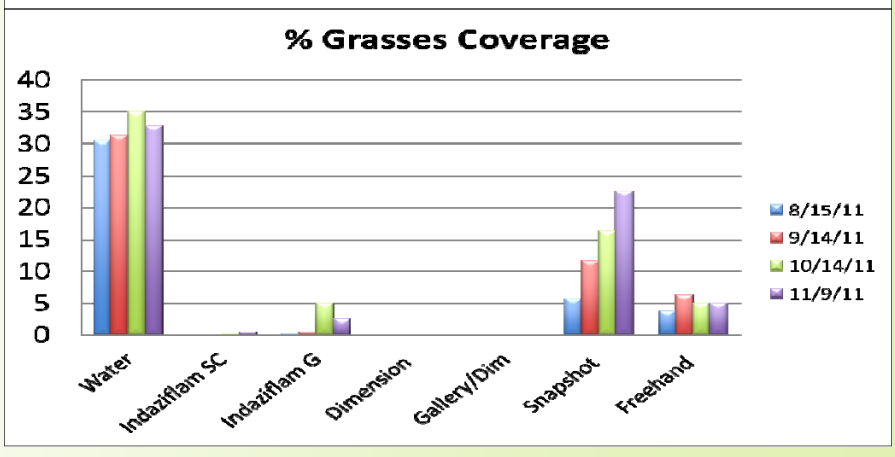
All products provided excellent preventive control of broadleaf weeds and grasses two months after application with the exception of Snapshot which allowed some broadleaf weeds to emerge. Treatments provided excellent prevention of grasses after three months although plots treated with Snapshot or Freehand did have some break through.

About 4½ months after herbicide application, all treatments except Snapshot provided significant prevention of broadleaf weeds. At this rating, both Freehand and indaziflam G did show some growth of broadleaf weeds. At this time, grasses remained under control in all treatments although their growth in the Snapshot plots was starting to appear.

Five and a half months after application, broadleaf weeds were not controlled by Snapshot. All other treatments were still showing significant control. Grasses remained under control in all treatments although their growth in the Snapshot plots was starting to appear. The pictures to the right show an untreated and indaziflam G plot at this rating date.

Six months after treatment there was slight broadleafed weed growth in the granular indaziflam (not significantly different than 100% control seen with liquid indaziflam). Some weeds present in October had died due to temperature changes. Only Snapshot failed to provide significant broadleaf weed control at the close of this trial. Grass coverage in the plots was significantly reduced by all treatments except the Snapshot plots compared to the untreated controls. Final top grade on lilac, photinia and juniper were not affected by any treatment. All products except the Snapshot provided very good to excellent long term (6 months) weed control.





DMI Fungicide Comparisons—MOA 3

The mode of action group 3 (demethylation inhibitors, also called sterol biosynthesis inhibitors) fungicides were first introduced in the mid 1970's and continue to be introduced to this day. There are over 30 active ingredients in this group with but a few registered for ornamentals. Some of the first to be registered on ornamentals include triadimefon (Bayleton and Strike) in 1975, propiconazole (Banner MAXX) in 1979 and myclobutanil (Systhane=Eagle) in 1984. These examples represent the largest sub-group - the triazoles which are often described as being both protective and curative as well as having contact and systemic properties (in some cases). Other subgroups include piperazines (triforine – no longer registered on ornamentals) and imidazoles (imazalil=Fungaflor TR introduced in 2007 as a total release product and triflumizole=Terraguard introduced in 1982).

Resistance development to these fungicides is variable but overall described as medium with cross-resistance possible. Thus resistance to propiconazole might confer resistance to other triazoles like myclobutanil. Rotating a MOA group 3 fungicide with another MOA group is therefore the best approach for minimizing development of fungicide resistance. Resistance management with DMI fungicides is a little different than with some other types of fungicides (strobilurins). While resistance may be present, not all of the fungi in a given greenhouse or nursery will have the same level of resistance. The instinct to use more when an application has failed can actually work with DMI resistance. Thus starting out with a low rate and having unsatisfactory results can lead directly to using a higher labeled rate with much better results.

Nearly all of the MOA group 3 fungicides are used as foliar sprays with the exception of Terraguard which is effective as a drench and foliar spray depending on the pathogen target. Most DMI fungicides have some element of plant growth regulator effect. This can be extreme or minor and registration site is often a reflection of this characteristic. Sensitive plants are darker green, shorter and sometimes have glossy leaves when treated with DMI fungicides. For instance Banner MAXX is registered for outdoor use only and indeed has a moderate PGR effect on sensitive greenhouse crops. Representing the other end of the spectrum is Terraguard which is registered for greenhouse use and even has drench applications. The DMI fungicides are also variably labeled for application method with only Eagle (or Hoist) and Terraguard legal for chemigation according to the labels I reviewed.

I have been working on DMI fungicides since Terraguard was researched in the mid 1980's. Research at that time concentrated on foliage plants for me with other crops added when Chase Horticultural Research, Inc. came into existence in 1996. We have worked since then on many of the products listed in including the total release fungicide Fungaflor TR and the two newest triazoles – Trinity and Tourney.

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There are many uses for this group of fungicides as indicated in Table 2. All of them appear to be very good to excellent on powdery mildew and rust diseases and miscellaneous fungal leaf spots including *Cercospora*, *Alternaria* and scab (*Sphaceloma*). Some of the less likely targets include Botrytis blight, anthracnose (Colletotrichum), and downy mildew. Control of downy mildew can be poor to excellent depending on the plant and exact active ingredient. This may indicate that unless treatments are preventative they might not be effective but may also indicate variable levels of sensitivity in the pathogen populations to different active ingredients in the DMI group.

The only DMI fungicide to really stand out from the pack is Terraguard. It is not a triazole but rather an imidazole and can be very effectively used on a wide range of some very tough soil-borne fungi. We tested it against Cylindrocladium root and petiole rot on Spathiphyllum, azalea and myrtle wi6th very good results. We have also found good control of Fusarium wilt on cyclamen with many reports of similar results on other Fusarium diseases on ornamentals. It provides fair to very good control of Rhizoctonia as well. Rhizoctonia is often an aerial disease in the warmer, wet climates of the southern US and fungicide sprays (not drenches) can be an excellent method for control of Rhizoctonia web blight, leaf spot and aerial blight. While some of the other DMI fungicides have been evaluated for some soil-borne diseases, they are not registered for this use.

I consider DMI (MOA 3) fungicides a natural rotation partner to strobilurin (MOA 11) fungicides for many foliar disease but especially powdery mildews and rusts. But this group offers unique application opportunities with chemigation (Eagle, Hoist and Terraguard), total release (Fungaflor TR) and drenching (Terraguard). Remember to always use products only according to their current labels.

Disease/pathogen	Level of Control
Alternaria	Very good to excellent
Cercospora	Good to excellent
Colletotrichum	None to good
Cylindrocladium	Good to very good (Terraguard only)
Downy mildew	Some
Fusarium	Good
Myrothecium	Some to very good
Phyllosticta	None to very good
Powdery mildew	Very good to excellent
Rhizoctonia	Fair to excellent
Rust	Very good to excellent
Scab (*Sphaceloma*)	Very good to excellent

HOW CULTURAL CONTROLS IMPACT FUNGICIDE EFFICACY

There are many factors in cultural control of plant diseases but a few stand out in their effect on fungicide efficacy. I have included the relative impact of many cultural controls directly on disease and on fungicide efficacy. Some factors, like new pots and sanitation may be important in reducing disease but have relatively low impact on the ability of a fungicide to control the disease. Other methods, like using the right amount of water or keeping the leaves dry can make all the difference in the world on whether or not a fungicide (or bactericide) has a chance to work. If the conditions are too much in favor of a disease, it will not go away even when very effective fungicides are used. Anything that stresses the plant or promotes the pathogen makes the disease worse and therefore the fungicide must work harder. There is no such thing as a fungicide that can overcome a disease under all growing conditions.

Use only **new or thoroughly cleaned pots, flats and other containers**. If you must re-use containers, wash and disinfest them using products containing quaternary ammonium, chlorine, peroxides or other disinfestant. We performed some simple tests in cooperation with a nursery operation to determine the actual need for cleaning if a quaternary ammonium soak was used on recycled plug flats. The best control was a thorough washing followed by a 5 minute soak in a quaternary ammonium at labeled rates. Even higher rates used much longer were not as effective as when the flats were washed before treating. Other research has shown that steaming flats can also be very effective if the plastic will withstand it. This has been especially effective in reducing contamination of flats with the black root rot pathogen, *Thielaviopsis basicola*.

Use **new potting media** whenever possible. Do not add soil to any potting medium without steaming or treating with a product like methyl bromide. Plants are dumped because they fail to grow and are not salable (possibly due to disease) or they are simply overage. Even if they are all overage the quality of the potting medium when it has already been through a growing cycle is reduced and it now contains roots and at least lower stems of the crop. Further, there usually are pesticides and fertilizer that remain active. All of these things make the "new" crop a challenge to produce since the consistency from one crop to another is gone. How can you determine the rate of fertilizer to add when you do not know what is already in the potting medium? If you re-use contaminated potting medium you are stacking the deck against your crop and even the best fungicides do not work if the disease pressure is too high.

Avoid dipping cuttings. This is an excellent way to spread many bacterial and fungal pathogens including *Xanthomonas, Erwinia, Fusarium* and *Cylindrocladium*. Even when effective fungicides or bactericides are used, the spores will spread throughout the entire batch of dipped cuttings. If you suspect a pathogen, a post-sticking sprench will be the most effective way to apply a fungicide.

In other cases, spraying the stock plants the day before cuttings are made can be a very effective way to reduce losses from pathogens like *Cylindrocladium*. I have been involved in several situations where a *Fusarium* or *Cylindrocladium* cutting rot was controlled simply by STOPPING the pre-stick fungicide drench.

If you recycle water, consider a **water-treatment**. This water has the same concerns as reused potting media. Fertilizer, pathogens and pesticides may wreak havoc in your propagation and throughout production of the crop. The most common pathogens that are spread this way are the water-molds, *Pythium* and *Phytophthora*. However, *Erwinia* has been found in southern ponds and I have seen even leaf spot pathogens like *Helminthosporium* reintroduced into the foliage of palm trees when recycled water is used to overhead irrigate them.

Keep leaves dry. Do not water crops from overhead and protect them from rainfall if at all possible. Wet leaves are ideal targets for many plant pathogens. Splashing rain water or over-head irrigation spreads spores for bacteria and many fungi such as *Alternaria, Cercospora, Colletotrichum, Cylindrocladium, Glomerella, Helminthosporium, Myrothecium, Pseudomonas* and *Xanthomonas*. I did some research the first year I worked for the University of Florida demonstrating that when plants were protected from wet leaves, no foliar disease could develop – even when we inoculated the plants. Water is often the key to disease prevention.

Cultural Control Strategy	Effect on Disease	Effect on Fungicide Efficacy
Sanitation	Low to medium	Low
Disinfesting tools and equipment	Low to medium	Low
New pots, flats	Medium (soil-borne mainly)	Low to medium (can be high if a resistant strain is carried over)
New potting media	Very high – easiest way to have root and crown disease	Very high
Clean seeds, plugs, cuttings and liners	Very high (virus and bacteria especially)	Medium
Dipping cuttings	Very high - best way I know to spread disease to all cuttings at once	High (adding fungicides to a dip is often ineffective due to extreme disease pressure)
Remove diseased plants	Medium – stops spread	Medium
Keep leaves dry	Very high – can control many foliar disease with dry leaves alone	High – disease pressure is low when leaves are dry
Water correctly	Very high	High – over-watering shortens longevity of fungicides

New Products for Phytophthora and Relatives

We have been testing a variety of new products, both traditional and biological for control of Phytophthora and its relatives, Pythium and the downy mildews. One of these products is in the registration process now. This is Micora (mandipropamid) from Syngenta. The other I am focusing on is BW240 from BioWorks.

MICORA

Although Micora is not going to be labeled for control of Pythium root rot, we did test it at relatively high rates (17 oz/100 gal) a number o years ago. Results were variable. In some cases we saw excellent control but in most cases Micora only provided some control. IR-4 trials with Micora showed good control of *P. aphanidermatum* in a geranium trial; however, some phytotoxicity was observed. It provided no significant control of *P. aphanidermatum* in a snapdragon trial. A trial on geranium against *P. ultimum* showed no significant reduction of a severe root rot pressure. The same active ingredient provided marginal control of cottony leak (*P. aphanidermatum*) in a snap bean trial. In two greenhouse trials on celery, it showed no to poor control of mefenoxam-resistant Pythium root rot (*Pythium* spp.).

The main uses of Micora are for *Phytophthora* and downy mildew control. Over the past few years, we have tested 4-8 oz/100 gal as a weekly drench. We tested *Phytophthora parasitica* on vinca, and *P. cryptogea* gerbera with some to excellent results. IR-4 trials with Micora, demonstrated good to excellent control of *P. cinnamomi* on azalea and rhododendron, excellent efficacy on *P. nicotianae*, and good efficacy of *P. ramorum*.

We tested Micora on downy mildew (4 oz/100gal) as a weekly spray. Control on stock was good. In IR-4 trials with Micora, good to excellent control of lamium downy mildew, snapdragon downy mildew and coleus downy mildew was seen. It also provided fair control of viburnum downy mildew. Registration should happen in early 2012.

Phytophthora crown rot on Gerbera (above) and vinca (right).

Summary of trials on Micora for Phytophthora and Pythium diseases.

Plant	Pathogen	Rate/100 gal	Result
Gerbera	*Phytophthora cryptogea*	4.1-8.2 oz	Some
Gerbera	*Phytophthora cryptogea*	8 oz	Some, better with Capsil
Vinca	*Phytophthora parasitica*	8 oz	Very good, better with Capsil
Gerbera	*Phytophthora cryptogea*	8 oz	Good, better without Capsil
Vinca	*Phytophthora parasitica*	8 oz	Excellent
Geranium	*Pythium irregulare*	4-8 oz	Some
Geranium	*Pythium irregulare*	4 oz	Excellent
Geranium	*Pythium irregulare*	17 oz	Some
Pansy	*Pythium* sp.	17 oz	Some

BW240

We have also been testing a biological agent from BioWorks for the past few years. The table below shows a summary of that work to date. We found that the product works best against *Phytophthora* in our trials. We did also see some control of Pythium root rot on poinsettia but not on other crops. We did nto see any control of Fusarium wilt on lisianthus in a single trial or of Rhizoctonia damping-off on celosia in a single trial. More testing would be needed to see if results are consistent. It will be interesting to see how BW240 is developed since it has pretty good activity against *Phytophthora* in some cases.

Summary of trials on BW240 for soilborne diseases.

Plant	Disease	Result
Lisianthus	*Fusarium*	None
Gerbera	*Phytophthora*	Some-good
Vinca	*Phytophthora*	Excellent
Vinca	*Phytophthora*	Slight
Poinsettia	*Pythium*	None to excellent
Pansy	*Pythium*	None
Celosia	*Pythium*	None
Celosia	*Pythium*	None
Celosia	*Pythium*	None
Poinsettia	*Pythium*	Excellent
Celosia	*Rhizoctonia*	None

Be sure to test all new products in a small way initially until you are sure of their safety and efficacy. Both Micora and BW240 may be important new tools for our *Phytophthora* arsenal since they represent unique modes of action.

Brand Name Products vs. Generics

Over the past ten years we have seen post-patent fungicides enter the ornamental market place. They are sometimes less costly and usually have a very similar label to the brand name fungicides we are familiar with. We have also started seeing products with similar active ingredients (such as phosphonates and Aliette) marketed as the same or superior. The companies that sell post-patent fungicides do not routinely trial their product against the better known trade name fungicide. At Chase Research Garden, Inc., each year we compare fungicides with the same or very similar active ingredients in side-by-side trials. These comparisons can result in one of three conclusions: 1) the post-patent and brand name products give the same level of control, 2) the trade name product gives better control than the post-patent product and 3) the post-patent product gives better control than the brand name product. For obvious reasons the companies do not want to gamble on the outcome.

We have compared different phosphonates (phos-acid alternatives) to Aliette 80WP for powdery mildew on rosemary with the result that sometimes one or the other was slightly better but overall similar levels of control were achieved. In another powdery mildew trial, we saw similar results. Since the use rates were not identical, some analysis of efficacy vs. cost must be made before deciding which product gives the best value.

In another trial including two phosphonates and Aliette we compared drench and spray applications for prevention of Phytophthora aerial blight on annual vinca. Both Aliette treatments provided excellent control of *Phytophthora* as did all application methods of the two phosphonates. In this case, the phosphonates were as effective as Aliette but again the rate-cost comparison must be made to determine actual value.

About 10 years ago, I heard claims that certain phosphonates were safer than Aliette since they did not contain aluminum. After testing them in over 20 trials (*Phytophthora*, downy mildew and *Pythium* especially), I believe the opposite is actually true. We compared Aliette at 16 oz/100 gal to other phosphonates at rates of 32 to 64 oz/100 gal. Roots were damaged by the high rates of some of the phosphonates. Be sure to compare all factors when considering a post-patent fungicide. The cost per unit of the product is not the only thing to compare.

We have also been able to make some comparisons of different fungicides with the same active ingredient. In the first instance we were primarily comparing the wettable powder formulation of iprodione known as Chipco 26109 to a newer flowable formulation Chipco 26GT. We also had another flowable formulation to compare in the Alternaria leaf spot trial on Impatiens. We found that in general, the products performed to the same degree of safety as well as efficacy in the same trial for Alternaria leaf spot on Impatiens, Botrytis blight on primrose and Rhizoctonia cutting rot on poinsettias or damping-off on annual vinca. Control in the two Rhizoctonia trials was not impressive for either formulation.

Finally, we compared high and low rates (based on labels) of several thiophanate methyl fungicides to 3336 for control of *Thielaviopsis basicola*, the cause of black root rot (BRR) on pansy. In this case, even the 4 oz rate of 3336 gave excellent control of BRR while the lower rates of other thiophanate methyl products were not as effective. The higher rate chosen for each of the thiophanate methyl fungicides each gave excellent results.

The most important message I can send at this point is that if you opt to simply choose post-patent products based on their cost per unit you may be successful and you may not. In some cases, you will have effective and safe control while in others the brand name fungicide will be more effective or safer and actually result in a better value.

Cost and efficacy are not the entire answer

The cost and efficacy are just the tip of the iceberg when it comes to choosing a brand name product over a generic product. Other things to be considered include ease of use, knowledge of the product and customer service.

The exact formulation of a product can mean all the difference between poor and good results. The initial manufacturer of the brand name product has exclusive rights to development of the product. Years of experience in formulation chemistry are part of what goes into making the product work at the most effective and safe level. If you become accustomed to the way a brand name product works and switch to a generic product your results may differ simply due to the formulation chemistry used. They are not always interchangeable.

The generic company simply buys a formulation of a post-patent active ingredient. They have no investment in the product since they did not pay for its original development. They do not have years of experience with the product making trouble-shooting. If you have a problem, they are not as well equipped to respond. Finally, the likelihood of maintaining a label by a generic company is not as great due to lack of initial financial investment.

It is wise to consider all aspects before switching products.