Southeastern Regional Peach Newsletter

Volume 3, No. 1 February 2003

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Editors Note

Well, we have our chill hours this year, and bloom is already starting on some varieties. In general, all is looking good at this point. However, leave it to us to keep you worried!

Conditions have been and may continue to be good for bacterial spot development in 2003. Dave Ritchie (NC State) explores these possibilities in his submission, and I encourage all producers to pay close attention to this issue. Guido Schnabel and Eldon Zehr address early-season scab control and best-management practices for this disease. Wayne Mitchem lines you up with questions for weed control, and the horticulture folks give you the latest in research information relative to Clemson irrigation studies and website updates – a plethora of information for the willing mind.

Godspeed to all.

Phillip M. Brannen
Editor

Focal Points – New Information for the Peach Industry

❋ **Peach entomology assignments for South Carolina and Georgia.** There have been some recent changes in peach entomology assignments in GA and SC. Dan Horton is now officially the GA Extension Fruit Entomologist, with a peach entomology research assignment, as well as being the Clemson University research and extension entomologist for commercial peaches. Sam Hudson, with Clemson University, also supports research and extension for commercial peaches. Bottom line, these are now the peach entomology contacts in GA and SC.

❋ **U.S. Environmental Protection Agency visits Georgia and South Carolina.** U.S. EPA's Pat Cimino, Minor Crops liaison, visited with southeastern peach growers and scientists during the first week in December to discuss the industry's pest management research and extension needs. The Georgia Peach Council hosted Pat and a large contingent of scientists at the Lane's cabin. As always, the food, hospitality and dialogue were outstanding. Later that day, Pat traveled to Edgefield, SC, where Greg Henderson hosted a second meeting for South Carolina growers and scientists from Clemson University, North Carolina State, and the University of Georgia. Candid discussions at both locations focused on the industry's acute need for long-term, stable research funding to develop cost-effective programs that pose

truly negligible risk factors. Pat expressed interest in short-term issues, such as experimental use permits for on-farm evaluation of low-risk, organophosphate replacement chemistries. She noted that the southeastern peach industry's interest in and support for research are commendably high. She further acknowledged that research funding is an obvious and genuine need. Pat traveled the next week to New Jersey, where she again met with growers and peach scientists from Rutgers. EPA is clearly aware of the peach industry's pest management needs and challenges.

❈ **Recent reports on human exposure to environmental chemicals.** Bob Belinger, Clemson University Extension Pesticide Coordinator, reports that the CDC (Centers for Disease Control & Prevention) released their report on exposure to chemicals in the environment, the **"Second National Report on Human Exposure to Environmental Chemicals."** See **"CDC RELEASES MOST EXTENSIVE ASSESSEMENT TO DATE OF AMERICANS' EXPOSURE TO ENVIRONMENTAL CHEMICALS** http://www.videonewswire.com/cdc/013103/reg.html Go to http://www.videonewswire.com/cdc/ for the webcast. Also, the Environmental Working Group (EWG) hit the web with their new site. The Environmental Working Group's report, "Body Burden: The pollution in People" (posted at http://www.ewg.org/) Much is made from a sample size of nine.

Weed Science Updates

Weed Control Thoughts

Wayne Mitchem
North Carolina State

It will soon be time to start thinking about orchard weed control for spring and summer. Now is a good time to reflect on the previous year, if you have not already done so, and make adjustments if needed. Having a good preemergence (PRE) herbicide program can minimize the need for paraquat during the summer when insect and disease issues, as well as harvest, are high priorities. **Perennial grass (bermudagrass or bahiagrass) weeds have often been a problem, and they continue to be a challenge in some orchards. In my opinion, perennial grass weeds can induce more stress in a peach orchard than any other weed. Late-season residual control in later-maturing varieties often breaks down, resulting in competition and the need for control.** In the event you had less than desirable weed control last year, the four questions below may address one or more of your concerns from the previous year.

1. Did I have good residual weed control in 2002?
2. Have annual grasses (large crabgrass, fall panicum, etc.) been difficult to control?
3. Have perennial grass weeds (bermudagrass or bahiagrass) reduced fruit size in previous years?
4. Has weed emergence in mid to late summer reduced fruit size in July and August maturing varieties?

Now, let us deal with each of these questions individually.

Question #1.
If you were not happy with weed control in 2002, maybe you should consider changing you PRE herbicide choice. Sometimes, the same PRE program is used a number of years consecutively, selecting for weed species that are tolerant to the herbicide(s) you have used. In the event that this is your situation, consider choosing herbicides you have not used in several years. There are four very good PRE herbicide tank mixes that you can consider: Karmex + Sinbar, Karmex + Solicam, Simazine + Solicam, or Simazine + Oryzalin or Surflan.

Question #2.
This problem is usually related to the use of either Karmex or Simazine alone. The addition of either Surflan or Solicam to Simazine or Sinbar or Solicam to Karmex improves annual grass control considerably.

Question #3.
In terms of directly reducing fruit size and quality, no other weeds have an impact like perennial grasses – bermudagrass or bahiagrass. In order for either of these species to be adequately controlled, a postemergence program using Fusilade will be necessary. These herbicides will only be effective if sequential applications are used and applied in a timely manner. The initial application should be applied in the spring when the grass has produced 4 to 6" of new growth. The second application is applied when regrowth occurs, not before.

Question #4.
In the Southeast – with our long growing season, warm temperatures, and usually good rainfall – herbicides break down quickly, and residual control can fail in late summer. Based on competition work done in NC, orchards weed-free 4 weeks prior to harvest will not be adversely affected by weeds emerging within that 4 week period. However if weeds have emerged, and you are four weeks or more from harvest, it is likely fruit size and quality would be improved with a postemergence herbicide application – assuming that you have at least a moderate crop load on the trees.

Plant Pathology Updates

High Risk of Bacterial Spot on Peaches for the 2003 Growing Season

Dave Ritchie
North Carolina State University

If the trend for frequent periods of rainfall continues to occur across the Southeast, the risk for early-season peach diseases, including bacterial spot (caused by *Xanthomonas arboricola* pv. *pruni*), will be high! This is in contrast with the last several years, during which weather conditions have been very dry. Such dry conditions are not favorable for the occurrence of bacterial spot on peaches. This also may have lulled many growers to forget about the weather conditions that can result in severe fruit infections. Analysis of weather conditions recorded at the North Carolina Sandhills Research Station (located near Candor, NC) since the late 1980s shows a very strong correlation between years with severe bacterial spot of fruit and frequent periods of rainfall starting at late bloom and continuing through pit hardening. Shown below (Figure 1) are

the rainfall events for two contrasting years, 1999 (when 15% of O'Henry fruit had bacterial spot lesions) and 2000 (when 100% of O'Henry fruit had bacterial spot lesions).

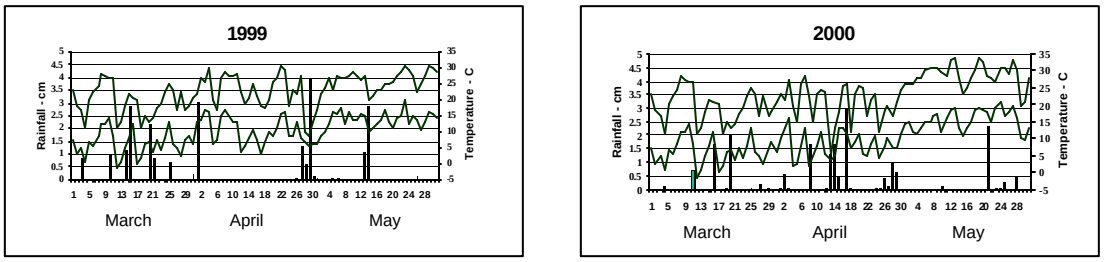

Figure 1. Rainfall events from 1999 and 2000. For both years, shuck split started at approximately the same time, April 1 to 5. Shuck off occurred 10 to 15 April, and pit hardening occurred about 10 to 12 May.

The bacterial pathogen can overwinter in association with leaf scars, around which cankers can develop as tree growth becomes active in late winter (Figure 2). Leaf tissue that emerges before bloom can become infected and serve as a very large source of bacteria (Figure 3), in addition to other overwintering sites for fruit infection (Figure 4) starting at shuck split and also for later emerging leaves (Figure 5).

Figure 2. Dark, black colored portion of branch and dying bud where a canker is forming and becoming visible in mid-March – about the time of 50% bloom.

Figure 3. Lesions which are visible in early April – near the time of late petal fall – start of shuck split. This leaf was one of the first to emerge, and it was probably infected prior to or during early bloom.

For cultivars on which bacterial spot has been or can be a problem, management of the fruit phase of this disease (Figure 6) is based on **prevention** of early season infections by the use of 3 to 5 applications of **decreasing rates** of copper materials from late dormant/ budswell through shuck split. The objective is to kill the bacteria as they emerge from their overwintering sites and to prevent the early leaf infections. If this is accomplished, the number of bacteria available to infect the fruit as shuck split starts, should be greatly reduced. Peach foliage is very sensitive to and can be injured by copper, thus it is very risky to apply copper after shuck split. Mycoshield, being systemic and non-phytotoxic, is the product of choice starting at shuck split through pit hardening (on a 7 to 14 day application schedule adjusted for frequency of rainfall; closer to a 7 day interval if rainfall is frequent; if dry, then closer to the 14 day interval). After pit hardening, the need for additional sprays is based upon the presence of bacterial spot in the orchard and occurrence and frequency of rainfall or other conditions resulting in free moisture or slow drying of the fruit and foliage. Prior to pit hardening, when weather conditions are favorable for the disease, waiting to spray until the first symptoms are observed results in poor or no disease control and a waste of costly spray materials. Specific guidelines for spray applications may be found in the 2003 SOUTHEASTERN PEACH, NECTARINE AND PLUM PEST MANAGEMENT AND CULTURE GUIDE – Georgia Cooperative Extension Bulletin 1171 OR at the NSF Center for Integrated Pest Management (CIPM) web site (**http://ipm.ncsu.edu/)** by linking to the Crop Production Section then clicking on Peaches.

Figure 4. Overwintering canker of the bacterial spot pathogen shown near the time of petal fall (late March-early April).

Figure 5. Newly developed lesions on peach leaf that have become visible within the previous 24 hours (Picture taken in mid-May).

Figure 6. Lesions on fruit first visible near time of pit hardening, about the 2nd week of May. The bacteria likely infected the fruit about 2 weeks earlier.

Peach Scab Control in the Southeast with Early-Season Reduced Fungicide Sprays

Guido Schnabel and Eldon Zehr
Clemson University

Last year, scab control in some peach orchards was unsatisfactory. To maintain effective control of scab, early-season fungicide sprays are very important, and sometimes these sprays may not

begin early enough. Recently, we examined the timing of early-season sprays. We found that the petal fall application for scab control is critical under South Carolina growing conditions (Table 1). Spray treatments without the petal fall spray yielded significantly more scab in experimental blocks (Table 1) and in commercial orchards near Anderson, SC.

Effective fungicides for scab control include sulfur, captan, chlorothalonil, trifloxistrobin and azoxystrobin. Sulfur is preferred by many growers because its cost is comparatively low, but more frequent applications are needed (7 to 14 day intervals) because sulfur is easily removed by rainfall. The other fungicides have better retention, so fewer applications are needed. As few as 5 or six applications may be sufficient for reliable scab control. Recently, a reduced fungicide treatment, consisting of chlorothalonil applied at petal fall and shuck split and captan applied subsequently in 14-day intervals (referred to as the chlorothalonil/captan treatment in this article), was recommended for scab control. The treatment has been used successfully in commercial orchards near Anderson, SC for more than 15 years and some scab only developed in years when the petal fall spray was missed.

The characteristics of two reduced fungicide treatments, specifically the chlorothalonil/captan and the chlorothalonil/azoxystrobin/captan treatments, are listed in Table 2. Both treatments are currently the most effective reduced fungicide treatments for peach scab control in the southeastern United States. Both treatments controlled scab in two subsequent years in two varieties even under high disease pressure (table 3). Of the five applications, the one at shuck split is most critical for scab control because spore production peaks around this time. Chlorothalonil and azoxystrobin were equally effective when applied at shuck split. Additional applications of chlorothalonil or azoxystrobin at shuck fall did not improve scab control (data not shown).

Sulfur-based products are cheaper than chlorothalonil, azoxystrobin and captan, but at what point does the cost of the reduced number of sprays with these materials equal the more frequent applications of Sulfur? Based on current fungicide prices and the cost of equipment and labor (assumed to be $12.90 per application per acre), each of the chlorothalonil, captan and azoxystrobin containing treatments in Table 2 were as economical (about $144/acre/season) as nine applications of wettable Sulfur. If more than nine applications of sulfur are used, the reduced spray program is more economical. An additional benefit from using more efficacious, non-sulfur based products is the superior protection from other diseases such as anthracnose and brown rot.

Table 1. Importance of the petal fall spray in South Carolina.

	Stage of development or spray interval (days)[1]						
Year, treatment (rate/acre)	PF	SS	SF	7	14	14	% scab
1996							
Captan 50W (4.0 lb)	+	+	+	+	+	+	10.8 a
	-	+	+	+	+	+	30.0 b
	-	+	-	+	+	+	39.5 b
Control	-	-	-	-	-	-	99.8 c
1997							
Captan 50W (4.0 lb)	+	+	+	+	+	+	8.50 a
	-	+	+	+	+	+	21.2 b
	-	+	+	-	+	+	34.0 b
Control	-	-	-	-	-	-	100.0 c

[1]PF = petal fall; SS = shuck split; SF = shuck fall; different letters within seasons and columns indicate significant differences *($P < 0.05$)*.

Table 2. Characteristics of the reduced fungicide treatments for control of peach scab in 'Contender' and 'Cresthaven' peaches.

Treatment	Fungicides	Rate/acre	Application timing[a]
Control	Untreated	-	-
Chlorothalonil/captan	Bravo Weather Stik 6F	3.5 pt	PF, SS
	Captan 50W	5.0 lb	1C, 2C, 3C
Chlorothalonil/azoxystrobin/captan	Bravo Weather Stik 6F	3.5 pt	PF
	Abound 2.08F	13.0 floz	SS
	Captan 50W	5.0 lb	1C, 2C, 3C

[a]PF = petal fall; SS = shuck split; 1C = first cover (14 days after SS); 2C = second cover (14 days after 1C); 3C = third cover (14 days after 2C).

Table 3. Effect of reduced fungicide treatments on the development of peach scab on fruit in 2001 and 2002.

	Peach scab, % of fruit[1]	
Year/treatment	Cresthaven	Contender
2001		
Control	98.7 a	35 a
chlorothalonil/captan	3.2 b	0.2 b
chlorothalonil/azoxystrobin/captan	1.7 b	0.3 b
2002		
Control	63.5 a	63.5 a
chlorothalonil/captan	4.2 b	3.7 b
chlorothalonil/azoxystrobin/captan	5.2 b	6.2 b

[1]Different letters within seasons and columns indicate significant differences *($P < 0.05$).*

Horticulture Updates

Monitoring Peach Fine Roots Using Minirhizotrons

Christina Wells and Desmond Layne,
Clemson University

Peach fine roots (< 1 mm in diameter) perform a host of critical belowground functions including water uptake, nutrient uptake, and hormone synthesis. Unfortunately, in terms of management practices, the peach fine root system is still treated as a "black box." Because we can't see when fine roots are active and growing, we have little information with which to properly select and time belowground management practices. Pre-plant fumigation, irrigation, fertilization, and orchard floor management are all aimed at improving tree performance by supporting fine root system health and function. However, in contrast to the large body of research that guides aboveground spraying and pruning practices, much less information is available to guide the selection and timing of belowground management practices.

Low-level fine root production occurs throughout the growing season in peach and is punctuated by one or more seasonal "flushes" of very high production. Frequently, there is one flush of

feeder root production in the spring and one in the late summer or early fall. The exact timing of these flushes is variable. During a flush of fine root production, the majority of the tree's fine root system consists of new, young roots whose nutrient uptake capacity is at its peak. A smaller application of fertilizer during a period of fine root flushing will therefore be better utilized by the tree than a larger application given at a time when the tree's feeder root population consists of mainly older, less active roots. Until recently, it has been difficult to determine when the fine root system is experiencing a flush of production.

New tools for root research are helping us to develop a more accurate picture of peach fine root dynamics during the growing season. One such tool is the minirhizotron camera, a specially-designed, belowground fiber-optic camera that allows researchers to videotape roots growing under natural conditions in the field or orchard. Weekly videotapes of fine root growth are digitized and analyzed in the lab to determine when flushes of fine root production and death occur throughout the season. Information on fine root appearance, age, branching, and depth distribution can also be obtained from this belowground video footage.

We are currently using a minirhizotron camera system to monitor peach fine root production under irrigated and non-irrigated trees in a South Carolina peach orchard. Our long term goal is to develop a simple model for predicting the timing of fine root flushes. Using readily available weather data and growth observations, growers will be able to use this model to determine when fine root activity is highest and time their spring fertilizer applications accordingly. By making a smaller, properly-timed application of fertilizer, growers can reduce costs and prevent the soil acidification, excessive vigor and poor post-harvest quality that result from over-application of nitrogen.

The short term goal of the study is to determine how fine root characteristics differ between irrigated and non-irrigated trees. In particular, we are interested in the extent to which irrigation can alter root depth distribution. The use of irrigation to influence rooting depth is a potential management tool for Oak Root Rot, a disease spread through fungal inoculum present in the deep soil layers. Here we report on the installation of the peach minirhizotron experiment and present initial data on root architecture and depth distribution under irrigated and non-irrigated trees.

INSTALLING THE EXPERIMENT

In the winter of 2002, seventy-two root observation tubes ("minirhizotrons") were constructed. Each tube was 70 cm in length, 6 cm in outer diameter, and was scribed with three vertical transects of forty 1.8 x 1.2 cm windows (120 total windows per tube). The bottoms of the tubes were sealed with acrylic plugs. Light penetration and radiant heating were prevented by wrapping the tops of the tubes in black electrical tape, sealing them with rubber stoppers and covering them with white aluminum cans (Figure 7).

One root observation tube was installed beneath each of seventy-two open-center, four-year-old 'Redglobe' peach trees in the Peach Systems Trial at the Musser Fruit Research Farm near Clemson University (Figure 8). Trees were planted on either Lovell or Guardian™ rootstock and received one of three irrigation/fertigation (I/F) treatments: (1) rainfall only + granular fertilizer at standard rates, (2) 1" of supplemental irrigation per week + granular fertilizer at standard rates, and (3) 1" of supplemental irrigation per week + liquid fertilization at half the standard rate. Root observation tubes were installed in the ground approximately 2.5 feet from the tree base at an angle of 45 degrees from the vertical. Soil temperature, soil volumetric water content and pan evaporation data were also collected throughout the growing season.

Fine roots were allowed to recover from the disturbance of minirhizotron installation for two months prior to the initiation of a bi-weekly video sampling protocol. Beginning in May of 2002, a specially-designed fiber optic video camera system (BTC-100X, Bartz Technology Corporation, Santa Barbara) was used to videotape images of fine roots that had grown against the outer surface of each minirhizotron tube (Figure 9). Images of each minirhizotron window were collected in the orchard every two weeks; notes on tree phenology were also recorded at this time.

Individual video frames were digitized and archived on a computer (Figure 10). An image library was created that contained pictures of over 2000 individual roots as they appeared throughout the growing season. Information on root length, diameter, longevity and visual appearance was extracted from each image using specially-designed RootTracker software written by David Tremmel of the Duke University Phytotron.

INITIAL RESULTS

Data from the first video sampling date in May 2002 were used to assess differences in fine root production, diameter, branching, and depth distribution between irrigated and non-irrigated trees. Data from two treatments are presented here: (1) rainfall + standard granular fertilization, and (2) 1" supplemental irrigation + standard granular fertilization.

There was no difference between irrigated and non-irrigated trees in the amount of fine root length produced per tube (data not shown). However, the fine root systems of non-irrigated trees did differ from those of irrigated trees in ways that reflected their adaptation to lower soil water availability. Non-irrigated trees produced thinner roots (Figure 11), allowing them to deploy greater root surface area per gram of root tissue constructed. Non-irrigated trees also produced a more highly branched root system capable of intensively exploring the surrounding soil volume (Figure 12). Previous research in peach has shown that thinner roots and lower order lateral roots die more quickly than thicker, higher order roots. Whether the thinner, highly branched root system of non-irrigated trees also experiences higher rates of root mortality is a question we will address in the coming year.

Non-irrigated trees allocated more of their fine root length to deeper soil layers where water is present during much of the growing season (Figure 13). Irrigation altered the soil water profile and encouraged rooting in the upper soil layers. This result suggests that irrigation may constitute an important component of Oak Root Rot management. By promoting root growth in shallower soil layers, root contact with fungal inoculum in the deep soil may be minimized.

This study will be continued for three more years in order to develop a model that predicts the timing of fine root flushes as a function of soil temperature, moisture, and whole plant phenology.

ACKNOWLEDGMENTS

We gratefully acknowledge the financial support of the South Carolina Peach Council. We also thank Greg Reighard, Eric Hitzler, Bill Newall, Duncan Cox, Cory Tanner, Eric Wiseman and Kristen Hill for their many contributions to the project.

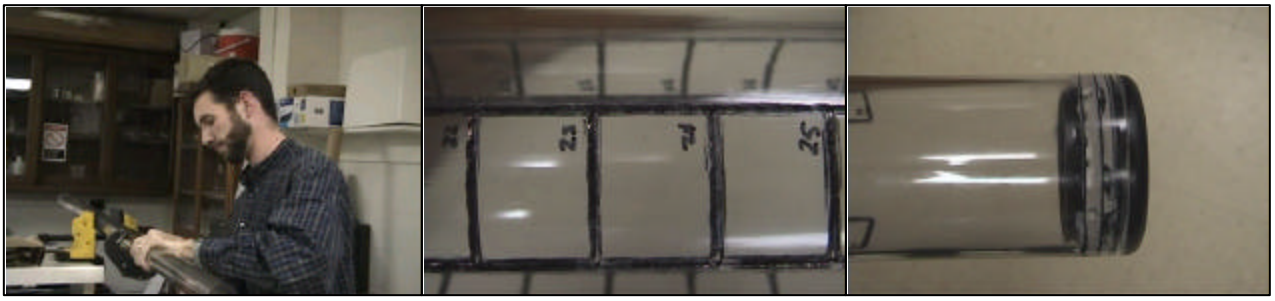

Figure 7. Root observation tubes (70 cm in length) were cut from clear butyrate tube and scribed with three transects of 18 x 12 mm windows. The bottoms of the tubes were sealed with acrylic plugs.

Figure 8. Observation tubes were placed into the soil beneath 72 peach trees at the Musser Fruit Research Farm near Clemson, SC. After installation, the top portion of the tube was covered with a white aluminum can to prevent light penetration and radiant heating.

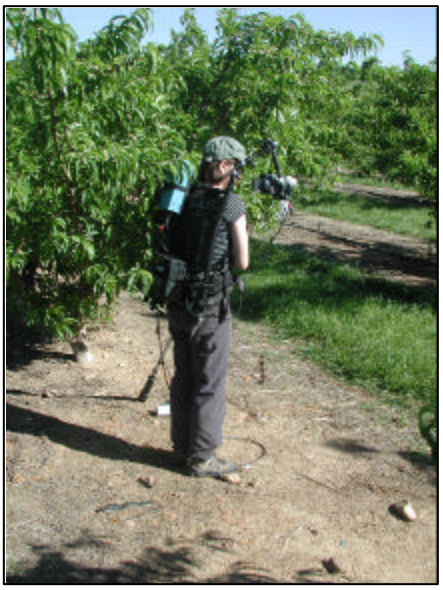

Figure 9. Roots that had grown against the sides of the observation tubes were videotaped at bi-weekly intervals using a specially-designed fiber optic video camera.

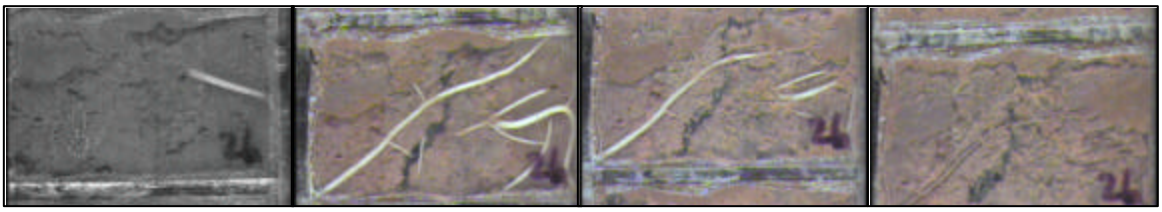

Figure 10. This series of four images illustrates the production and mortality of fine roots in a single observation window during the growing season. The images were recorded in April, May, July and August, respectively.

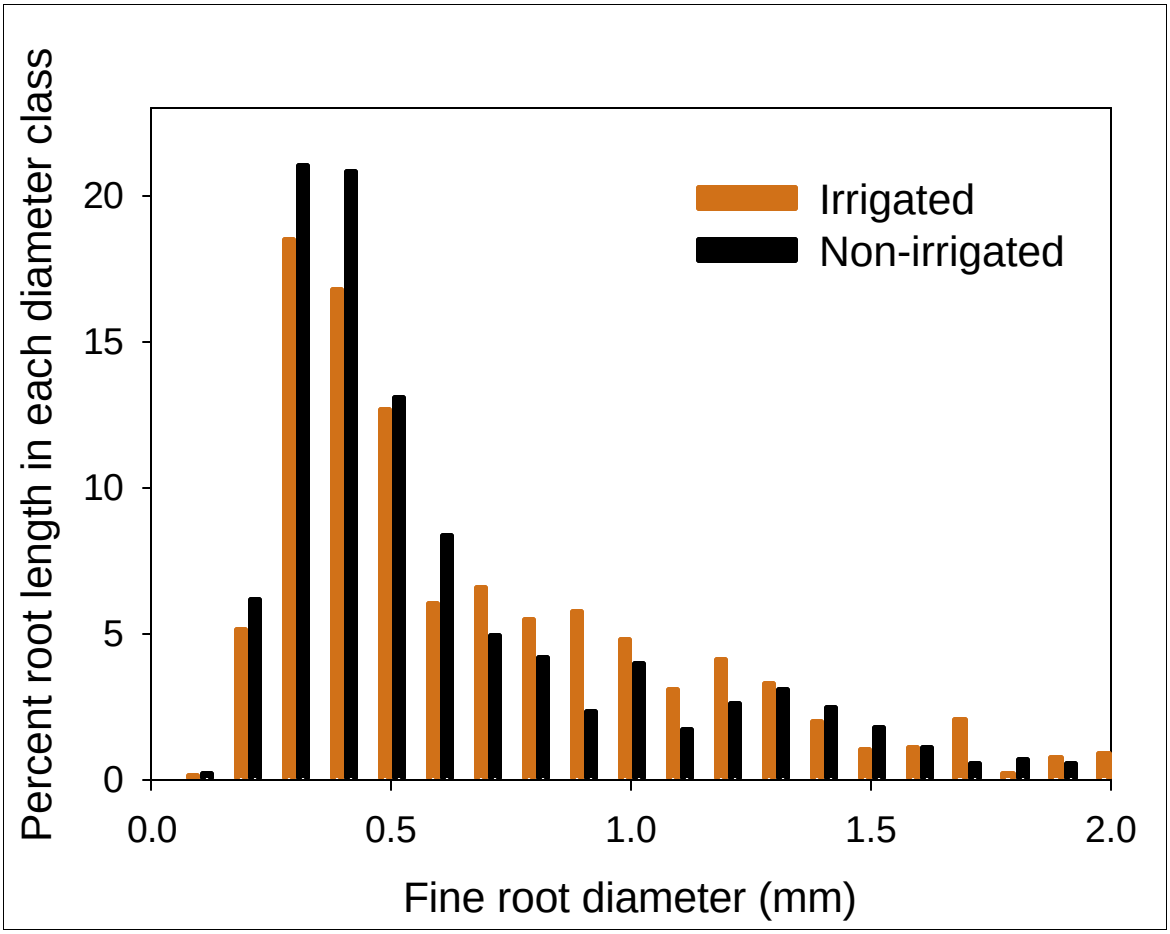

Figure 11. Distribution of fine roots among diameter classes from 0.1 to 2.0 mm. Non-irrigated trees produced more roots in the finest diameter classes, from 0.2 to 0.5 mm ($P < 0.05$; ANOVA; SPSS Software, SPSS Inc., Chicago, IL).

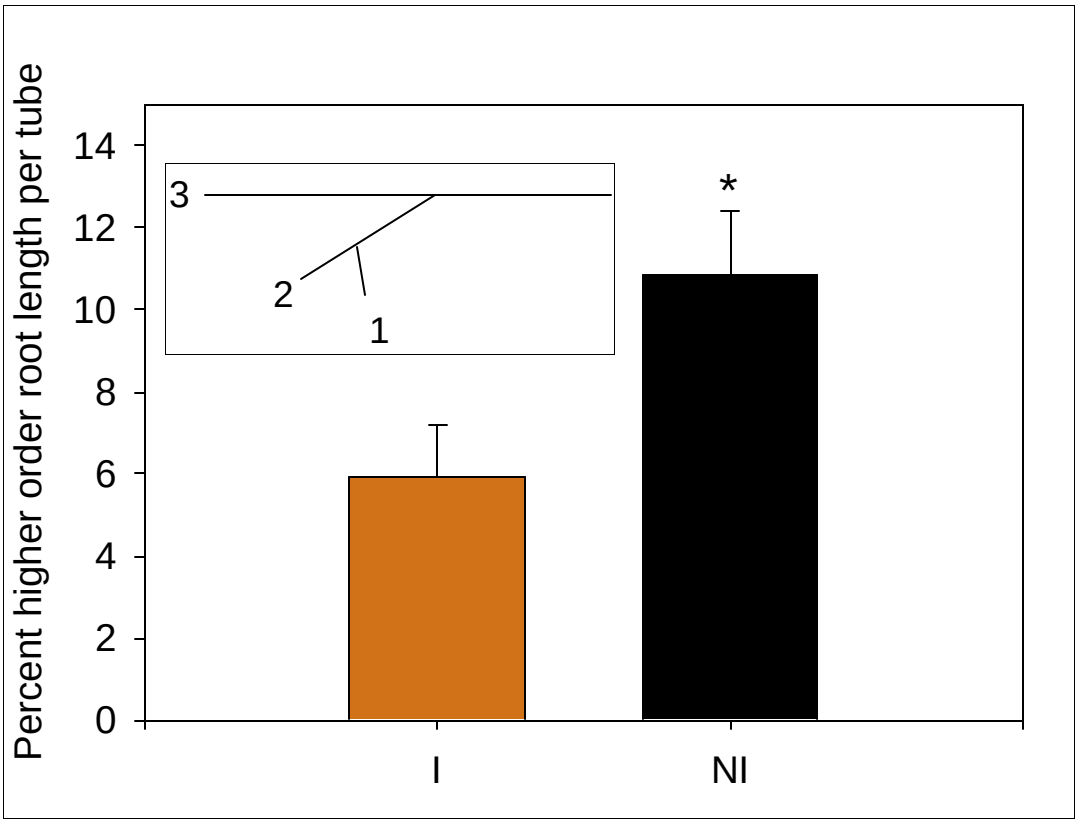

Figure 12. Percent of fine roots that were 1st or 2nd order laterals (see inset drawing) in irrigated (I) and non-irrigated (NI) trees. Non-irrigated trees produced a more highly branched fine root system: significantly more fine roots were 1st or 2nd order laterals ($P < 0.05$; ANOVA; SPSS Software, SPSS Inc., Chicago, IL).

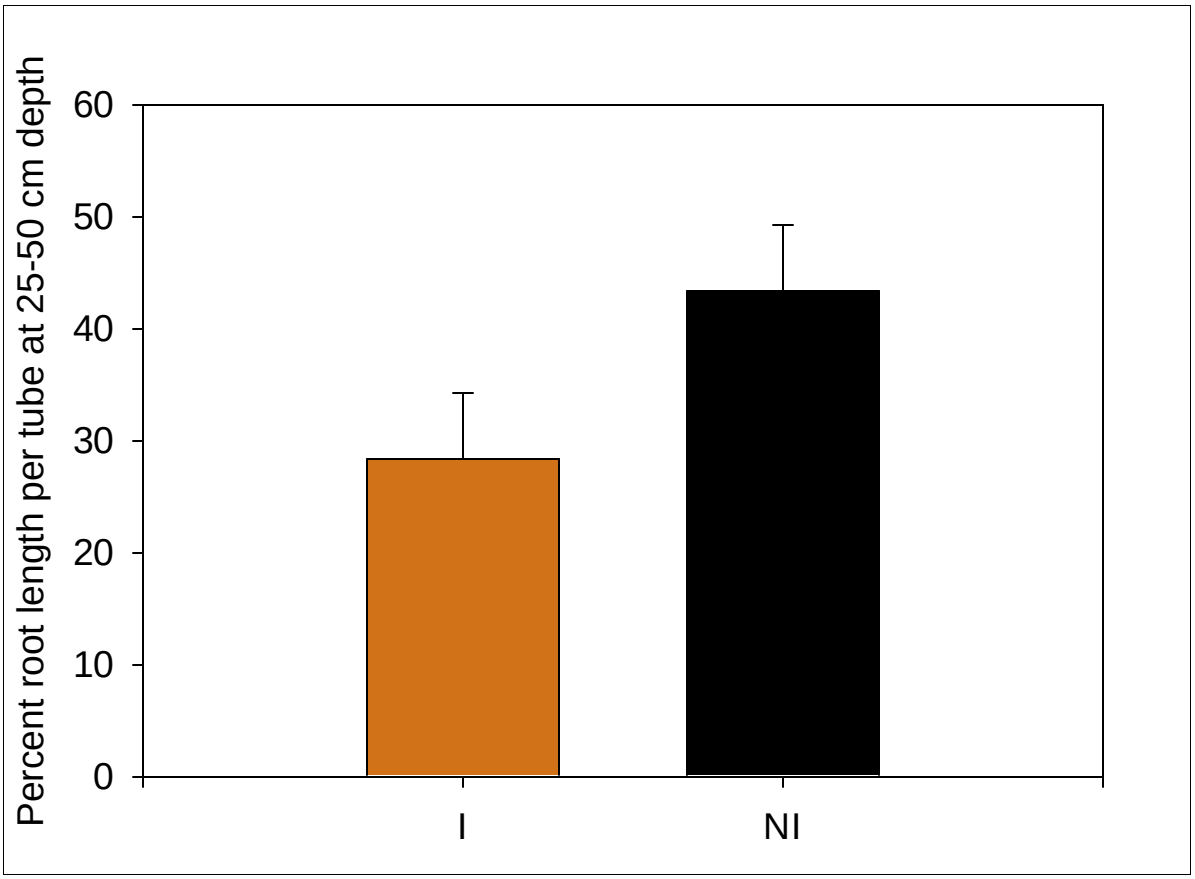

Figure 13. Percent of fine root length per tube that was present at the 25-50 cm soil depth in irrigated (I) and non-irrigated (NI) trees. Non-irrigated trees allocated a greater percentage of their fine root length to the deeper soil layers ($P < 0.08$; ANOVA; SPSS Software, SPSS Inc., Chicago, IL).

Peach Website at Clemson Gets Face-lift

Desmond Layne
Clemson University

Dick Okie
USDA-ARS

Thanks to the support of the SC Peach Council and a graduate student web programmer at Clemson, the peach website at Clemson has a new look and a tremendous amount of new information for the interested hobbyist, peach grower, county agent, specialist, etc. It is important to note that the address for the website has changed. To visit the website, go to:

http://www.clemson.edu/hort/peach/index.html and then click on the heading "Peach Information".

The largest substantive change in the website is the section on **peach variety evaluations** . Now, there is evaluation information, variety descriptions and photos of more than 200 peach and nectarine varieties (both yellow and white flesh) for 2000, 2001, and 2002. In addition, advanced selections from Dr. Dick Okie's breeding program at USDA-Byron, GA are being evaluated at grower farms in SC. The 2002 images of his advanced selections are also available on the site.

Growers should note that variety performance was evaluated at Clemson and Monetta, SC, respectively. Varieties may perform better (or worse) in other states/regions and should be evaluated at different locations to ensure satisfactory performance there before large acreages are planted to untested varieties in other regions of the southeastern U.S.

Comments, suggestions for improvement, and critiques of the website are welcomed. Please contact Dr. Layne directly by e-mail at: dlayne@clemson.edu for further information.

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Published quarterly. The Southeastern Regional Peach Newsletter is available through the following website http://resources.caes.uga.edu/publications/newsletters/SRPN/. If a hardcopy is desired, please contact your local county agent.

PUTTING KNOWLEDGE TO WORK

The University of Georgia and Ft. Valley State University, the U.S. Department of Agriculture and counties of the state cooperating. The Cooperative Extension Service offers educational programs, assistance and materials to all people without regard to race, color, national origin, age, sex or disability. An equal opportunity/affirmative action organization committed to a diverse work force.