Chase News

Chase Horticultural Research, Inc.
Education for Horticulture

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SEASONS GREETINGS!

Well, I am getting closer to an on time completion for the newsletter. Maybe I will end out the 2010 year with an issue before the end of the year! For the first year in many, I actually have an active schedule for the first three weeks of December.

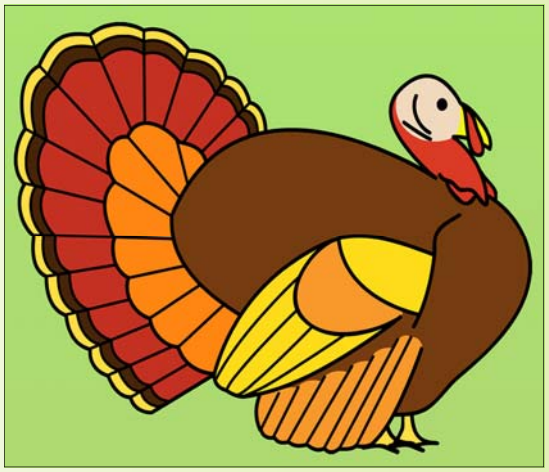
We are launching our new website in December. I hope you will let Mike and me know what you think once it comes online. Access will remain www.chasehorticulturalresearch.com. We have simplified some of the sections and improved accessibility of others. This is especially true for ***Chase Base***. We added dates to the reports and alphabetized them by disease to facilitate ease of access. We have retained the search engine for plants and fungicides as well. Coming early in 2011, we will be adding about 70 new reports bringing us up-to-date with the trials completed by the end of 2010. The Online Store is being updated as well.

Don't forget you can purchase images from us. We have a library of thousands of images of the most common diseases on the many ornamental plants our industry produces. Use the "Contact Us" cue to ask about those you wish to purchase.

We are also collecting pre-publication volume purchases of the 2011 **Chase's Guide to Ornamental Fungicides.** This will be available as an information sheet and also the popular wall poster. You will be able to purchase these in our online store or at tradeshows when they come out in the first quarter of 2011.

The lab will be closed for two weeks starting on December 20th in observation of the holidays. The final months of the Diagnostic Lab start again on January 3rd 2011. Please mark on your calendars that February 28th is the final day for sample submission. We will be sending out an accounting for those of you with prepaid diagnosis packages regarding how many remain.

Happy Thanksgiving from Chase Horticultural Research!



CONTENTS

Control of Rose Powdery Mildew with Gary Osteen

Our partner in the Central Valley of California is Gary Osteen. Gary is a PCA and also expert in forensics on crop problems. At least once a year, Gary and I get a trial going on field-grown roses for powdery mildew control. The first one for 2010 was started at the end of October and it coincided with weather that promoted the start of powdery mildew. This trial was conducted on eight cultivars of roses with the bio-pesticide Regalia. This is an extract from Giant knotweed that is under development by Marrone Bio-Innovations.

The trial included two rates of Regalia (1% and 2%) compared to an untreated control. We have four replicates for each of the three treatments which were ten feet long and contained about 20 newly planted liners. At the end of the trial, they were 10-18 inches tall and had good new growth and flower development. Treatments were applied on 28 October, 1 and 9 November. We rated them for severity of powdery mildew on the following scale: 1 (none), 2 (slight), 3 (moderate) and 4 (severe). We rated them on 16 November.

On all cultivars, Regalia provided significant suppression of the powdery mildew. In some cases this was 100% effective (Pink Double Knockout and Apricot Drift). The 2% rate of Regalia was somewhat more effective than the 1% rate but in no case was this difference statistically significant.

Powdery mildew severity on rose cultivars with Regalia

Cultivar	Unsprayed control	Regalia 1%	Regalia 2%
Regular Knockout	2.8 b	1.5 a	1.4 a
Blushing Knockout	3.0 b	1.8 a	1.2 a
Rainbow Knockout	3.6 b	2.5 a	2.1 a
Pink Double Knockout	2.1 b	1.0 a	1.0 a
White Out	2.8 b	1.4 a	1.8 ab
Apricot Drift	2.0 b	1.0 a	1.0 a
Pink Drift	3.0 b	2.1 a	1.5 a
Sunny Knockout	1.0 a	1.0 a	1.0 a

Severity of powdery mildew was rated using the following scale: 1(none), 2 (slight), 3 (moderate) and 4 (severe). Numbers in the same row followed by a same letter are not significantly different (Student-Newman-Keuls method).

I was very interested to see how differently these eight rose cultivars reacted to natural infection with powdery mildew. Sunny Knockout appeared immune in this trial and only slight powdery mildew developed on the Pink Double Knockout and Pink Drift. The most severely infected was Rainbow Knockout.

This led us to a new trial for control of powdery mildew on Rainbow Knockout. This time we are testing a new adjuvant for ability to in enhance efficacy of several strobilurins. Look for results next month in ***Chase News.***

Site of our field trial near Wasco, CA

Diseases to Watch For

In the past few weeks, we have received a few samples in our diagnostic lab. The image to the left shows typical symptoms of shot-hole on Cherry Laurel. In this case we isolated *Pseudomonas syringae*. Copper bactericides continue to be most effective on many bacterial spots.

The oleander immediately below depicts leaf spots (we also saw tip dieback) caused in this case by *Phyllosticta*. Winter is one of the most common times for anthracnose on woody ornamentals. Our control trials indicate two of the most effective products are Spectro and Pageant for Phyllosticta anthracnose.

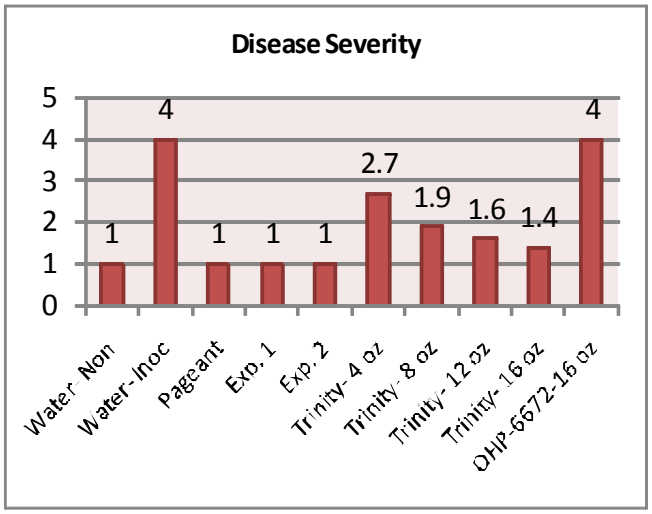
The Camellia plants (below) looked poor in the spring, pretty good during the summer and finally gave up as the winter started. Pythium root rot often causes minor damage and plants can recover at least for a time. Don't forget to check roots if plants have dieback since it may be due to dead roots.

Cercospora Leaf Spot Prevention on Pansy

I ran across Cercospora leaf spot a couple of times this fall and was able to obtain a new isolate of the pathogen. This one is hard for me to keep alive in between trials so I was really glad to be able to isolate and keep the pathogen going. We started one trial on 'Dynamite Strawberry' that had been grown for about 3 weeks before starting the trial. Plugs were planted in 3.5 inch pots containing Fafard Mix 2B on 28 September. We included several treatments:

- Water noninoculated
- Water inoculated
- Pageant (12 oz/100 gal)
- Experimental 1
- Experimental 2
- Trinity (4 oz/100 gal)
- Trinity (8 oz/100 gal)
- Trinity (12 oz/100 gal)
- Trinity (16 oz/100 gal)
- OHP-6672 (16 oz/100 gal)

Plants were sprayed to drip four times on a weekly interval with inoculation three days after the first fungicide application. Disease took about 2 weeks to develop but was very fast once it started (see below). Disease pressure was very high in this trial and we rated it on a scale instead of counting spots: 1 (none), 2 (slight), 3 (moderate), 4 (severe) and 5 (dead). The graph below shows the final severity rating.



Excellent control was achieved with Pageant as well as the two experimental treatments. Trinity worked better as the rate increased but was accompanied by stunting. PGR effects of DMI fungicides is always a concern and in this case the pansies were sensitive to even the lowest rate tested. Trinity is NOT labeled for use on ornamentals yet so please wait until it is legal and read the label before using any fungicides.

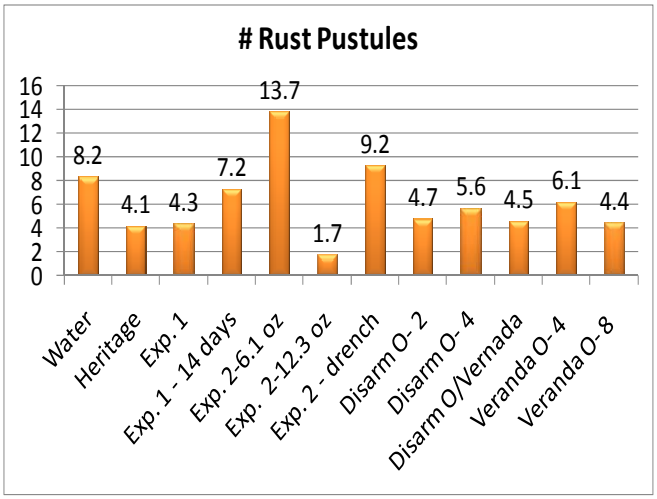
OHP-6672 (thiophanate methyl) was a failure in this trial. This is the first time I have seen a thiophanate methyl product fail on a Cercospora trial. Additional testing is planned.

Hypericum Rust Prevention

.We sometimes perform "prevention" trials after the spirit of the real world when prevention often means after a very small amount of disease is detected. One of the most reliable systems for rust work has been Hypericum which is grown as a ground cover, woody landscape ornamental and cut foliage crop.

We obtained rooted cuttings of "Greenie" *Hypericum perforatum* which is used as a cut foliage crop. They were planted in 3.5 inch pots containing Fafard Mix 3B in early October. They started to show a tiny amount of rust (*Uromyces triquetrus*) on their oldest leaves so we started the trial on 20 October. We treated them four times on a weekly interval by spraying to drip. Treatments included:

- Water
- Heritage (2 oz/100 gal)
- Experimental 1
- Experimental 1 (14 day interval)
- Experimental 2 (6.1 oz/100 gal)
- Experimental 2 (12.3 oz/100 gal)
- Experimental 2 drench (6.1 oz/100 gal)
- Disarm O (2 oz/100 gal)
- Disarm O (4 oz/100 gal)
- Disarm O (4 oz/100 gal) alternated with Veranda O (8 oz/100 gal)
- Veranda O (4 oz/100 gal)
- Veranda O (8 oz/100 gal)



The graph above shows the final data collected on the number of rust pustules per plant. Optimal control was achieved with the 12.3 oz rate of Exp. 2. The drench of Exp. 2 did not work. Exp. 1 and Disarm O were as effective as Heritage in this trial. Disarm O and Heritage are both strobilurins which have been very effective in controlling many ornamental rusts. Exp. 1 used on a 14 day interval was not effective. The active ingredient of Veranda O is polyoxin D and it was also as effective as Heritage in this rust trial. Alternating Disarm O and Veranda O was an effective rotation for resistance management which is always a concern.

Tank Mix or Rotate to Avoid Resistance

Over the past year, I wrote a series of articles on making the most of your fungicide dollars (*Greenhouse Manager*). I decided to print the article on tank-mixing or rotation for resistance management.

This is the final article in the series and this month I am considering fungicide resistance management. There are some key topics that should be addressed and I am covering them by answering questions. Obviously, if your fungicide fails due to resistance your dollars are wasted.

Which pathogens become resistant the most easily?

The pathogens that become resistant to fungicides most quickly are those that reproduce quickly and in high numbers. These include powdery mildew fungi (e. g. *Oidium*), downy mildew fungi (e.g. *Peronospora*), *Botrytis*, *Pythium*, *Phytophthora* and bacteria (e. g. *Pseudomonas*, *Xanthomonas*, *Erwinia* etc.). It is interesting that although bacteria develop resistance to copper quite readily fungi don't seem to. The FRAC (Fungicide Resistance Action Committee) actually has copper listed as low risk of resistance development.

Which fungicides are most likely to have resistance concerns?

In this case, the more narrow the mode of action the more likely the target fungi can develop resistance to that fungicide. Fungicides like chlorothalonil and mancozeb actually have multiple sites where they attack the fungus making them less likely to have resistance problems. In contrast, some of the newest fungicides have very narrow, specific modes of action making resistance development more likely. That has led to very strict instructions on their labels concerning the number of times they may be used on a crop and/or if they must be tank-mixed.

What are the methods used to reduce the potential for resistance development?

The most important method is to do everything in your power to reduce disease including using alternative methods – practice IPM. If you do nothing but spray fungicides you are placing too much strain on them and they certainly are more likely to fail. Even the best fungicides work poorly when the cultural and environmental controls of IPM are ignored. Don't wait – be preventative when necessary. Downy mildew and some bacterial diseases are not easy to control (sometimes impossible to control) if preventative applications are not made. Use products according to their labels – the fungicide manufacturers really do know more about how to use their products effectively than anyone else does. Learn more about important diseases of your crops so you can find their Achilles heel. Botrytis can be controlled without any fungicides if humidity and temperature are firmly under your control. Some diseases must be present on the seed or cutting or liner since they do not blow in with the wind (for example Cylindrocladium stem rot on rose or azalea). Finally, rotate or tank mix products.


Downy mildew spores on leaf underside

Is tank-mixing or rotation best?

Most studies have shown that both methods work for resistance management so the preference is yours. If you make a tank mix with two products for the same disease, then you are doing so to manage resistance. If however, you combine products with different spectrums, you are simply using a shotgun approach. This gives you some assurance you will control an un-diagnosed situation or one that is caused by more than a single pathogen.

I find that many growers like to use tank mixes and that one reason is they think they can reduce costs by using lower rates of the fungicides if they mix them. Sometimes this is true – but not always. You can reduce the rate of fungicides in a tank mix when you are treating preventatively, disease pressure is low, both products work on the target fungus and you are sure you do not have resistance to either product. You should not go below labeled rates in most circumstances. Do not reduce rates when you do not know the cause of the disease, more than one disease is present, the fungicides have a narrow or similar mode of action or the product is new to you.

Pre-mixes can make the entire question mute. Palladium and Pageant are each a combination of two fungicides and can be very effectively used to manage resistance development for some diseases including Botrytis blight and Alternaria leaf spot. They also make ideal rotational partners since, between the two fungicides, they represent four separate and distinct modes of action.

Conclusions

I favor rotation over tank-mixing for resistance management because it can teach you to be a better grower. You have to know what the disease target is and how to use the fungicide. You do not need to know everything about fungicide classes, since using only two products (in different classes) in an alternating routine can go a long way to avoiding resistance development. Rotation also allows you to decide what happened – if the application worked or failed or caused phytotoxicity, at least you can interpret it. In tank-mix situation, one never really knows which product or even if the combination is responsible for the reaction. In the end it is a matter of your preference. Whether you choose tank-mixing or rotation at least choose one of them.

Botrytis Blight Review

Now is the time to consider doing more to prevent Botrytis blight on ornamentals. This disease is usually caused by *Botrytis cinerea* but other species are found on certain crops. Unless you are growing some of the bulb crops like tulip and hyacinth, your main concern over the next few months will be Botrytis. It is certainly a last minute worry about your poinsettia crop since the finished product is very susceptible to this opportunistic pathogen.

Symptoms

Botrytis can cause flower spots, stem rot, leaf spots and blight, cutting rot and damping-off. Be sure to check inside plant canopies whether they are in propagation or production. This is the ideal area for Botrytis to start and spread undetected (image to right).

Botrytis sporulation always look the same so if you see something very white, brown or purplish you are not looking at Botrytis.

Conditions that promote Botrytis

High humidity and more than 6 hours of leaf wetness are most important for an outbreak of Botrytis. Temperatures around 50 to 75 F are ideal but I have seen Botrytis occur at much higher temperatures (up to 95 F during the day) as long as the crop was very susceptible and there is sufficient wetness. Poor air circulation also promotes this and other foliar diseases since it means leaves will stay wet longer and relative humidity around the plant is higher. Finally, damage to the crop (phytotoxicity and wounding) often result in a Botrytis outbreak. We have seen copper fungicides that stay wet too long actually cause more Botrytis damage despite the fact that when they dry quickly, they do not cause phytotoxicity and can effectively control Botrytis. Unfortunately, spraying plants more than once a week can also lead to an outbreak since this adds a lot of unnecessary water to the canopy.

Host Range

Nearly all plants can be attacked by this very general pathogen. Those in propagation are especially sensitive since the excess water required for rooting will also promote Botrytis blight. Plants that are normally warm to hot weather plants can be especially badly hit since they are physiologically stressed and weak plants are more susceptible to *Botrytis*. Some of the crops commonly susceptible to *Botrytis* include:

- Fuschia
- Geranium
- Cyclamen
- Exacum
- Poinsettia
- Primula
- Hydrangea
- Pansy
- Lisianthus
- Rose
- New Guinea Impatiens

Fungicides best for controlling Botrytis

There are quite a few choices that can be very effective in preventing and in some cases curing Botrytis blight. One of the active ingredients with the longest use for *Botrytis* is chlorothalonil. This can be found in Daconil formulations and Spectro. Residue may be a concern in some crops or near finishing. Remember that chlorothalonil can (and often does) damage petals on most plants. Therefore, its use should be timed before flowering starts.

Fenhexamid (Decree) is another fungicide that provides excellent control. This product has a pretty narrow range of activity (mainly *Botrytis*) but has been the most effective at killing spores if disease starts.

Fludioxinil is another active ingredient for *Botrytis*. It can be found in Medallion and Palladium, which also has cyprodinil. Both of the active ingredients in Palladium offer Botrytis control so its use can be considered a good strategy for resistance management.

Iprodione (Chipco formulations like 26GT and 26019) has also been available for the past 25 years or so. It has a broad-spectrum of activity.

Finally, pyraclostrobin and boscalid (Pageant) are very effective on *Botrytis* and the closely related *Sclerotinia*. As with Palladium, both active ingredients are excellent for *Botrytis* and provide a good tool for resistance management.

Conclusions

Get out there and look closely for early signs of Botrytis—look under the leaves. Do not let plants go to bed wet since this easily exceeds the 6 hour leaf wetness minimum and Botrytis can explode. Don't use a copper fungicide when it won't dry quickly. Don't spray flowers with chlorothalonil and try to resist spraying more than once a week.

Research Reports

DISEASES ON HARDY ORNAMENTALS IN ENGLAND

I just received the November issue of ***Hardy Ornamentals Notes*** from ADAS in England. This monthly newsletter highlights the similarity in diseases in different parts of the world. This month they stress the importance of minimizing irrigation amounts and timing for rapid leaf drying. They also recommend using fans to improve air movement and thus reduce relative humidity and leaf wetness. Some of the most common diseases over the previous month are summarized in the table below.

Disease	Crops Affected
Bacterial Leaf Spots	*Hedera*
Botrytis	*Gaura, Bergenia, Echinacea, Lavandula, Lysimachia, Heuchera*
Colletotrichum	*Lupinus, Lavateria*
Downy Mildew	*Digitalis, Hebe, Geum*
Powdery Mildew	*Aster, Berberis, Lonicera, Polemonium, Tellemia, Verbena*

The ***OFA Bulletin*** (November/December issue No. 924) also just arrived. There were two articles I thought you might be interested. in.

DOES SILICON HAVE A ROLE IN ORNAMENTAL CROP PRODUCTION?

Frantz, Locke and Mattson have been researching the effect of silicon in crop production. They researched effects of supplemental silicon on development of powdery mildew on zinnia, phlox and sunflower. The control of powdery mildew was not complete but silicon delayed development about a week with severity and spread also delayed another week. While this may not be commercially acceptable is does indicate that an integrated program including silicon might be beneficial in a variety of ways.

They also found that supplemental silicon in hydroponics production of zinnia protected the plants from copper toxicity. Copper toxicity manifests as long-term stunting but plants treated with silicon had the same mass of leaves, roots and stems as control plants that were not exposed to copper. Other studies also showed tolerance of excess copper when plants were treated with supplemental silicon.

The final study they reported concerned post-harvest shelf-life of poinsettias. Those treated with supplemental silicon showed delayed development of stress due to lack of water and recuperated more quickly with less damage than those without supplemental silicon.

Supplying silicon in a reliable manner was also addressed. The authors tested the amount of silicon in a variety of materials that either are used or could be used as part of substrates used to grow ornamentals. They found the highest levels in rice hulls. Other methods would be to apply silicon as a spray or "fertilizer". The authors consider using silicon to be a good idea but caution growers to test any changes in crops production in small trials before widespread use in your greenhouse or nursery since plants do respond differently to silicon supplements.

ECOLOGICAL APPROACHES TO WATER TREATMENT

Water treatment has been a hot topic for the past few years and will continue to be as we seek a more sustainable method for ornamental production. Oki and White (University of California and Clemson University, respectively) summarized this topic in the ***OFA Bulletin*** (November/December issue No. 924).

Concerns for water runoff surround contamination with fertilizer and pesticides and also pathogens like *Phytophthora* and *Pythium*. At the time the article was written California, Florida, Maryland, Oregon and Texas had adopted regulations to capture or control runoff from irrigated agricultural operations.

Oki and White go on to describe large scale treatment systems which are typified by constructed wetlands. These ecologically based systems include: free water surface (surface flow), subsurface flow (both horizontal and vertical flow), mobile and floating wetlands.

Free water surface flow in constructed wetlands has been researched extensively at the University of California. The system works best for moderate to high water runoff and should be designed to retain water from 3 to 3.5 days to allow for the biological action. The ideal depth should be 2-3 feet with a maximum of 4 feet. These systems can be very good at removing nitrogen but not necessarily phosphorous.

Subsurface flow constructed wetlands consist of an impermeable basin filled with a 2 foot layer of coarse gravel (like pea gravel) planted with wetland plants. Apparently, these systems are better suited for winter treatment than the free surface water flow. The system is not permanent since the gravel becomes clogged after several years of operation.

Slow sand filtration has been recognized worldwide as a very effective means of treating runoff or waste water to remove plants pathogens. The filter consists of a layer bed of sand through which water moves "slowly". Some keys to this method are:

- Round sand grains (60 mesh) to avoid packing
- Sand remains submerged at all times
- Depth is 3 feet with drainage system underneath
- Surface is not disturbed

The authors suggest the size needed to yield 50,000 gal/day is 628 square feet. This is probably the most limiting concern for many nurseries.

Check the entire article when you have a chance!

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