

CHASE NEWS

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Spring Trials - It's All Marketing

Mike and I spent the first few days of the spring trials (aka Pack Trials) in Nipomo, California. I have been attending pack trials rather sporadically over the past 20 years and always enjoy seeing the new plant material. Sometimes, I have even found diseases like Botrytis blight and downy mildew which can be very common during the late winter/early spring in Coastal California. Some years in the 1990's I had more pictures of diseases than new flowers. As the displays of new plants and actual trials has shifted to marketing, very few examples of diseases can be found.

This year, we attended the trial at Greenheart Farms. I was interested to see how much the spring trials differ from one place to another and even one year to the next. Greenheart Farms was all about marketing. They included many ideas about how to market their products to the final customer. They even prepare marketing material to

really help the grower sell the roses to the consumer.

This is probably a reflection of the times since simply growing a good liner or plant isn't enough. We are all working together to make every part of our industry successful. That is the new meaning of sustainable according to some people.

As long ago as the early 1980s, we saw the shift in the tropical foliage industry. At that time, the growers became more interested in marketing than growing since they could grow more plants than they could sell.

Another clear trend is to provide service to your client. This started as the extension service at our major universities has received increasingly less support starting in the late 1980's. Now, education is often supplied by the product manufacturer representative and private consultants. If it becomes

a more routine part of what the propagator source supplies, the balance will continue to shift away from basic research/extension from the Universities. To remain effective the information will have to retain its unbiased nature. Many more partnerships between the manufacturers, scientists and growers will develop to fill this need.

It will be interesting to see what types of marketing tools are developed and used in the ornamentals industry in the next 5-10 years. Use of all methods such as those newly developed like QR codes as well as previously successful methods will probably give the best results. It still remains critical, however, that we continue to have new plant products, as well as the many tools and inputs needed to produce them. We should not lose sight of the ultimate goal which is to grow and sell at a reasonable profit the crops we chose to grow. This is my (and probably many growers) vision of sustainability.

Designing the Most Effective Fungicide Rotation - Black Spot

I am frequently asked for fungicide rotations for specific diseases. Although many people don't particularly want to tell me what they are currently doing, they will tell me when I ask specifically. It may seem like a strange place to start but if I don't know what is being tried (including complete with rates and intervals) I often am shooting in the dark. Sometimes, growers are using someone else's suggestions that may be based on labeled products alone. This is typically NOT a great way to design the most effective control program. Just because a product lists a disease on the label does not guarantee disease control at the level you want. Other times growers are using the best products available but applying them at a rate that is sub-optimal or relying on an interval that is too short or too long. Since I don't want to reinvent the wheel but rather fine tune it, this is my first step always.

After that I usually start with a review of my own trials and then move on to those that have been published by any other researchers I can find. Earlier this month the question centered around black spot control on roses. We have done very few trials on black spot over the years so if I did not check other people's work I would be stopped dead in my tracks.

I did a trial on roses planted in the ground about ten years ago evaluating a homeowner product containing tebuconazole. This sterol inhibitor has the unusual characteristic of being systemic from the roots upward. We applied it to the roses as a drench and got very good control of black spot. The active ingredient has been around over 20 years in AG crops, and found market in homeowner products (like Bayer Advanced). It was finally labeled for our market a year or so ago and can be purchased as Torque (Cleary Chemical now).

The other trial I performed was in commercial garden rose production where the grower had decided to use overhead irrigation. We trialed a few products including Cygnus, Eagle and Pageant. In this case, Cygnus was the best at

Summary of Rose Black Spot Control



Treatment	Rate/100 gal.	Interval	Result
Banner MAXX	4 oz	14 days	some
Compass O	1-4 oz	7-28 days	good at 4 oz on 14 days
Daconil Ultrex	1.4 lb	7-14 days	very good to excellent
Eagle 40WP	6 oz	7-14 days	excellent
Insignia	4-12 oz	14 days	poor to good
Medallion	2 oz	14 days	none
Pageant	8-12.5 oz	14 days	good to excellent
Phyton 27	25-40 oz	7-14 days	none at 14 days to good at 7 days in one trial
Rhapsody	5 quart	7 days	poor
Triact	1%	7 days	none

Nearly all trials included Daconil Ultrex at 1.4 lb/100 gal. It is almost always the best in the trial and that is usually excellent. It is pretty good on a 14 day interval but always better on a weekly interval. Under severe disease pressure it should be used on a weekly interval. It would not be very effective for rust, powdery mildew or downy mildew.

The next best standard is Eagle 40W (Hoist) used at 6 oz/100 gal. Eagle gave the same results as Daconil regarding the interval of 7-14 days. However, Eagle would be excellent on rust and powdery mildew but not downy mildew.

Pageant was very good to excellent on a 14 day interval when used at 12.5 oz. I only saw it in one report. It would be very good on rust, powdery mildew and downy mildew too.

Heritage and Compass were also very good when used at 4 oz/100 gal on a 7 day interval. They also would provide very good to excellent control of rust, powdery mildew or downy mildew.

1. Daconil Ultrex (22 oz/100 gal)
2. Pageant (12-16 oz/100 gal) OR Heritage (4 oz/100 gal)
3. Eagle (Hoist) (6 oz/100 gal)

The most important thing is that if you do not live in a part of our country where summer rainfall occurs **don't overhead irrigate**. The only times I have seen black spot on roses in California were when the grower or gardener chose to overhead irrigate. If you are in the southeastern US, you don't have to overhead irrigate to have a serious challenge. In this case, you must use weekly sprays in the summer months especially and do not think the products that show "some" control will be good enough.

Use disease **resistant varieties**. And remember that resistance to black spot does not impart resistance to all rose diseases. Some of the "non-spray" roses have terrible powdery mildew, downy mildew or Cercospora leaf spot epidemics.

Copper Bactericides and Resistance Management

There are many copper containing products that can be used to prevent or cure diseases like *Pseudomonas* blight on lilac caused by *Ps. syringae* pv. *syringae*. In 1998, Schenk and Pscheidt (Oregon State University) published a series of studies on 14 copper products and their ability to control populations of copper sensitive and copper resistant *Ps. syringae*.

They found that the amount of free cupric ions in a solution are what determines control of the bacteria. Unfortunately, their tests also showed that simply knowing the amount of metallic Cu in a product could not predict the amount of free cupric ions. I include below a summary of their work on the % metallic copper compared to free cupric ions. You can see that adding ferric chloride to Kocide the number of free Cu ions increases dramatically. Battling Cu resistant bacteria can be better accomplished if more free Cu ions are available.

BACTER- ICIDE	% METALLIC CU	FREE CU ION (UG/ML)
Bordeaux	25.00	2.50
C-O-C-S	50.00	1.50
Kocide 101	50.00	0.50
Kocide 101 and Ferric chloride	50.00	22.00
Kocide 101 and zinc sulfate	50.00	0.80
Kocide 2000	35.00	0.70
Kocide DF	40.00	0.10
Kocide LF	15.00	0.01
Kop-R-Spray	8.00	9.40
ManKocide	30.00	6.40
Microcop	50.00	13.00
Nordox WP	50.00	0.04
Phyton 27	6.00	5.40

Soil Disinfestation with ASD and Steam

I recently gave a talk at a meeting in California where I heard Dr. Steve Fennimore (University of California at Davis) present a talk on current work on soil disinfestation.

Dr. Fennimore reviewed the fumigants currently available from metam sodium (Basamid and Vapam) and 1,3 D (Telone) to chloropicrin, methyl bromide and methyl iodide (the manufacturer recently discontinued sales of this new fumigant in California).

He then went on to describe some possible replacements for fumigation such as anaerobic soil disinfestation, steaming and solarization and avoiding use of soil altogether.

Anaerobic Soil Disinfestation (ASD)

This method has been good for control of both pathogens and nematodes and has been widely used in Japan. Addition of organic material (you need a carbon source for microbial growth) at about 9 Tons/acre is the first step. It is then covered with a plastic tarp and irrigated through drip tapes. The conditions generated are anaerobic and the organisms that thrive under these conditions make chemicals that suppress other soil-borne microbes like pathogens and nematodes. Testing in California strawberries showed ASD did a good job of keeping out *Macrophomina* (charcoal rot) and *Verticillium*. ASD also improved yield in a strawberry trial at the same level that of chloropicrin and 1-3 D. Unfortunately, ASD is not reliable means for weed control. Dr. Fennimore estimated cost of ASD treatment might be \$1600-1800/A.

Steam

Steam has been used in some parts of the ornamental industry for well over 60 years starting with live steam and followed by use of aerated steam. The effect of temperature and duration of treatment on specific pathogens, nematodes and weeds is well-researched. It was published in 1957 in the University of California book "The U C System - Manual 23".

The keys to understanding and using steam effectively include:

1. Heating value of steam
2. Methods to apply steam

3. Heat transfer and distribution
4. Soil moisture
5. Time of exposure

Steve described that conduction is transmission of heat from a hot mass to a cool mass - solid, liquid and gas. In contrast, convection - transfers heat through liquid or gas phase.

The ways to apply steam include:

1. **sheet steaming** - inject under a tarp and moves with conduction and is fuel intense.
2. **drain steaming** - injects steam via in buried pipes.
3. **sandwich steaming** - involves an 8 foot wide applicator - some machines have a 16 foot head capacity. This system operates fine on flat ground with shallow needs (like strawberries or cut flowers).

Dr. Fennimore group has built its own steaming unit using a 100 horse power Clayton steam generator. The machine burns propane -and is done in seconds. The prototype is estimated to cost about \$4K per treated acre. Adding labor the cost is estimated to reach about \$5.5K/A. Their research has shown that a "dwell time" (exposure) at 158F is 20 minutes. If a lower temperature is achieved, the dwell time at that temperature is longer. Critical factors include seed moisture since germinated seedlings are easy to kill and moist seed heats better than dry seed. That means pre-treatment will dramatically affect the efficacy of using steam to kill weed seeds in soil.

A soil moisture level using the hand squeeze test where it crumbles easily is best. A little dry is however, better than wet (which is better for solarization). As with all soil treatment, avoiding clods which are hard for steam or fumigants to penetrate is very important.

In conclusion Steve said this method is more expensive than fumigants and it needs to be faster as well to become commercially viable.

Dr. Steve Fennimore, Extension Specialist and Weed Ecophysiologicalist, University of California at Davis.

Controlling Powdery Mildew on Gerber Daisy with Regalia

In 2010, Dr. Lucia Villavicencio (Director of the Center for Applied Horticultural Research in Vista, CA) performed two trials on Regalia Biofungicide. She used gerber daisy with powdery mildew and tested Regalia Biofungicide (extract from Giant Knot Weed - Marrone Bio Innovations) compared to several synthetic fungicides known to be effective for powdery mildew.

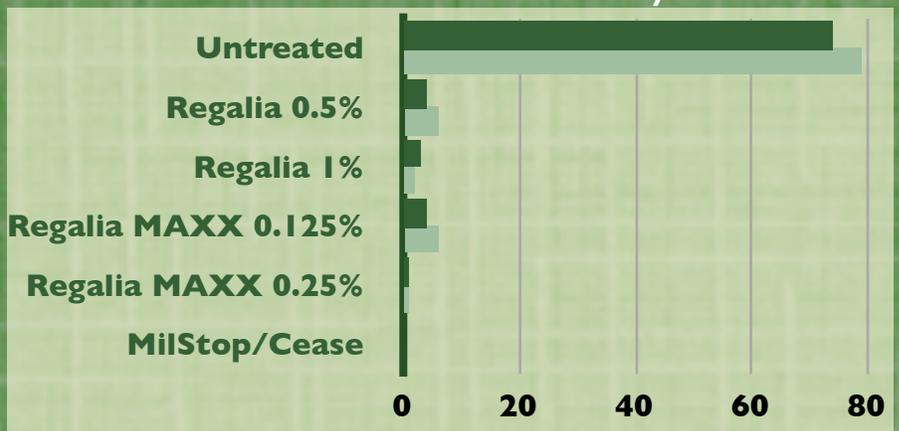
In the first trial, she applied products weekly for a total of 4 applications. Disease was recorded as the percentage of the leaf area with active powdery mildew growth. Treatments included an un-treated control, Regalia (0.5, or 1%), Regalia (0.5%) alternated with Compass O (4 oz/100 gal), Banner MAXX (8 oz/100 gal), Regalia 0.5% mixed with Compass O (1 oz) alternated with Regalia (0.5%) mixed with Banner MAXX (5 oz/100 gal) and Compass O (1 oz/100 gal) alternated with Banner MAXX (5 oz/100 gal).

In this trial, all treatments provided significant control of gerber daisy powdery mildew. Regalia at 1% was significantly better than 0.5%.

The second trial was simpler with a comparison of Regalia (0.5% and 1%) with Regalia MAXX (0.125% and 0.25%) and MilStop (5 lbs/100 gal) mixed with Cease 2%). Products were again applied weekly, this time for a total of three applications. In this trial, all treatments provided excellent and equal control (1-6% compared to 80% for the untreated control).

We have also performed a few trials with this biofungicide for powdery mildew control with very good results. So taking it a step further, I recently reviewed all of the trials reports I could find on Regalia Biofungicide regardless of crop or disease. Results were not inspiring in most trials.

Efficacy of Regalia Biofungicide on Powdery Mildew on Gerber Daisy



Percent powdery mildew infection of leaves after final spray (2 weeks - dark green and four weeks (light green))



Based on the 55 trials I reviewed, the best uses of Regalia Biofungicide appear to be on downy mildew and powdery mildew. Results are given in parentheses after each disease. Multiple entries indicate more than one trial and often variable results.

- Downy mildew on cucumber (none, none)
- Downy mildew on squash (poor)
- Downy mildew on mustard greens (some)
- Downy mildew on lettuce (some to good)
- Downy mildew on basil (none to slight)
- Downy mildew on coleus (some to very good)
- Powdery mildew on grape (none, some, good, good)
- Powdery mildew on lettuce (some)
- Powdery mildew on cantaloupe (none to some)
- Powdery mildew on squash (none, none)
- Powdery mildew on rose (very good - my trial)
- Powdery mildew on gerber daisy (very good to excellent)

Marrone Bio Innovations suggest many other uses of Regalia Biofungicide as a tank mix or rotational partner.

Biopesticides

Ray Cloyd presented the following definitions of biopesticides during the session described to the right.

Biopesticides are types of pesticides that are derived from natural materials such as animals, plants, bacteria, and certain minerals.

Biopesticides are placed into four major classes: Microbial pesticides, plant-derived pesticides, plant-incorporated protectants and biochemical pesticides. Microbial pesticides (or mycoinsecticides): consist of a micro-organism as the active ingredient (e.g., bacterium, fungus, virus, or protozoa). Highly selective in activity against specific target insect pests. Plant-derived pesticides (or botanicals): derived from plant parts such as leaves, stems, roots, or seeds. Plant-incorporated protectants: substances that plants produce based on genetic material that is incorporated into plants. Biochemical pesticides: naturally occurring substances that control insect pests by non-toxic mechanisms (e.g., sex pheromones).

The general characteristics of biopesticides are:

- Short-residual activity and low mammalian toxicity.
- Sensitive to ultra-violet (sunlight) degradation and rainfall.
- Primarily active on the young (immature) stages of arthropod (insect and mite) pests.
- Less harmful to natural enemies (e. g., parasitoids and predators) compared to conventional pesticides.
- Generally take longer to kill insect and/or mite pests, and have broad modes of activity.

You can contact me or Ray for more info.

The State of IPM

Last week, I attended an IPM conference in Memphis, TN. I gave a talk on the integration of biological control agents in an IPM program. I focused on the areas where biological control agents are most successfully used and ended with an overview of a very effective IPM program for propagation of cuttings.

The session was introduced by remarks from Randy Martin and closed by Matt Krause (both from BioWorks Company). Dr. Raymond Cloyd (University of Kansas Entomologist) discussed his work on integrating insecticides and the rove beetle (biological predator of fungus gnats) and I spoke on the integrated approach (including biological controls) used by a rose producer during the propagation phase.

I present here some of the opening and closing comments which help us to understand the state of integration of biopesticides in greenhouse and nursery grown ornamentals.

INTRODUCTION

1. Use of biopesticides is on the rise
2. They are not just for “organic” growers
3. Integration with conventional products is common
4. The end-user may be providing some motivation

We've come a long way--

1. Quality control
2. Formulations and packaging have improved
3. Cost of use is better
4. Business and marketing have improved.
5. Technology has greatly improved products.

Growers increasingly understand the necessity of considering biopesticides as a part of their disease and pest management programs. They have used them in resistance management and to improve short- and long-term effectiveness of disease and pest management programs. Once growers learn the strengths and limitations of biopesticides, they weigh their benefits and creatively fit them into their programs.

Biopesticides are not for chemically dependent growers. Biopesticides are more user friendly than they were in the 1970's as manufacturer understanding of their products continues to improve. Higher quality and consistency, better formulations and higher efficacy each allow more knowledgeable choices. The registration process is also greatly improved and more are being registered giving growers many more choices. Some of the factors influencing product choices include economic factors (cost in use), worker preference, safety, resistance management and customer satisfaction. Biopesticides used by conventional growers greatly outnumber the amount used by organic growers. The decision to use biopesticides in disease and pest management is often made for practical reasons.

Matt concluded with some the following comments.

1. Biopesticides can be used as effective components in integrated disease and pest management programs.
2. Biopesticides generally act preventively, not curatively; natural enemies generally act curatively.
3. How, when and how often biopesticides are applied greatly impacts their efficacy and impact on other management tools.
4. True knowledge and practice of all IPM components lead to more effective use of biopesticides (i.e., sanitation, scouting, timing, rotation, nutrition, education, etc.).
5. Knowledge about compatibility of biopesticides with other approaches is critical.
6. Decisions to use biopesticides in disease and pest management

Recommendations for Controlling Verticillium Wilt

University of Illinois Extension RPD No. 1010 July 1997

1. Steam the soil used for potted plants or for bench crops in the greenhouse and nursery at 180°F for 30 minutes or 160°F for 1 hr.
2. Do not grow susceptible plants on land where crops previously have been killed by Verticillium wilt. For vegetables, flowers, and field crops, rotations of five years or more may help to reduce the amount of infection. Only non-host crops should be used in the crop rotation cycle.
3. Control weeds (ground cherries, lamb's-quarter, pigweed, horse nettles, and velvet leaf) that can act as inoculum reservoirs in and around planting sites.
4. Fertilize to promote vigorous growth and maintain a balance of nitrogen, phosphorus, and potassium. Fertilizing can help reduce symptoms in nursery, field, and landscape plantings. Apply a fertilizer containing ammonium sulfate following the suggestions in a soil test report. Affected trees and shrubs should be fertilized and watered as soon as possible after initial wilt symptoms are exhibited. For quick response, the fertilizer should either be injected into the soil in liquid form or be applied to the soil surface and watered in immediately after application. Ammonium sulfate can be applied at the rate of 29 pounds per 1,000 square feet.
5. Water trees and shrubs that show symptoms every 10 to 14 days during dry periods of the growing season, applying 1 to 2 inches (600 to 1,200 gallons per 1,000 square feet) each time.
6. Destroy dead plants in nurseries or flower beds, removing as much of the root system as possible.
7. Branches or entire trees with recent wilt symptoms should not be removed immediately. They may recover in response to watering and fertilizing (see 4 and 5 above). Dead branches on trees should be removed. Cut well below the area of internal discoloration. This wood should not be chipped and used as a mulch as it may spread the fungus to other plantings. Pruning tools should be disinfected by swabbing them with 70 percent rubbing alcohol after working on an infected plant.
8. Plant only resistant species, varieties, or cultivars where Verticillium wilt is a problem.

Acknowledging e-mail communications

Acknowledgment---What does this mean? Both Ann & I have had our discussions about this, we've pretty much come to the same conclusion and that is in our minds it's straight forward. You received something and now comes the time to "Acknowledge" the receipt of it, Hmm.

Seems like we've gotten in either a time crunch, forgotten common courtesy or our computers don't have a "Acknowledgment" button to reply with. I know on several occasions I've sent someone either an email or something in the regular mail just to never hear that they've received it. To most this may not be an important factor, but at times when an email is directly documented or with an attachment with some sort of action taking place or TO take place, and you don't hear anything in reply, what comes to mind. Maybe not important, but to whom is it not important? Do we just not do anything until we hear back? What does this "wait time" create?

I think a simple "Acknowledgment" is important, common courtesy and just good business practice.

Even a simple response of a few words like:

- Received it
- Got it
- Taken care of
- Will get back with you (when)
- Call me (when)
- I'll call you (when)



The list can go on but you get the drift! None of those replies take long to type and they tell us exactly how to proceed. Sometimes when we don't hear back and we're in the "Holding Pattern" it can create a problem if we are supposed to be doing some sort of action, especially if it involves other people. Are we just supposed to wait? For how long? Do we assume? We know we don't want to do that when a simple reply will take care of just about everything.

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