Southern Forest
Nursery Management Cooperative
Fall 2013

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Director's Report

A lot of changes have occurred over the past year. What a difference a year makes in the amount of precipitation with last year's record drought and this year's record rainfalls throughout the region! Tom Starkey has more information on the record rainfall in the region. I hope that, despite the excessive rainfall, you have been able to get into the fields and finalize seedling culture for lifting this growing season.

Membership

Current membership within the Nursery Cooperative is 17 Full members. They include: ArborGen, Campbell Timberland Management, International Forest Company, Rayonier, Weyerhaeuser, the States of Arkansas, Georgia, Louisiana, North and South Carolina, Oklahoma, Tennessee and Virginia. The US Forest Service State and Private Forests is also a member.

2014 Advisory Meeting

The Advisory meeting is scheduled for Wednesday and Thursday, November 13 & 14, 2013 at the School of Forestry and Wildlife Sciences Building on the campus of Auburn University. The Nursery Cooperative staff will begin the process of updating our Accomplishments, Budget and next year's Work Plan. If you have any ideas or items that your organization would like addressed, please contact Tom or me. The Advisory meeting will begin after lunch on Wednesday and adjourn around noon on Thursday. We will set up the meeting using video conferencing for those who may not be able to travel to Auburn. If you would like to get access to the meeting online, please call Elizabeth Bowersock at 334.844.1012. Place those days on your calendar; more information will be available shortly.

2013 Contact Meeting

The 2013 Nursery Cooperative Contact meeting was held July 9-11, 2013 in Hendersonville, NC and was attended by 39 Nursery Cooperative members. Nursery Cooperative staff presented information to the entire group on cool storage and freeze tolerance and shortleaf pine myths. Guest lectures included an update on Sudden Oak Death caused by the fungus *Phytophthora ramorum*, the upcoming pulpwood shortage and the progress of introducing American Chestnut back into the forests and the problems with seedling production of the resistant planting stock. The field trips at this meeting deviated from the typical tour and included stops at the USFS Rust Screening Laboratory, the NC Arboretum and the VanWingerden Greenhouse in Mills River, NC. For those who were unable to attend, we have posted all the presentations on the Nursery Cooperative's web site for you to access. If you are unable to access or have any questions about the presentations, please do not hesitate to contact a Nursery Cooperative staff member. Next year's Contact Meeting will be held in conjunction with the Southern Forest Nursery Association's biennial meeting in Williamsburg, VA. The Nursery Cooperative's Contact Meeting will occur on the afternoon prior to the SFNA meeting. We are currently working with Dwight Stallard about the nursery tour that will showcase soil fumigation trials. More details will be forthcoming with the Spring 2014 Newsletter.

Contents

2014 SFNA Meeting

Mark your calendar for the 2014 Southern Forest Nursery Association meeting in Williamsburg Virginia, July 21-24, 2014. The conference will be held at the Crown Plaza hotel at Fort Magruder. For information about sites and attractions, visit http://www.fortmagruderhotel.com/Activities-And-Recreation/.

Activities planned thus far include dinner at the Jamestown Settlement on July 23rd. Staff will be on site before and after dinner for tours of the settlement for anyone that is interested. If the weather cooperates, we will enjoy dinner on the patio overlooking the historic James River. For the nursery tour, the plan is to cook a pig down at the river for lunch.

Speakers and other plans are still being developed and more information is forthcoming. If you have any questions, contact either Dwight Stallard or Justin Funk at the Garland Gray Forestry Center in Courtland, VA 804-834-2855.

Personnel Notes

As most of you know, we have had a number of scientists leave Auburn and their involvement with the Nursery Cooperative over the past few years. This includes David South (retired), Paul Jackson (Assistant Professor) and recently Ben Whitaker (forest land manager). Shortly after we heard that Ben Whitaker was leaving Auburn for Birmingham, AL, we began the process to fill that position. Delays at the AU HR office have dragged this out longer than I wanted, but we are in the process of interviewing candidates to fill Ben's position. We will hopefully introduce a new person at the Advisory Meeting in November in Auburn.

As a result of Ken McNabb's international association between Brazil and Auburn University, we have had a number of interns from Brazil work with the Nursery Cooperative staff through the years. In mid-July, Daniel Cury Spolidorio began a 4-month internship with the Nursery Cooperative as part of his undergraduate forestry degree in Brazil.

Daniel is from Botucatu which is about 2 hours from São Paulo (the largest city in Brazil) and is in his last semester of forestry (a 5-year program in Brazil) at the Botucatu campus of UNESP, the São Paulo State University. He will return to Brazil in November to give a report of his Nursery Cooperative work and graduate.

In Brazil, Daniel enjoys motocross endurance races. While he has been working with us, he has been involved in a number of Cooperative research studies such as the Eucalyptus deep planting study, the soil moisture profile study and the seed polymer study. Tom and Barry have enjoyed the extra hand in collecting data and have been able to introduce him to many of our member nurseries in our travels. We have also enjoyed teaching him some of the "finer points of southern living" such as the difference between "War Eagle" and "Roll Tide", how to correctly pronounce "Okefenokee Swamp", how to eat hot boiled peanuts and, of course, the location of every Bass Pro Shop.

Levi - 7 weeks

Welcome a new member to the family! On July 25, 2013, Elizabeth Bowersock, husband Jonas, and son Micah welcomed Levi Alexander Bowersock to the world. Coming in at 8 lbs 11 oz and 21 inches, Levi is a good- sized walleye and obviously a keeper. Elizabeth and Levi stayed home for a couple of months while Tom and I desperately awaited her return to help wrap things up for FY 2013.

I would like to introduce myself to the Nursery Cooperative. I am Nick Barnwell, and I am a graduate assistant under Dr. Scott Enebak. I graduated from Auburn with my B.S. in Forestry in August 2013. I am currently working on several studies for my graduate project, with a focus on weed control and herbicide tolerance in longleaf pine restoration. This was a project that Paul Jackson had initiated prior to his departure from Auburn and I plan to pick up where he left off. I have some nursery experience that I gained by interning with ArborGen in Shellman, GA in the summer of 2012. My responsibilities at ArborGen included some herbicide application and weed control, as well as a number of other daily tasks around the nursery. I look forward to my work in graduate school and anticipate helping with the

Nursery Cooperative along the way. If you are interested in any of the studies that I am doing or if I can help in any way, feel free to contact me at 678-925-1151 or email me at nab0006@auburn.edu.

Congratulations to Dr. Scott Enebak, who was surprised with the Christen Teaching Award on Friday, May 3, 2013 at a meeting of faculty, staff, and graduate students at the School of Forestry and Wildlife Sciences.

Dean Jim Shepard said, "Dr. Enebak is an excellent teacher because he cares deeply about the quality of instruction he provides and he integrates his research with teaching. He's very interested in student success and uses his connections in the forest nursery industry to provide summer internship opportunities for students."

The Christen Teaching Award is presented to an outstanding faculty member every 2 years for significant and meritorious service to teaching. Such achievement should be evidenced by: (a) unusual effort devoted to ensuring the quality of the students' classroom learning experience and (b) the possession of high standards for both the rigor and currency of course content and for the level of student.

Research Proposals

The Southern Forest Nursery Cooperative and the Forest Health Cooperative, both housed at Auburn University, jointly applied for membership within the Center for Advanced Forestry Systems (CAFS). Deadline for the proposal was September 27, 2013 and we are hopeful that the National Science Foundation (NSF) panel will approve the new research site at Auburn. Membership will allow a broader exposure of our research to others in the forest industry arena to solve complex, region-wide forest issues. There is the potential of $30,000 annually that will be used to direct Nursery Cooperative and Forest Health Cooperative research over the next five years.

In September of 2012, I submitted a proposal to the US Forest Service to examine pitch canker and seed infestation. Entitled *"Comparison of the rapid screening protocol to the blotter paper method to confirm the presence or absence of the Fusarium circinatum on/in southern pine seed and evaluation of seed infestation,"* the proposal had two objectives and requested three years worth of funding. The objectives were: 1) to compare the rapid screening protocol to the blotter paper method to confirm the presence or absence of the pathogen on/in southern pine seed that can be used for pest risk assessment of an invasive fungal pathogen and 2) to evaluate seed sample size requirements for different phytosanitary objectives. In July 2013, the $209,925 request was funded and, working with Dr. Jason Smith of University of Florida and Dr. Steve Oak of USFS Asheville, we have begun the process of hiring a post-doc to work on this important disease on pine seed.

Pesticide News

As part of our continuing quest for a soil fumigant to replace methyl bromide, there has been some use of a three-compound mixture in row and vegetable crop production that has shown some promise for nutsedge control. Officially known as Trifecta (TE-3), a three-way mixture of chloropicrin, dimethyl-di-sulfide (DMDS = Paladin) and 1-,3-dichloropropene (Telone II) under TIF has been tried at a couple of nurseries with good success. Success was measured by good seedling quality, no buildup of weeds and a reduced aroma of DMDS. If you are interested in testing this material in your nursery, contact your sales representative.

Soil flux studies that examine the off-gassing of soil fumigants under various tarps continue to be collected by EPA. A recent published article in the California Department of Agriculture (http://californiaagriculture.ucanr.edu/issue.cfm?volume=67&issue=3) has a good summary of soil fumigants under TIF in areas of high bystander risk (Sacramento Valley, San Joaquin Valley, etc). A couple of different soil types, soil fumigants and plastic tarps were compared and air monitored over time. In one of the more positive statements with respect to soil fumigants, the last paragraph states: *"The significant emissions reductions obtained when using TIF should allow regulatory agencies to provide relief to growers by implementing smaller buffer zones, increasing the volume of fumigant use and providing growers with greater flexibility in areas with spatially or temporally-based fumigant restrictions where total emissions are of concern."* Thus, when the soil fumigants are reviewed again, one might expect some changes in the labels to reflect the decreased risk of using soil fumigants.

Research News

Tip Blight - Revisited, Republished, and Still Here

If the calendar indicates it is August, we can be sure that phone calls about symptoms that occur every year in nearly every nursery – Tip Blight of southern pines - will be coming to our desks. Every year I send the following

reprint to two or three nurseries. This article was first published by Bill Carey in Fall 1999 and then republished again by Scott Enebak in Fall 2005 and 2009.

I have received two samples in the mail and one e-mail with images concerning tip blight or tip dieback of loblolly pine. Looking back through the Coop Newsletters and judging from the literature, Tip Blight was more common in the late 1970's but would sporadically appear. Therefore, disease symptoms may not be familiar to some. With seedling tip blight, the terminal inch or two of tissue is killed and the stem tissue usually turns purplish in color and dries up. Sometimes the seedling dies, but usually the disease is almost self-limiting as the necrosis stops where a lateral bud starts to grow.

Tip Blight typically shows up in August or September and be mostly gone by October. However, it can appear any time after it gets hot enough for seedlings to wilt slightly in the afternoon. Dieback usually appears to be random and diffusely scattered through a nursery without evidence of infection centers or secondary spread. Sort of like a random shot-gun blast. Sometimes there can be more disease among seedlings with restricted root systems, such as those in intermittent wet-spots or where the undercut is nearer the bed surface. This may indicate a role for temporary wilts in infection and disease progression.

The only journal article found for loblolly or slash pine was a 1982 article by Jim Rowan. There are a couple of nursery proceedings by Charles Affeltranger (1983 and 1988) but the "disease" doesn't even get a mention in the Forest Nursery Pests Handbook.

Actually, Tip Blight is a syndrome or a collection of symptoms as several fungal species are typically isolated from symptomatic tissues (Fusarium, Diplodia, Phomopsis, etc.) and experimentally, though apparently not in nature, infection requires wounds. Fungicidal sprays have not been cost effective and outplanted symptomatic seedlings survive as well as healthy ones (Rowan 1982, Affeltranger 1982).

When asked my opinion of spraying either regularly or in association with top-clipping to reduce the incidence of Tip Blight, I am non-committal. From my desk in Auburn, the disease will "go away" and the seedlings will get better anyway and data shows the disease does not affect outplanting survival. Although he presented no data to support the claim, Charlie Affeltranger reported that spraying with fungicides reduced incidence but was not cost effective. However, fungicidal sprays probably "buys" some peace of mind and I always suggest that a couple of control plots be left to see if the disease incidence is different. This way you really, really know if your treatment was effective or not. Thus, knowing the psychology of nursery managers and the premium for a restful nights' sleep, I think most spray and we never hear any more about Tip Blight.

Seed Polymers - Better than Latex?

Latex has been used for many years as part of the seed treating operation prior to sowing southern pine seed. The purpose of the latex is to help adhere fungicides such as Bayleton or Thiram to the seed.

Latex is a paint product. Actually the name is a misnomer since there is no latex in latex paint. True latex originally came from the Brazilian rubber tree (*Hevea brasiliensis*) but is now primarily produced in southeast Asia. Synthetic polymers which look like natural latex are used to make latex paint but have different chemical makeup and properties than latex rubber.

For many years, most nurseries used a latex from Dow Chemical company. International Forest Seed Company used to purchase it in large drums, repackage it and sell it in smaller quantities to nurseries. There have been many changes in the Dow product over the years. References in the literature cite Dow Latex 512-R, 512-L, 630, 636 and 2028 all generally diluted for seed treatment at 1 part latex to 9 parts water.

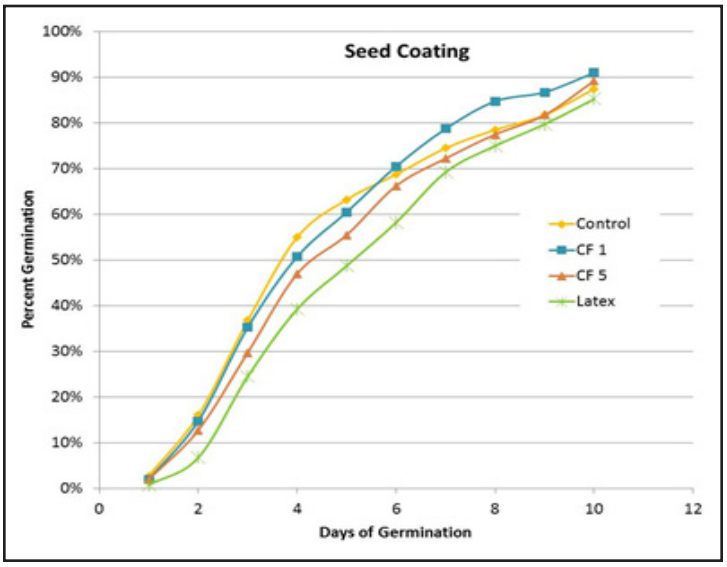
Information from the recently completed Seedling Culture survey indicates that over 80% of nurseries in the southern US use a form of latex in their sowing operations. About half the nurseries still use a Dow product. The other nurseries purchase latex from a local paint or hardware store. The latter group cites the ability to purchase latex in small quantities as their primary reason. Those that are still using a Dow product all indicate difficulty in finding or purchasing latex, especially in small quantities. One nursery responded that they are still using the same product purchased more than 15 years ago. Other points of concern with the use of latex in general are what is termed "dust-off." This occurs after pesticides are applied to the seed with the latex and dried. During the handling associated with sowing, part of the latex/pesticide coating flakes off and becomes a dust irritant for workers. This concern was expressed to the Nursery Cooperative with the most recent reregistration of Bayleton by the US EPA. Seed clumping after treating also was a concern expressed with the use of latex.

In agriculture, seed polymers are being used extensively on crops such as soybean, wheat, sunflower, corn, beans and cotton. These polymers are designed for one function: to protect treatments applied to the seed by providing uniform coverage. They are compatible with fungicides, insecticides, inoculants and colorants. The use of seed polymers also reduces the "dust-off" problem. In addition, they enhance seed plantibility by reducing clumping and stickiness thus increasing seed drop accuracy. A quote in Farm Industry News, December 3, 2012 describes polymers by saying "Seed polymers are a bit like "force fields" (in Star Wars): You cannot always see them, but they are there to protect."

There are many companies that manufacture seed coating

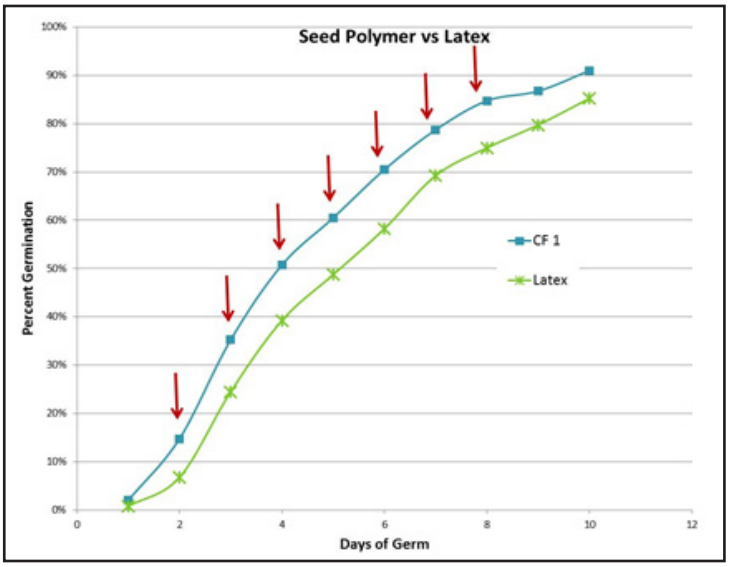
polymers and similar seed treatment products. Bayer CropScience and BASF are devoting significant resources in this developing field. Many nurseries in the south have used Becker Underwood as a source of seed colorant. In late 2012, BASF acquired Becker Underwood. In discussing seed treatment with a Becker Underwood scientist, he recommended that we try CF Clear to replace latex. The suggested rate for pine seed was 0.25 fl oz/50 lbs of seed. Our initial study was to compare germination of slash pine seed using latex, 2 rates of CF Clear and a control. The treatments of CF Clear used were a 1x rate (based upon 0.25 fl oz/50 lbs of seed) and a 5x rate. Below are two graphs of the results. The first graph presents the data for all the treatments (Fig. 1). The second graph compares just the CF Clear 1x rate and latex (Fig. 2).

Figure 1



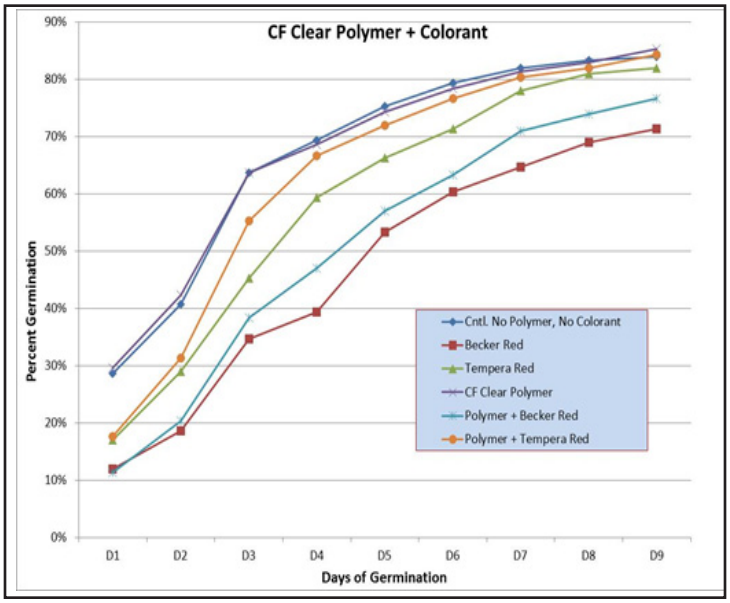
In the graph below, the red arrows indicate dates where the values are significantly different.

Figure 2



In a second experiment we compared CF Clear with and without seed colorant on slash pine seed. In a discussion with a nursery manager, they believed that they had experienced some reduction in germination using Becker Underwood colorant. At their suggestion we also included Tempera (Red) paint which is readily available from hobby stores. Tempera paint is a permanent, fast-drying painting medium consisting of colored pigment mixed with a water-soluble binder medium - usually a glutinous material such as egg yolk. The graph below presents the data (Fig. 3).

Figure 3



An interesting observation in this experiment was that the two treatments that contained Becker Underwood Red had a reduced rate of germination as well as a reduction in total germination. This is also presented in the following table. To save space, only the data from days 1,3,5,7, and 9 are presented in Table 1.

Table 1.

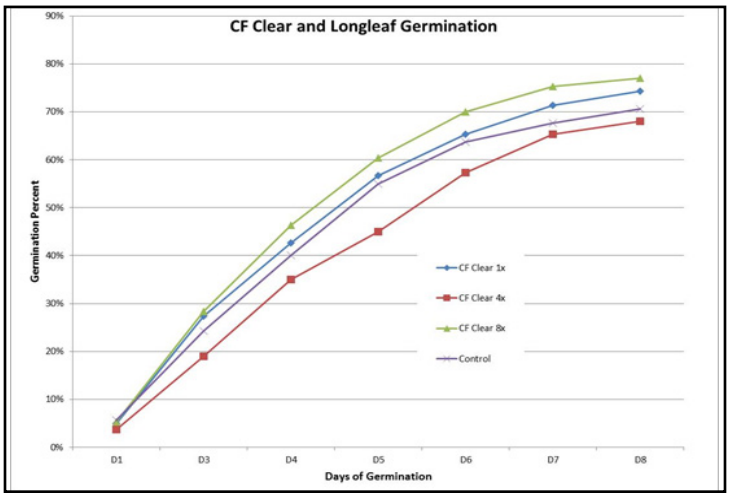
Treatment	Day 1	Day 3	Day 5	Day 7	Day 9
CF Clear Polymer	30% A	64% A	74% A	81% A	85% A
Control	29% AB	64% A	75% A	82% A	84% A
CF Clear + Tempura Red	18% ABC	55% AB	72% A	80% AB	84% A
Tempura Red	17% BC	45% AB	66% AB	78% AB	82% A
CF Clear + Becker Red	12% C	38% C	57% B	71% BC	77% AB
Becker Red	11% C	35% C	53%B	65% C	71% B
lsd 0.05	*12%*	*13%*	*12%*	*9%*	*8%*

The Nursery Cooperative would be interested in speaking with any other nursery that may have

experienced a germination reduction using seed colorant.

In a third experiment, we tested three rates (1x, 4x, 8x) of CF Clear on longleaf germination. The following graph shows the three rates and control (Fig. 4).

Figure 4



Conclusions: CF Clear did not negatively impact germination of slash or longleaf pine seed. The use of a seed polymer such as CF Clear offers some distinct advantages over latex.

Based upon the positive results in the three studies, we will include a nursery study in our 2014 Work Plan looking at CF Clear in both bareroot and container nurseries. We will choose bareroot nurseries that use a vacuum precision sower and a gravity drop sower. We will work with the nursery to set up a study protocol. CF Clear sells for approximately $60/gallon.

Zinc Coating of Container Seedling Trays

We all have heard of the use of copper to coat the interior walls of container sets in an effort to produce a more fibrous root system. Recently, I examined another product that could result in similar root fibrosity. Sherwin-Williams Paint is marketing a product called Root Perfect® which contains 14% zinc oxide. Sherwin Williams agreed to treat several dozen trays with Root Perfect® for a trial. When I was visiting the nursery in early August, the trays with the zinc coating were readily apparent on the benches. Within each zinc coated tray the seedling height was less and more variable than non-coated trays. In addition, it was not possible to extract the zinc coated seedlings in early August without destroying the root ball.

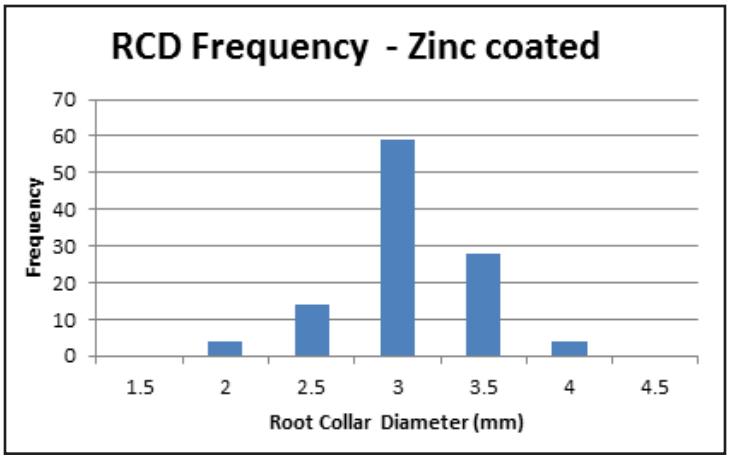
The container sets we examined were the Stuewe & Sons hard plastic FT135 tray with a cell volume of 6.9 cu in and a cell depth of 5 in. The variation in height observed in the field was also apparent in the data shown in the following table. Although there was no difference in RCD, the frequency of diameters favored larger RCD for the no zinc coated trays (Fig. 1 and 2).

	# of Seedlings	RCD (mm)	Height (cm)
Zinc Coated	109	2.8	23.6
No Zinc	112	2.9	31.1

A comparison of dry weights indicate greater root and total seedling biomass in the non-zinc coated (Fig. 3)

At the end of the season we will do a multiple tray analysis which will allow us to evaluate this product statistically.

Figure 1



20 Years Ago...

In the Fall 1993 Newsletter, Dr. Walt Kelly, who had been director of the Nursery Cooperative since Spring 1989, announced his retirement, effective April 1, 1994. Results from the evaluation of cyproconazole (unregistered fungicide) for the control of fusiform rust were promising. David South discussed the results from a published paper that showed bareroot seedlings with small roots did not perform as well as larger container–grown seedlings. Bill Carey described a longleaf pine pitch canker study initiated in North Carolina. DrW. Bruce Zobel discussed the question "Can individual genotypes be culled at the nursery by examining seedling phenotype?"Other reports about freeze injury, controlling eclipta, and alternatives to methyl bromide can be found in the Fall 1993 Newsletter. New Worker Protection Standards were introduced in April 1994 establishing Restricted Entry Interval (REI) following pesticide applications. David South returned to Auburn following a one year sabbatical in South Africa.

Figure 2

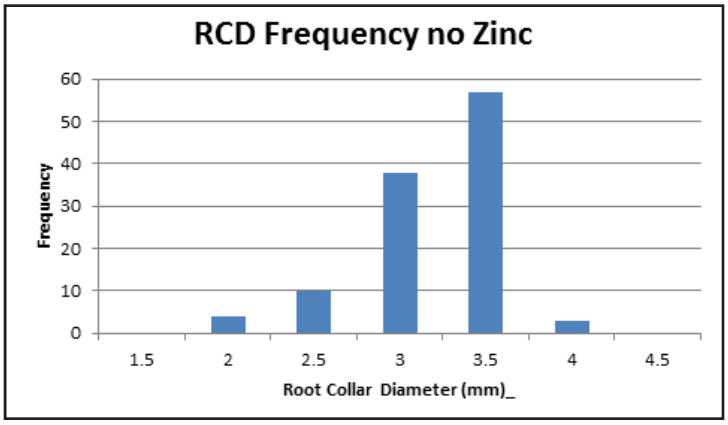
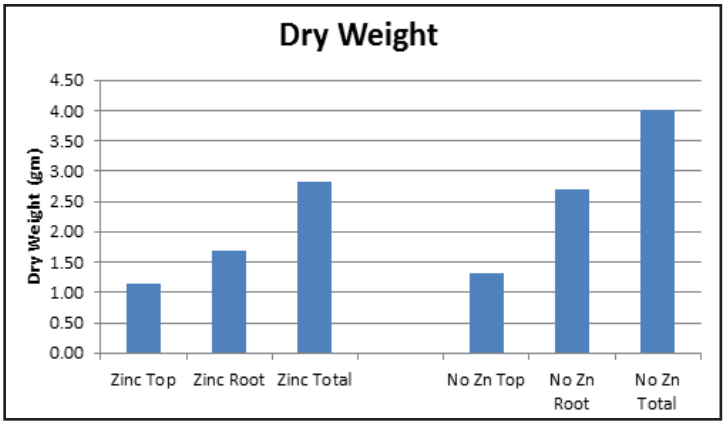


Figure 3



Seedlings Can Recover from a Freeze Event!

At the end of the planting season this past April I told someone, "This past winter was fairly mild, so I don't expect to see much evidence of freeze injury in the lab this year." This year probably hits the record for seedlings I examined showing evidence of freeze injury. I saw evidence of freeze injury on both bareroot and container seedlings, Nursery Cooperative members and non-Coop members, from throughout the entire southern region.

This past winter was mild; the number of chilling hours was less compared to previous winters. Chilling hours is directly related to freeze tolerance. At one location in Georgia, the number of chilling hours from the first of November to the end of January was 46% less than in 2010. At another location, just a little further south, the number of chilling hours was 62% less than 2010.

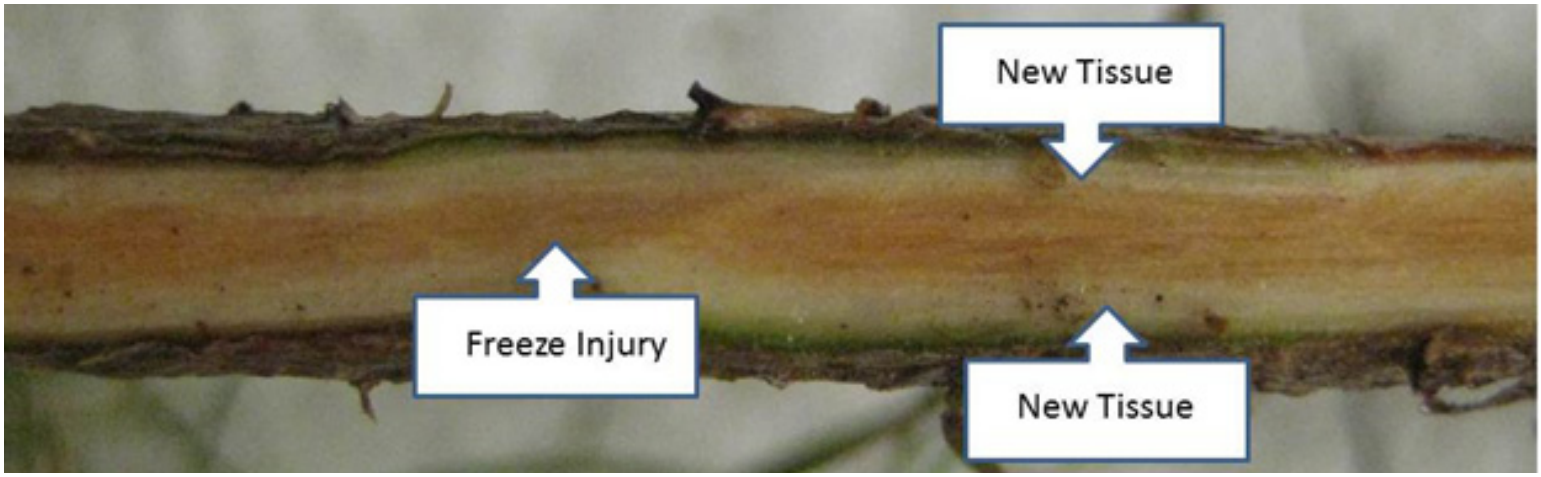
As seedlings began to come into the laboratory showing evidence of classic freeze injury, I began looking at the weather data for what we consider "a classic scenario" for a freeze event. This would be characterized as a period of warm day and night temperatures (we generally look for temperatures at night above 60 F) followed by the passage of a cold front when the temperatures dramatically drop well below freezing. Sometimes this can be a drop in temperatures of as much as 50 to 60 F in one or two days. I will typically start looking at nursery weather data beginning the first of December until the time the seedlings are lifted. At this point, I looked at the weather data from the planting site for one to two months following outplanting.

The symptom field foresters typically use to describe the seedlings is that they are surviving but are just "sitting there" with little to no top growth. Although these symptoms can also describe other problems, they are a common symptom of seedlings that have experienced a freeze event. Sometimes seedlings die quickly after outplanting when the freezing temperature completely kills the cambial tissue. Other seedlings that seem to "survive" or "hang on" typically have freeze injury up a portion (side) of the stem/root tissue. Whether the latter group ultimately lives or dies depends upon the environmental conditions following the freeze event. Moist soil and favorable temperatures will help the seedling to establish new roots and start the process of growing out of the freeze injury. In any case, first year growth may be negatively impacted. If a freeze event occurred after outplanting, the seedlings can struggle to get established. If the freeze event occurred in the nursery, recovery is possible since nursery conditions are more favorable than outplanting conditions.

This year, many areas in the south experienced 1 to 3 freeze events between mid-February and early March. In one case, the temperatures were below freezing for 3-4 straight nights dipping to 23 F one night. For many of the seedlings we examined this year, these events occurred after outplanting.

Two samples were sent in this past season where the field forester reported "fairly good survival, but the seedlings were just not growing like they should." When we began to examine them, our initial reaction was that these seedlings look pretty good. The average root collar diameter was over 6 mm. After examination of the top and roots we normally peel back the bark around the root collar and below to look for freeze injury. After the first 3 or 4 seedlings revealed white tissue under the bark, I decided to go back and slice into the stem deeper. That is when we found the brown tissue typical of freeze injury. The seedlings had put down new tissue and grown over the freeze injury.

We then began to look at our weather data in the nursery from the first of December to late January when the seedlings were shipped out and also in the field following outplanting. Our initial inspection showed no obvious freeze events. I then decided to look at earlier nursery data even though we normally start our examination on December 1st. On Nov 25, three days before Thanksgiving, a freeze event occurred when the temperatures in the



nursery dropped below 25 F. In the southeast United States, a cold front pushed all the way to the Gulf Coast and the Florida border. This early in the season, the number of chilling hours was minimal so the ability to tolerate a freeze was also minimal. However, the seedlings remained in the nursery bed until late January during which time recovery of the seedlings most likely occurred.

When the seedlings were shipped out for planting, the wet cool spring allowed the seedlings to become established and start growing. It wasn't until the heavy rains of July occurred that the forester noted anaerobic conditions and a slowdown in seedling development. We most likely never would have been able to document this example of seedling recovery from freeze injury if it had not been for the unrelated wet July.

Can Eucalyptus be Planted Deep?

Last year the question "can eucalyptus be planted deep?" was raised following an outplanting problem in the panhandle of Florida. When we began to look for information and discuss with people familiar with eucalyptus, the general consensus was that Eucalyptus should not be planted deep (not more than 2" above root collar). To look at this question, this past spring we planted a replicate study of eucalyptus into both the covered seedling stress facility and our outdoor trophatron at Auburn University.

In April, the containerized *Eucalyptus benthamii* we received were between 18" – 20" tall. At each location we planted half the seedlings at the root collar and then the other half 9"above the root collar. In the outdoor trophatron we watered the seedlings for the first three weeks with 1" of irrigation per week. After this time we ceased supplemental irrigation and relied on Auburn rainfall. In the covered stress boxes we irrigated three days a week for 3 weeks for a total of less than 3" of irrigation. Following this period of establishment, the seedlings in the covered stress facility did not receive any additional irrigation from April forward. In contrast, from April 2013 to August 1, 2013 there was 12" of rainfall on the outdoor trophatron. In both facilities, the ground line diameters, height and survival were measured on May 1 and July 31, 2013. The experimental depth of planting study will be completed in October when final measurements including top biomass will be collected.

When Daniel Spolidorio arrived for his internship we told him about this depth of planting project and that he would be collecting data. He thought to himself *"Why are they talking about planting Eucalyptus deep? Everybody in Brazil knows they will die if planted deep."* After the second measurements in August we asked Daniel to put together some summary information which follows below. For the basis of comparison, he assumed that the stem of the eucalyptus could be considered as a cylinder and calculated volume using the ground level diameter and height.

Table 1 is a comparison of the RCD and heights in both the Trophatron and Seedling Stress Boxes for the first two periods of evaluation.

Table 1. Average of 4 replications RCD and Height

		Trophatron		Stress Boxes	
		Shallow	Deep	Shallow	Deep
5/1/2013	RCD (mm)	5.2	3.3	6.3	3.3
	Ht (cm)	19.1	13.3	48.6	33.1
7/31/2013	RCD (mm)	7.0	6.3	7.5	5.2
	Ht (cm)	60.0	60.1	77.8	66.0

Figures 1 and 2 show the change in volume of the seedlings in the two facilities.

After 3 months, the greatest change in volume occurred in the Trophatron with the deep planted seedlings. In the Stress Boxes, where irrigation and rainfall had been withheld for 2.5 months, the deep planted seedlings also showed the greatest numeric change in volume. As of July 31 only 4 deep planted and 5 shallow planted seedlings

in the Trophatron had died (out of 128 seedlings). In the stress boxes only 1 deep planted seedling had died (out of 72 seedlings).

Final analysis will be completed during September and the results analyzed for a Research Report. Based upon Daniel's experience in Brazil and seedling availability, we intend to repeat this study next year in heavier soils.

Figure 1

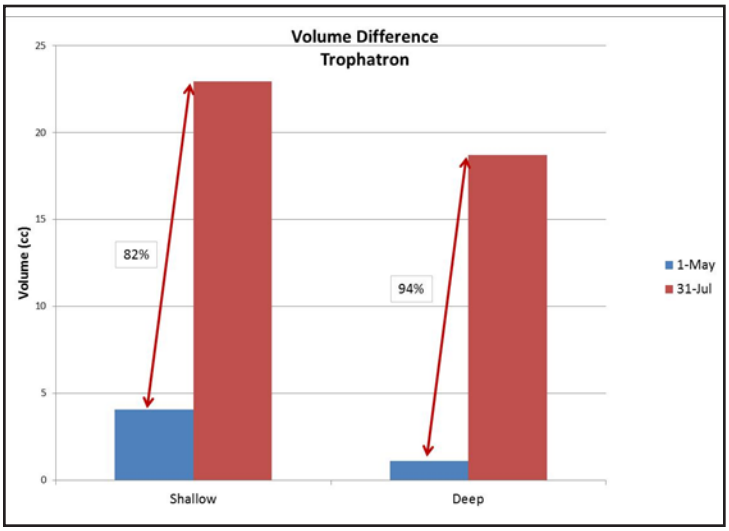
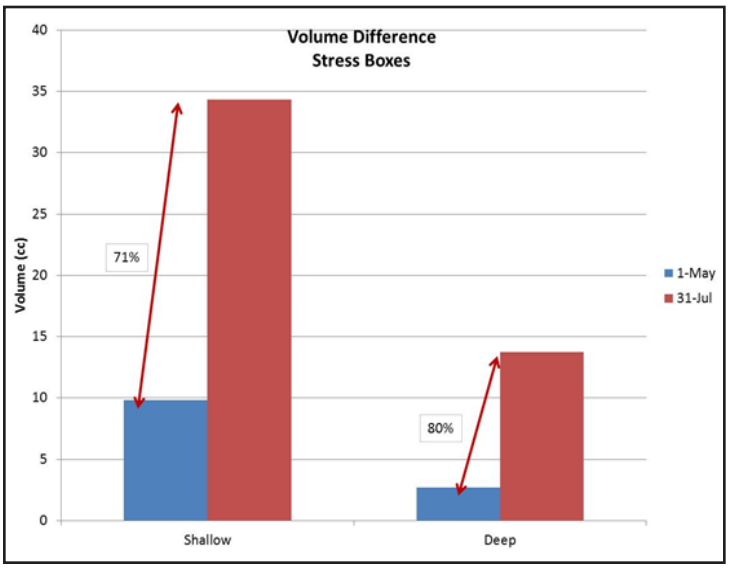


Figure 2



A July to Remember!

July marked the first time in over three years that the Southeast region was free of any U.S. Drought Monitor designation. To get free of this designation it had to rain, and rain it did! In fact, the whole period for April to July set many records throughout the region. The table below shows the state ranking as they relate to the previous 119 years, inches of rainfall above average, and total rainfall in April to July for 2013 and last year.

Rainfall for April to June 2013				
State	Ranking*	Inches of Rainfall Above Average	Total Inches for Period	Total Inches in 2012
SC	119	11.02	28.26	18.34
NC	118	9.15	26.96	18.32
GA	119	8.96	26.49	14.25
TN	116	8.08	26.27	13.57
AL	110	7.02	25.41	16.12
MS	94	3.04	22.65	17.16
VA	116	6.54	22.19	14.31
LA	74	1.26	21.49	18.84
OK	105	3.88	19.07	9.38
AR	84	1.1	19.03	8.83
TX	46	-1.06	10.18	8.72
		Total	**248.00**	**157.84**

*Ranking out of last 119 years.

Here are some more interesting weather facts from the NOAA web site (http://www.ncdc.noaa.gov/sotc/national/2013/7) for this past July which was for most areas the wettest month this year.

- The wettest locations were found across the western Panhandle of Florida, the Upstate of South Carolina, and western North Carolina, where monthly totals exceeded 20 inches in places, or more than 300 percent of normal.
- Several locations recorded their wettest July on record, including Asheville, NC (13.69 inches), Greenville-Spartanburg, SC (14.45 inches), and Roanoke, VA (12.73 inches).
- Asheville, NC came within just 0.07 inches of breaking its all-time monthly total, which was last set in August 1940.
- On July 9th, the spillway at Lake Hartwell, one of the largest lakes in the Southeast, located along the northern border of Georgia and South Carolina, was opened for only the third time since 1948 to control for flooding. Over the past three months, rainfall totals around and upstream of the lake have exceeded 40 inches, which is more than 200 percent of normal.
- Mean temperatures were variable across the Southeast in July. The greatest departures were found across

much of Alabama, Georgia, South Carolina, and South Florida, where monthly temperatures were 2 to 3 degrees F below average.

- In contrast, monthly temperatures across much of Virginia and parts of eastern North Carolina were 1 to 2 degrees F above average.
- In June and July there was a relative absence of extreme heat across much of the Southeast region. In fact, several locations recorded monthly maximum temperature departures of 5 to 7 degrees F below average. In addition, more than 200 daily low maximum temperature records were tied or broken across the region.

Too much rain? Temperatures too cool? Just wait - next spring may be "normal" despite all this rainfall. A local county agent recently said "No matter how much rain we have had, many places in the south are just one week away from a drought."

Review of Recent Research Paper - Nutsedge Control

Occasionally when we come across a paper that we feel will benefit the Nursery Cooperative membership, we will provide a brief summary of the results and provide a reference for your use. If you have a difficult time acquiring the paper, please email Tom and he will send you a copy.

Yellow Nutsedge (Cyperus esculentus) Growth and Tuber Production in Response to Increasing Glyphosate Rates and Selected Adjuvants. Joel Felix, Joseph T. Dauer, Andrew G. Hulting, and Carol Mallory-Smith. Weed Technology, 26(1):95-101. 2012. http://www.bioone.org/doi/full/10.1614/WT-D-11-00066.1

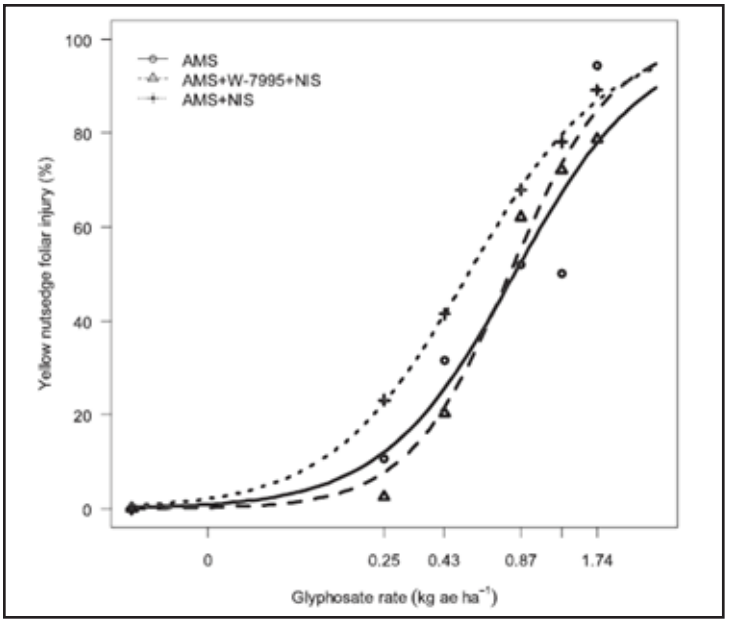
Greenhouse studies were conducted to evaluate the influence of selected adjuvants on glyphosate efficacy on yellow nutsedge and tuber (nut) production. Glyphosate was applied at 0, 0.25, 0.43, 0.87, 1.26 (1x rate), and 1.74 kg ae ha-1 at 31 days after yellow nutsedge was planted. The product used was Roundup Power Max by Monsanto.

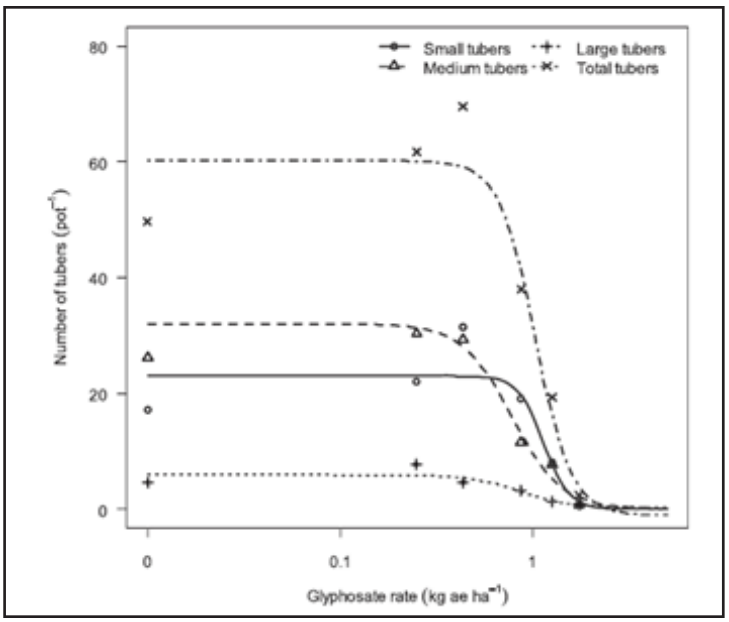
Each rate was mixed with one of the following adjuvants: ammonium sulfate (AMS), AMS plus nonionic surfactant (NIS), or AMS plus an experimental adjuvant (W-7995) plus NIS. Plants were evaluated for foliar injury and for the number and size of tubers (nuts) produced.

The addition of a nonionic surfactant (NIS) plus ammonium sulfate (AMS) to glyphosate resulted in the greatest yellow nutsedge injury 28 days after treatment.

The authors discouraged the use of rates less than 1x label rate based on the injury to nutgrass and the reduction in the number of tubers (nuts). Lower glyphosate rates were discouraged because they may increase tuber (nut) production and encourage yellow nutsedge expansion in infested fields. These results are presented in the following graphs.

Increases in labeled rates of glyphosate may be required to reduce yellow nutsedge tuber (nut) production in field conditions. The authors also suggest that the use of soil-residual herbicides applied before nutgrass germination and then followed by glyphosate may be better than sequential applications of glyphosate alone.





In both graphs above, 1.26 kg ae ha-1 is 1x label rate.

Other News & Notes

Purdue App Helps ID Plant Problems

From Nursery Management Weekly News Update – September 3, 2013 http://www.nurserymag.com/plant-Diagnostic-Sample-Submission-app-from-purdue.aspx

Greenhouse and nursery growers, agricultural specialists and others who need to identify plants, plant diseases, insect pests and other plant problems, have a new mobile application resource created by eight university labs, including Purdue's Plant and Pest Diagnostic Laboratory.

The Plant Diagnostic Sample Submission app includes submission forms with customized questions about agronomic crops, weeds, vegetables, houseplants and more. It was developed by IN3 located in the Purdue Research Park of West Lafayette.

"The app is for anyone who wants to send a sample, said Tom Creswell, PPDL director. "It guides users through the right questions for their submissions."

It allows users to take and send digital photos and plant-problem descriptions to any of the eight participating labs. The university diagnostic labs involved are Alabama Cooperative Extension, University of Connecticut, University of Illinois Extension, University of Kentucky, Michigan State University, University of New Hampshire and Ohio State University.

When submitting samples, users answer questions about the specific types of plant problems they need to identify, such as farm, household or lawn.

"If you're sending a sample from your home lawn, the form will contain questions specific to turf and lawn," Creswell said. "But there's a different set of questions if your plant submission is vegetable- or greenhouse-related."

Submissions are sent to the labs using the iPhone or iPad built-in mail app, which requires an email account on the device.

PPDL will charge normal sample-handling fees for samples submitted through the app. Those fees are $11 for Indiana samples and $22 for out-of-state submissions. However, if a physical sample is needed as a follow-up, there is no additional fee.

Each of the other diagnostic labs has specific fee policies, so users should check with their preferred lab for details.

The PPDL accepts submissions from the 48 contiguous states. International submissions are not accepted. Right now Kentucky and New Hampshire laboratories will only accept samples via the app from Extension educators and specialists who have a proper passcode.

The app is available for free download in the iTunes store. For more information, visit http://www.ppdl.purdue.edu/PPDL/hot13/8-12.html.

Pesticide Labels: Shall & Must vs. Should & May

This article first appeared in the Spring 2007 newsletter. As a result of a number of questions that arose this past year, specifically about GoalTender®, we have decided to include it in this newsletter.

Interpreting pesticide labels sometimes is not easy. Despite what we may think, EPA is concerned that pesticide labeling clearly identifies what is required of the user to handle and apply a pesticide safely. The words "must", "shall", "do not", "should", "may" and "recommend" have caused their share of confusion. EPA has tried to provide chemical companies guidance in using mandatory and advisory language when writing labels. "Pesticide Registration (PR) Notice 2000-5" outlines these language guidelines. A copy of this document is on the Nursery Cooperative web site under the chemical labels page.

Mandatory statements are commonly written in **imperative** or **directive terms**. When you see words such as "shall", "must", "do this" or "do not" the user should understand that some action is required or prohibited. Failure to follow these instructions is a misuse of the product. On the other hand, **advisory statements** are written in **descriptive** or **nondirective terms** generally providing information in support of the mandatory statement or about the product in general. Words such as "should", "may" or "recommend" although not EPA's ideal choice of words, are considered advisory words.

Advisory statements are potentially confusing. "Phrasing advisory statements in straightforward, factual terms minimizes the possibility that they will conflict with mandatory statements. The use of certain words such as "should," "may" or "recommend" in advisory statements has the potential to lead the product user to erroneously believe that they must comply with such statements, when in fact such statements do not have to be followed." EPA allows the use of such words on a label as long as they do not cause conflicting or ambiguous problems.

Let's look at an example of the two types of language from the GoalTender® label: *"GoalTender can be applied as a preemergence application following seeding. Postemergence application* **should** *be delayed until a minimum of 5 weeks after emergence of the conifer seedling"* The "should" is not mandatory language,

it is advisory language. Applying GoalTender® on seedlings less than 5 weeks is not a misuse of the product.

"**Do not** *apply more than 4 pints (2.0 lb active) of this product per broadcast acre per year."* This is a mandatory statement. Applying more than 4 pints is a misuse of the product.

"GoalTender **should** *be directed to the soil."* This is an advisory statement telling you how to get the most benefit from the product. Applying GoalTender® as a foliar spray is not a misuse of the product.

In summary, words like "should" and "may" are **advisory words**. Not following the statement in which they are a part will not represent a misuse of the product. In general, these types of words are used to help you get the greatest benefit from the product.

Nursery News from Around the Cooperative

Weyerhaeuser – Pine Hill Nursery, Camden, AL announced that, following the retirement of Ralph Bower and Gary Gaines, they have hired Mike Prime as a new Production Team Member.

ArborGen - South Carolina SuperTree Nursery, Blenheim, SC announced the retirement of Ava Colson who retired after 25 years of service. Amanda Britt is the new Business Specialist in Blenheim.

ArborGen - Georgia SuperTree Nursery, Shellman, GA has reached a milestone, believed to be the first of its kind for nursery production. After 17 growing seasons, the former International Paper Company nursery has documented the production of one billion, 52 million (1,052,000,000) seedlings.

Robert Cross, nursery manager and a 37 year veteran of the forestry business, says, "I love baby trees. We have been blessed to have produced a billion seedlings in such a short time frame. That speaks volumes to the seedlings we are planting and the experience of the people who work here." This number of seedlings would plant approximately 1.6 million acres. That would be enough to cover 121,000 football fields.

ArborGen position announcements: Arborgen has 2 postions available. These positions are "Nursery Specialist" and "Orchard Specialist." Further details about these positions can be found on the Nursery Cooperative web site or by contacting ArborGen directly.

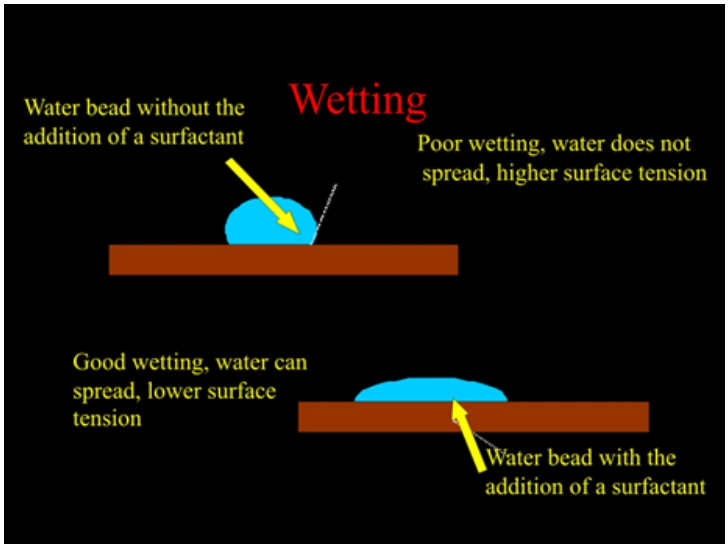
Nursery 101

Adjuvants, Surfactants, Spreaders and Stickers

Most common pesticides today are formulated to use water as the carrier. This is where the problems arise. Plants, especially conifers, have waxy leaf surfaces that make it difficult for most water–based pesticides to penetrate their target. Even insects and fungi have waxy surfaces that naturally shed water. In the nursery business, many have experienced needle burn with crop oil and the tendency for some managers has been to avoid all adjuvants.

Each molecule of water is bipolar, meaning it has both a negative and positive charge. When several water molecules are put together, the positive side of one molecule is attracted to the negative side of the other. The water molecules on the surface of a water droplet are held together with more force than those molecules in the interior of the droplet. This is where adjuvants come into play. Adjuvants help to break down the tight bonds of the water molecule to allow the water to disperse more evenly on the plant surface.

An adjuvant is a broad term for an additive to the spray tank that enhances the activity of the pesticide or its application



http://www.caes.uga.edu/publications/pubDetail.cfm?pk_id=7678

characteristics. The terminology associated with adjuvants is confusing as is the choice of over 400 products. According to a recent publication of world–wide adjuvant usage, the market is expected to reach close to $3 billion by 2018, an increase from 2013 of 5.3%. Adjuvant sales in North America led the global market in terms of revenue in 2012. Sales of surfactants are the most dominating segment of this market.

Spray adjuvants can be grouped into two broad categories:

1. **Special purpose adjuvants:** These products widen the range of conditions under which a given pesticide formulation is useful. They include compatibility agents, buffering agents, antifoam agents, and drift control agents.

2. **Activator adjuvants:** These products commonly enhance the performance of pesticides used as post-emergent. They increase a pesticide's absorption into the plant tissue, increase rainfastness and also help reduce photo-degradation of the pesticide. These include surfactants, crop oil concentrates, nitrogen fertilizers (i.e. ammonium sulfate or urea), spreader-stickers, wetting agents, and penetrants.

A little further description of examples in the latter group may be beneficial in sorting out the confusion over terminology.

Surfactants - products that increase the spread of droplets or the wetting of waxy or hairy leaf surfaces. Surfactants consist of three different types:

1. anionic -- have a negative charge and are not often used with herbicides. These products enhance the foaming and spreading properties. These surfactants are commonly found in hair shampoos.

2. cationic -- have a positive charge and are common in many domestic detergents. They are commonly found in heavy-duty cleaning compounds but rarely used with herbicides. Their action can be phytotoxic to plants.

3. non-ionic -- are the most commonly used surfactants in agriculture. They are nonreactive (no electrical charge). They remain on the leaf once dry and allow 'rewetting' after rain, permitting additional pesticide uptake. Application rate is critical, so read the label carefully.

Wetting Agents - commonly mixed in growing media used in container nurseries. They allow the peat moss, which is often hydrophobic (water-hating) when dry, to accept water and not run down the side of the container. Wetting agents work much like surfactants, breaking the surface tension of water and help the water transfer from particle to particle. Wetting agents in growing media do not last for a full season and can be reapplied during the summer. If this is done, use caution since high rates can injure plants.

Spreaders and Stickers - Spreaders are compounds that enable pesticides to spread into a thin film over a surface increasing the efficiency of the pesticide. They may contain fatty acids, latex, aliphatic alcohols, cottonseed oil, or inorganic oils. Each formulation is different. Stickers cause the pesticide to adhere to the leaf surface, resisting rain, evaporation and leaf runoff. Some products use emulsified polyethylenes, others use polymerized resins, fatty acids or petroleum distillates. Stickers are commonly used in field crops (e.g. corn and soybeans) where residue on leaves is not a problem. As with wetting agents, use caution as some spreaders/stickers can cause phytoxicity.

Oils - There are two types of oil: **crop oils** that are derived from soybean and other crops, and **inorganic oils** that come from petroleum refineries. They are frequently used as an aid to control insects in insecticides. They act by either suffocating the insect or as a penetrant to break apart the insect's chitin layer. In other uses such as pesticides, crop oils keep the leaf surface moist longer than water, allowing the pesticide to enter the plant. Some oils are blended with surfactants (13-20%), to take advantage of the properties of both adjuvants.

So, why not use common detergents such as kitchen soaps? Many ordinary kitchen or bath detergents can react with the cations in soil and fertilizer and leave a residue film on the leaf surface. Today's dishwashing detergents contain both anionic and nonionic surfactants. In certain circumstances, when combined with pesticides or fertilizers their combined effects are synergistic and potentially phytotoxic. None of the common detergents are labeled for use on plants.

When purchasing a suitable agricultural adjuvant for pesticide use, consider the following suggestions as provided by the Cooperative Extension Service at Purdue University:

1. Purchase an adjuvant that is manufactured and marketed for agricultural use with pesticides.

   Do not purchase products made for household use. Many of these detergents are more expensive and less active than agricultural adjuvants. They may be mixed or combined with products that interact with pesticides to reduce the level of weed control. These products can cause foaming or equipment malfunction.

2. When purchasing a surfactant, buy on the basis of percent active ingredient. Most pesticide labels call for the use of a surfactant with 75% or greater active ingredient. Read the label carefully to determine the active ingredients listed on the surfactant label.

   Do not consider isopropyl (isopropanol) and other alcohols or water as active ingredients. Some products list these solvents as part of the active ingredient or as functioning agents. Most spray adjuvants will clearly show on the label active ingredients, inactive ingredients, and principal functioning agents as a percentage of the total.

3. Be wary of claims such as, "even though this adjuvant may cost much more, it can be used at lower concentrations than other adjuvants on the market." Many adjuvants have had limited field testing. Little evidence exists to prove that a particular adjuvant is so effective that greatly reducing its concentration over other suitable adjuvants will result in equal or better weed control or reduce product cost.

4. Purchase agricultural adjuvants to improve pesticide coverage and penetration into plant foliage. Ignore claims such as "this product has certain properties which will keep the spray equipment clean," or "this adjuvant will increase water penetration into the soil," or "it will increase root penetration or nutrient uptake."

   There are no "miracle" adjuvants. Most adjuvants are good products and will increase the performance of foliar-applied pesticides when used at the recommended rate suggested on the label. No adjuvant used in a pesticide spray solution can justify a greatly increased price per unit, and none is so effective that the use rates can be lowered below those recommended on the pesticide label.

Information for this article and further information can be found at:

1. Penn State Extension. Agronomy Facts 37 Adjuvants for Enhancing Herbicide Performance

2. University of Georgia B1319 Using Surfactants, Wetting Agents, and Adjuvants in the Greenhouse

3. Purdue University Cooperative Extension Service WS-7 Adjuvant Use With Herbicides: Factors to Consider

Just for Fun!

Do you remember the location, year, and how this machine was used? Be the first to send Tom an email with your answer! We'll let you know the answer and winner in the Spring 2014 Newsletter!

Contact Us!

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