Chase News

Chase Horticultural Research, Inc.
Education for Horticulture

Volume 10—Issue 12
December 2011

2011 Disease Highlights

2011 closed with a bang as far as new diseases go. We saw a severe outbreak of downy mildew on impatiens in many parts of the country. We also saw a new disease on boxwoods found in some places on the East coast including North Carolina, Virginia and Connecticut.

BOXWOOD BLIGHT

Boxwood blight is caused by *Cylindrocladium pseudonaviculatum* (also called *C. buxicola*). The disease was reported from the United Kingdom in the mid-1990's and has spread throughout Europe and into Croatia and Georgia. Henricot has reported extensively on this disease in the UK including a host range study (no resistance found) and some lab studies on effective fungicides.

In the US, Dr. Kelly Ivors (North Carolina State University) was one of the first to alert our industry to this new disease. At the Connecticut Agricultural Experiment Station Dr. Sharon Douglas has published a bulletin on the disease with many color photos. This new disease has a lot of regulators reacting and I am getting questions from all over the US about how to control it and/or how to get a crop certified free of this disease. If you would like either of these publications please contact me and I will email them to you. Here is the link to Dr. Ivors information:

http://go.ncsu.edu/boxblight

The most effective products for Cylindrocladium diseases in our trials on azalea, Spathiphyllum and myrtle have been Heritage, Medallion and Terraguard. Kelly Ivors mentioned that Medallion was effective for some North Carolina growers on the recent outbreak of boxwood blight.

I present a brief summary of ours trials in the table to the right, above.

Efficacy trials for Cylindrocladium—Chase Horticultural Research, Inc.	
Chipco 26019, Chipco 26GT	Good to very good
Cleary 3336, Fungo, OHP-6672	Good to very good
Heritage	Very good
Hurricane	Very good
Insignia	Good to excellent
Medallion	Very good to excellent
Pageant	Good to excellent
Palladium	Good
Terraguard	Good to very good

STEM AND LEAF SPOT ON LEUCOTHOE

In 2011 another new disease caused by *Cylindrocladium* was described from North Carolina State University researchers Benson, Munster and Ivors. This disease was caused by *C. colhounii* which has been found in the US on other crops causing similar symptoms. Some of the previously reported hosts are: *Callistemon*, *Carya*, *Ficus*, *Gautheria* and *Pinus*. The research was published online: Plant Health Progress doi:10.1094/PHP-2011-0628-01.BR.

IMPATIENS DOWNY MILDEW

We saw downy mildew on impatiens first in 2004 although the disease has been in the US since 1897. Margery Daughtrey (Cornell University) published a review of the current outbreak in Long Island Horticulture News (November 2011). She included some very good photos of the disease as a review of its development and control.

The disease popped up again on the East coast in the summer of 2009 in landscapes. In 2010 and 2011, downy mildew once again appeared on landscape impatiens and reports started to come in from all over Long Island, Cape Cod and even Illinois and California. It is probable that it has spread further and escaped notice since it causes the most dramatic symptoms at the end of the summer when the landscape plants are starting to decline due to cooler weather anyway.

Downy mildew is systemic on impatiens making it possible to move it with cuttings. Make sure to discard all symptomatic plants and never propagate from them. Margery stresses preventative steps since once a plant is infected systemically with downy mildew nothing will help. She also stresses scouting since early detection in production and the landscape are keys to its control. The disease does not appear to infect New Guinea Impatiens. I am not aware of any fungicide trials specifically performed on impatiens downy mildew.

CONTENTS

Efficacy of Pre-emergent Herbicides on Long-term Control of Weeds in Containers

We started working more on herbicides in 2011 and completed a trial on longevity of some formulations of indaziflam for control of weeds in containers. The two weed species we tested were *Digitaria sanguinalis* (Large Crabgrass) and *Euphorbia maculata* (Spotted Spurge). Every two weeks, seeds (0.1 g/pot) were planted in 1 gallon pots containing a commercial potting medium obtained from a nursery crop producer. The test was conducted on outdoor benches in full sun. Pots were irrigated at least once daily using overhead sprinkler irrigation.

Treatments:

A. Water untreated
B. Indaziflam SC spray
C. Indaziflam G-A
D. Indaziflam G-B
E. Freehand (0.34 lb/100 sq. ft)

All treatments were applied once only as a soil surface spray (to wet) or granular broadcast as listed above on 26 April, 2011. Seeds were sown every 2 weeks starting at week 0 (4-26-11) and continuing through week 12 (7-19-11).

All treatments were close to 100% effective in preventing weed growth (regardless of sowing date) at the 12 week mark. At the 14 week mark there was some germination of spurge in both indaziflam G treatments but indaziflam SC and Freehand were still 100% effective. This continued through week 16. The 19 week rating showed the loss of efficacy for Freehand with slight crabgrass germination in some indaziflam G pots. Indaziflam SC was still 100% effective. Freehand also failed to prevent germination of amaranth and spurge at 19 weeks post treatment. There was slight break through for the indaziflam G treatments but indaziflam SC was still 100% effective. At the 22 week mark, more break through on the Freehand treatment showed germination of large crabgrass and spurge. Indaziflam G also had slight break-through that appeared to be due to distribution of the product originally as opposed to failure in activity.

At the end of the trial (25 weeks after treatment), Freehand had failed to prevent large crabgrass germination and miscellaneous other weeds. In contrast, the indaziflam G treatments also showed some large crabgrass germination but this was due to early germination (maybe due to coverage in the container) and not a case of longevity of the treatment. One of the indaziflam G formulations showed some new weed growth for the spurge containers at the 25 week rating. Overall, indaziflam appears to persist longer than Freehand but perhaps the G formulations do not provide a complete coverage as the SC which was 100% effective for the entire 6 months of this trial. Since the weeds in the pots were allowed to develop seed, the ability to persist for the full 25 weeks was clear for the indaziflam SC.

Trial plot at week 8 (top) and at trial close—week 25 (below).

Above—large crabgrass germination in untreated pots only. Below—spotted spurge and other weeds in untreated control and to a lesser degree Freehand and indaziflam G treatments.

A Close-up Review of Downy Mildew on Alyssum and Snapdragon

It seems logical to try controlling downy mildew on one crop using methods that have worked for another. Unfortunately, there are times when a product that gave excellent control on one crop is not as effective or is not safe on another crop. I was recently asked to recommend specific programs for control of downy mildew on alyssum and on snapdragon. I decided to review the trials we had performed on each crop and see how close results were for these two crops. The table below is a summary of our work. Most of it was completed 5-10 years ago and not all of the newest fungicides that are effective on downy mildew were included.

The first thing I wanted to review was safety of products on Alyssum. Our trials had left me with the opinion that Alyssum are very sensitive to many fungicides leaving them in very poor shape even when downy mildew was controlled. The most effective and safest fungicides for Alyssum are Aliette (phosphonate, MOA 33) and FenStop (fenamidone, MOA 11). Excellent control with slight damage was achieved with Heritage (azoxystrobin, MOA 11). Although most other fungicides we tested gave excellent control, they were not always safe on this very sensitive crop.

In contrast, we rarely see phytotoxicity on snapdragons. Kocide (copper hydroxide, MOA M1) and MilStop (K bicarbonate, MOA not classified) caused some phytotoxicity and gave a low level of downy mildew control. Heritage is known to cause very slight marginal burns on some snapdragon cultivars when it is used at high rates and short intervals but does give excellent control. One surprise we saw was on a single snapdragon cultivar Aliette was not safe. This was the only time we have seen Aliette result in phytotoxicity on snapdragons (or almost any other crop that I can remember).

The choices for downy mildew control on snapdragon are very large and achieving excellent control should be possible if you apply the products preventatively. Make sure that you spray the leaf undersides since this is where the downy mildew spores form. Improve drying by using adequate plant spacing and fans and be sure to avoid watering plants late in the day or overnight. Finally, do not spray for downy mildew more than twice a week since this can result in an outbreak of downy mildew due to excess leaf wetness.

Product	Rate/100 gal	Snapdragon Safety	Snapdragon Efficacy	Alyssum Safety	Alyssum Efficacy
Adorn	2 oz	No damage	Very good to excellent		
Aliette	16-32 oz	Slight damage in one of four trials	Good to excellent (mainly excellent)	No damage	Excellent
Aliette/Fore	2.5 lb /1.5 lb	No damage	Excellent		
Camelot	3-5 pint	No damage	None	A lot off damage	Excellent
Compass O	1-4 oz	No damage	Some	Some damage	Some
Cygnus	3.2 oz	No damage	Excellent		
FenStop	5.5 oz	No damage	Good		
FenStop	14-28 oz			No damage	Excellent
FenStop/Aliette	5.5 oz/2 lb	No damage	Excellent		
FenStop/Fore	7 oz/1.5 oz	No damage	Excellent		
Fore	1.5 lb	No damage	Excellent		
Heritage	2-4 oz	Slight damage on some cultivars	Excellent	Slight damage	Excellent
Insignia	0.2-0.4 lb	No damage	Excellent	Some damage	Excellent
Junction	1.5-3 lb	No damage	None	Moderate damage	Very good to excellent
Kocide 2000	2 lb	Some damage	None	Some damage	Excellent
Micora*	4-8 oz	No damage	Very good to excellent		
MilStop	2.5 lb	Moderate damage	Some		
Protect	1-1.5 lb	No damage	Very good to excellent	No damage	Some
Strike 25W	2 oz			Some damage	Excellent

***Micora is currently in the registration process and Syngenta expects federal registration in 2012.**

Rose Powdery Mildew Prevention

One of the most recent trials we completed was to prevent powdery mildew on rose. We used "Nearly Wild Medium Pink' planted into 4 inch pots containing Fafard Mix 3B on September 1st. They were fertilized with Osmocote Plus 15-9-12 the same day and grown for almost two months to allow a good canopy to develop.

The first fungicide application was made on 25 October. Treatments included:

- Water control
- Tourney (3.5 oz/100 gal)
- Armada WDG (3 oz)
- Armada WDG (6 oz)
- Armada WDG (8 oz)
- Compass O (4 oz)
- Terraguard 50WP (4 oz)
- Torque (8 oz)

We applied the fungicides as sprays on a weekly interval for a total of 7 applications. Plants were kept close together to promote high relative humidity except for when they were treated. They were then spaced out to allow maximum spray coverage.

Disease did not start to develop until a month after test initiation. We then counted the number of powdery mildew colonies every week until the end of the trial on 12 December. The graph below shows the last three disease ratings.

Disease was low throughout this trial presumably due to poor weather conditions for powdery mildew. All fungicide treatments provided significant control of powdery mildew on rose in this trial. It was clear, however, that Armada (a combination of triadimefon and trifloxystrobin) provided excellent control at all rates tested. Compass O (trifloxystrobin) was equally effective throughout the trial.

Sometimes, fungicides in the sterol inhibitor group cause a PGR effect on some crops. In this case, the products containing this type of active ingredient were Armada. Torque, Tourney and Terraguard. We did evaluate growth of the plants and at no time did any of the fungicides employed cause any PGR or other adverse responses in the rose. This was especially good to see since we used the products many times on a weekly interval.

Be sure to rotate between MOA groups to avoid development of resistance.

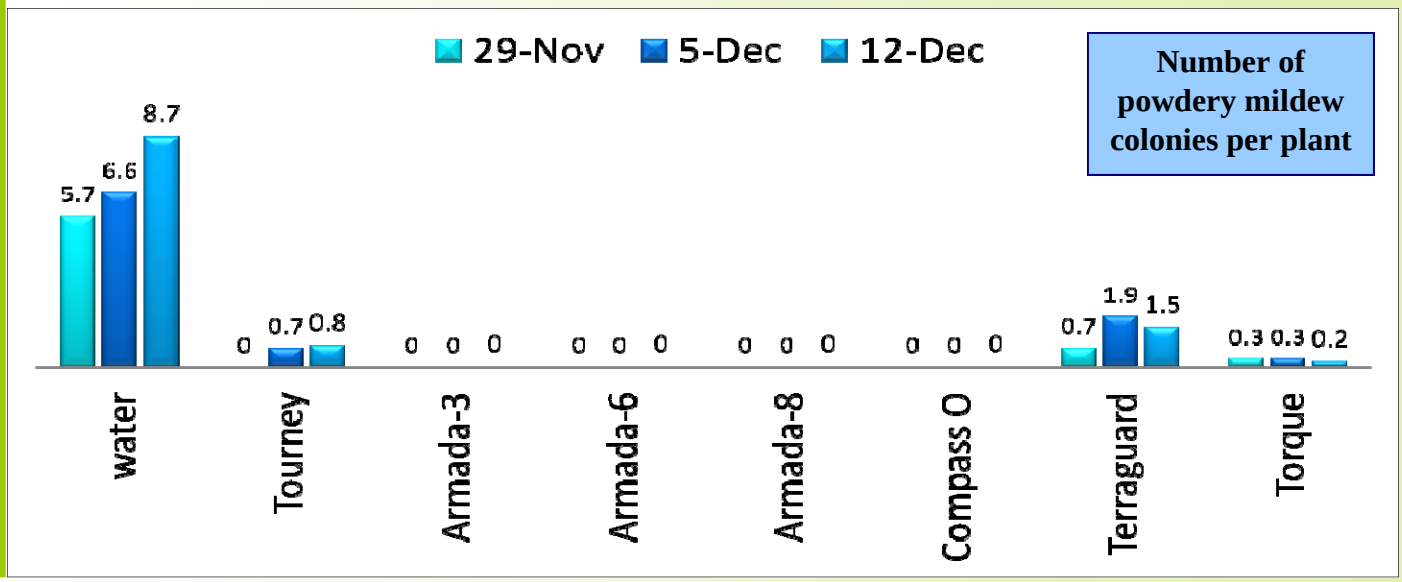
Salt Tolerance

As water becomes scarce and its quality declines it becomes critical that horticulturists assess salt tolerance of our most important crops. Researchers at Cornell University, Villarino and Mattson, published studies in HortTechnology on tolerance of fourteen floriculture species to sodium chloride.

Plants were exposed to water with different levels of salinity for five weeks starting at transplanting. The table below is a summary they presented in their paper. They determined the level of tolerance based on reduction in dry weight (DW) at the highest salt level compared to the controls. Most tolerant was DW reduction of 50-70%, somewhat tolerant was DW reduction of 70-90%, moderately sensitive was DW reduction of 90% or higher and extremely sensitive plants died.

Salt tolerance	Species
Most tolerant	Snapdragon, petunia
Somewhat tolerant	Begonia, fuchsia, coleus, marigold, vinca, verbena, geranium
Moderately sensitive	Impatiens, euphorbia, salvia
Extremely sensitive	Zinnia, pansy

Their results showed that some of the most popular crops cannot be grown with water that has a high level of sodium chloride. For the complete report see: HortTechnology October 2011 21 (5):539-545.



Canna Rust Control—A. J. Palmateer

In 2010, Dr. Aaron J. Palmateer at the University of Florida Research Center in Homestead Florida evaluated efficacy of preventative applications of Trinity 2SC and Pageant 38 WG compared to industry standards for control of canna rust. Canna lily (*Canna* cv. 'Australia') plants were treated with one of eight treatments including two untreated controls (inoculated and un-inoculated). The disease on canna is caused by *Puccinia thaliae*. The following is a summary prepared by Dr. Palmateer.

Canna plants were grown in 3-gallon containers containing Fafard potting soil amended with Florikan 18-6-8 slow release fertilizer. Potted plants were housed on benches in a greenhouse and watered daily with overhead irrigation. Experimental units were a plant treated with a single fungicide treatment, with 4 repetitions in a randomized complete block design with sub-sampling. Fungicides were mixed according to rates listed in Table 1, in 0.5 gal total volume, and applied with a backpack sprayer on foliage until runoff (approx 12 fl oz per plant). Treatments were made on a 7 day schedule for a total of five applications beginning on 8/31.

On 9/1, 9/17, and 9/22 plants were inoculated with a spore suspension of 1 x 10^6 spores/ml. Inoculum was prepared by rinsing spores from detached, diseased canna leaves with sterile water. On 9/22, severely diseased canna plants were placed on block ends to encourage further disease development. Disease variables measured were incidence (number of diseased leaves) and severity (average visual estimation of the percent of leaf area that exhibited rust for the top three leaves of the plant, using visual key). Percentages are given on 0-100% for severity. Disease ratings were obtained weekly from 8/20 to 10/29. Area under the disease progress curve (AUDPC) was calculated from the weekly ratings of both disease variables. Instead of measuring the amount of disease at a single point of time, AUDPC measures the total cumulative disease over the course of the trial. Final incidence, severity and AUDPCs were submitted to analysis of variance (ANOVA) using SAS v9.0, and means were separated using Fisher's LSD.

Results

Disease symptoms were not seen in the trial until 10/01, 3 days after the final fungicide application. All disease variables were significantly different across treatments ($P<0.05$) and y_{max}, ($P=0.0555$) (Table 1). Plant treated with Heritage and Pageant both significantly decreased disease compared to controls. Treatments with Trinity and Eagle did not significantly decrease disease levels. Introducing rust infested Canna lilies at the block ends of the trial on 9/22 increased disease incidence and likely accounted for the un-inoculated controls expressing greater disease incidence than those plants inoculated with a spore suspension. No phytotoxicity was observed for any treatment.

Table 1. Disease level after fungicides treatment to control canna lily rust.

Product	Rate/ 100 gal	Number of symptomatic leaves
Un-inoculated control	---	17.50±3.23 a
Inoculated - control	---	13.75±2.50 a
Pageant 38 WG	12 oz	1.00±1.00 c
Trinity SC	4 fl oz	16.00±1.83 a
Trinity SC	8 fl oz	10.75±1.11 ab
Trinity SC	12 fl oz	13.25±3.54 a
Heritage and Capsil	3 oz 6 fl oz	3.00±1.58 bc
Eagle	6 fl oz	17.00±4.69 a
	LSD	8.39
	P=	0.0022

Economics

Dr's. Hodges (University of Florida), Hall (Texas A&M University) and Palma (Texas A&M University) recently reported on the economic contributions of the green industry in the US from 2007-08. They used both the U. S. Economic Census and an industry survey. The full article is published in HortTechnology October 2011 21(5):628-638. I could not do their study justice here but I thought I would give you a few points that I was especially interested in sharing.

The total revenue was $176.11 billion dollars with a direct output of $117.4 billion. Direct employment in both full-time and part-time jobs was 1.2 million. Of that the largest portion was in the landscape industry with 1.075 million jobs and $50.3 billion dollars. The greenhouse industry had 436 thousand jobs valued at $27.1 billion dollars.

The top ten states were:

- California—258 thousand jobs
- Florida—188 thousand
- Texas—82 thousand
- North Carolina—81 thousand
- Ohio—80 thousand
- Pennsylvania—76 thousand
- New Jersey—68 thousand
- Illinois—68 thousand
- Georgia—66 thousand
- Virginia—59 thousand

The total value was 0.76% of the U. S. Gross domestic product. Comparisons to a similar study conducted five years earlier in 2002 showed an increase of 3.5%. They calculated this to be an average of 5.8% annual growth in inflation-adjusted terms.

As much as I like numbers this one was tough to decipher. Economics studies are complex and very specialized. Don't miss an opportunity to hear any of the authors speak if one comes your way!

The research was supported in part by a grant from HRI, Washington D. C.

Shot-hole Disease on Cherry Laurel

I was doing some online searching on shot-hole diseases on *Prunus* spp. and found a research article by Dr. Jean Williams-Woodward (extension pathologist at The University of Georgia at Athens). She did the work in 1998 but when I checked the list of treatments she tried I thought it was still relevant. Shot-hole on cherry laurel is caused by *Xanthomonas* spp. (right) and sometimes *Cercospora* and *Blumeria* spp. in the southeastern US. In California, Prunus shot-hole is caused by *Pseudomonas syringae* (below) and *Wilsonomyces carpophyllus.* You can see that an accurate diagnosis is critical for optimal fungicide/bactericide choice.

The work was done with *Prunus laurocerasus* cv. Otto Luykens in containers under full sun and overhead irrigation conditions. Plants were under severe disease pressure throughout the summer months. Fungicides were applied every 7-14 days starting in June.

The number of leaves with shot-hole symptoms was highest in September and the number of dead leaves per shoot reached a peak in October. The lowest disease pressure was seen in July and August when the weather was hot and dry.

Disease control was best in most months with Cleary's 3336 (12 oz/100 gal) and Fore (24 oz/100 gal). Over the entire test, Fore was clearly the best. Fore is mancozeb which has long been recognized as a broad-spectrum fungicide. More recent testing on bacterial diseases shows that this active ingredient is also a very effective bactericide. Copper products like Kocide 101 and Phyton 27 were not effective in this trial at any rating date.

Effect of fungicide/bactericides on severity of shot-hole on Cherry Laurel.

		Number of shot-hole spots per leaf					
Treatment	Rate/100 gal	June	July	August	September	October	Mean
Untreated	——	1.5 ab	0.8 ab	0.7 b	2.8 a	1.8 bc	1.5 a
Kocide 101	16 oz	1.9 a	0.8 ab	0.9 b	1.8 b	2.5 a	1.6 a
Phyton 27	20 oz	1.7 ab	0.5 bc	1.0 b	1.7 b	2.5 a	1.5 a
Phyton 27	35 oz	1.9 a	1.0 a	0.7 b	1.5 b	2.4 ab	1.5 a
Daconil 2787	1.25 lb	1.4 ab	0.9 ab	1.7 b	1.7 b	1.5 c	1.4 a
Cleary's 3336	12 oz	1.1 b	0.6 bc	1.0 b	1.8 bc	1.2 cd	1.0 b
Fore	24 oz	1.2 b	0.3 c	0.2 c	0.8 c	0.6 d	0.6 c

Numbers in the same column followed by the same letter are not statistically different.

Greetings from Clarkdale, Arizona!

The shot above is the front view of the Zemke house complete with holiday décor (including multi-colored cacti to the right).

This is the final issue of **Chase News** from Chase Horticultural Research, Inc. Mike and I have completed the process of opening our new business in Cottonwood, Arizona and will be continuing to provide consulting, training and educational tools for our industry starting on January 2, 2012. The new business is **Chase Agricultural Consulting, LLC** and you will see the newsletter format change to reflect this. I don't expect to see the contents of the newsletter change dramatically but it will reflect research and news from all over the US. I am continuing to do field trials in California especially with our consulting clients as well as a few locations with University and private researchers.

You can contact me at:
archase@chaseresearch.net
cell phone (530)391-3068 or
office phone (928)649-0400

Have a great New Year's and we look forward to working with you in the upcoming year!