the Southern Region small fruit consortium

Small Fruit News

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NC State University
Clemson University
The University of Arkansas
The University of Georgia
The University of Tennessee
VA Polytechnic Institute and State University

In this issue

Special Reports:

Southern Region Small Fruit Consortium Combines Strengths

Dee Shore,
Communication Services,
College of Agriculture and Life Sciences,
NC State University

Extension agents attend a blueberry training session hosted by the consortium. Photo Courtesy Tom Monaco

A nine-year-old partnership is bearing fruit for Southern region farmers. The Southern Region Small Fruit Consortium — a group of six universities, including N.C. State University — is designed to better serve the small fruit industry. The universities pool resources and expertise across state lines.

Dr. Tom Monaco, former head of the Horticultural Science Department in N.C. State's College of Agriculture and Life Sciences, coordinates the consortium. He said that in 1999, administrators with four southern universities came together on N.C. State's Centennial Campus and proposed a regional center to help lessen the impact of budget reductions that each faced in their states.

The administrators predicted that a regional approach would also be more effective than having full-fledged staffs in every state, Monaco said.

Each state contributes $35,000 annually to be a member while at the same time contributing different strengths to meet the needs of small but knowledge-intensive enterprises.

In addition to N.C. State, Clemson University, Virginia Tech and the universities of Arkansas, Georgia and Tennessee are consortium members.

The consortium makes it possible for each institution to contribute in its area of expertise. Experts from the various institutions support a Web site (www.smallfruits.org) and host grower meetings.

The Web site serves as a way for Extension specialists, agents and growers to get up-to-date information quickly. Production guides and integrated pest management guides are posted to the site and updated at least annually. The site, said Dr. David Lockwood, an extension fruit and nut crops specialist at the University of Tennessee, "is extremely valuable to all of our small fruit growers. Not only is the cultural information useful, but the site is a good way to keep growers up to speed on events happening in small fruit crops throughout the Southeast. Our growers and extension agents utilize this site heavily."

The consortium also awards annual research and extension grants and produces a quarterly newsletter featuring topics such as frost and freeze protection, irrigation, insect and weed control, disease problems and new cultivars.

Dr. Gina Fernandez, CALS associate professor and small fruit specialist, has used grant funds from the consortium to breed new varieties of raspberries and blackberries. She and Dr. Jim Ballington, CALS professor of horticultural science, recently released a new raspberry cultivar, and they have several others in the pipeline.

“The funds from the Southern Region Small Fruit Consortium, is not just seed money for me,” Fernandez said. “It has been the backbone for the project.”

Agent training programs have also yielded success. The consortium holds two agent training sessions a year on topics such as irrigation; strawberry, blueberry, bramble and organic production; and food safety.

Those workshops “are the best part of the consortium,” said Dr. Allen Straw, a faculty member at Virginia Tech. “Agents from all over the southeastern United States have the opportunity to learn, see for themselves and experience real-world small fruit production and techniques.”

Dr. Doug Bailey, head of the Department of Horticulture at the University of Georgia, agreed.

“Our agents who have participated in the multi-state trainings have commented on the high quality of the educational opportunities and also on the benefits of meeting and conversing with their counterparts from other states,” he said. “Without a multi-state program, this would not have been possible.”

Dr. John Clark of the University of Arkansas summed up the sentiment of those involved in the project when he said, “The bottom line is the consortium is a great thing, serving grower and technology disseminating needs. I can’t say anything but good about it.”

Small Fruit ‘Brain Trust’ Meets in Raleigh

Dave Caldwell, Communication Services
College of Agriculture and Life Sciences, NC State University

Approximately 50 small fruit experts from across the United States, Mexico and Canada descended on the College of Agriculture and Life Sciences Oct. 21-24 for the annual meeting to the North Central Cooperative Committee-22 (NCCC-22) working group. Cooperative Committee working groups are formed by the U.S. Department of Agriculture to share information about various agricultural commodities. Dr. Barclay Poling, professor of Horticultural Science, who helped organize the meeting with Connie Fisk, Extension Associate (muscadines), described meeting attendees as “sort of the brain trust of the whole small fruit industry.” While the meeting focused on reports on small fruit programs around the nation, it also included tours of the Centennial Campus and the North Carolina Research Campus in Kannapolis as well as a tour and wine tasting at an area vineyard. Also on the itinerary was a tour (pictured below of the JC Raulston Arboretum at NC State University. The tour was conducted by Tim Alderton (in green shirt, foreground) horticultural science research specialist.

Estimated Costs, Gross Revenues and Returns for Commercial Blackberry Revised for 2008

Charles D. Safley Professor,
Department of Agricultural and Resource Economics, NC State University and
Gina E. Fernandez Associate Professor,
Department of Horticultural Science,
NC State University

In 2008, Charles Safely and Gina Fernandez revised the budget for the production of 10 acres of blackberries. We realized that after several years of feedback from growers in the southeastern United States, and due to changes in prices of some of the inputs, a complete revision was due.

This budget presents the estimated costs of producing and harvesting blackberries in North Carolina (although much of the information is readily transferable to any location in the southern region) along with an analysis of the effects of varying yields and wholesale prices that can be useful for farmers considering starting a commercial blackberry operation or expanding an existing operation. The budget was developed for a representative 10 acre planting with drip irrigation. It was assumed that the management would be near optimal and that all currently recommended practices by the North Carolina Agricultural Extension Service would be followed.

The revised budget can be viewed at http://www.smallfruits.org/Bramble/production/CommercialBKBudget2008Final.xls.

Strawberry Agent Training Held in Charlotte North Carolina Was a Success

Tom Monaco, Coordinator
Southern Region Small fruit Consortium

A total of 25 county agents from the six member universities of the Southern Region Small Fruit Consortium (SRSFC) participated in the Strawberry Training held November 5-6, 2008 in Charlotte, NC. The first day of the training consisted of a bus tour organized by Powell Smith and Andy Rollins, Clemson, to two strawberry farms in South Carolina. The first stop was Bob Hall's operation Bush-N-Vine(www.bushnvinefarm.com/index.html) in York, SC where agents had an opportunity to view some protected culture of strawberries for the fall market primarily targeting Thanksgiving and Christmas. Bob Hall had a planting of "Festival" strawberries using row covers to protect the planting during cold weather (Figure 1). He also has an acre of strawberries under high tunnels and use of row covers to protect the crop (Figure 2). With this type of protection he is able have strawberries available at Thanksgiving and Christmas during a normal fall/winter which he sells at his roadside stand (Figure 3).

Figure 1

Figure 2

Figure 3

The second stop was at Strawberry Hill farm (www.strawberryhillusa.com/) at Chesnee, SC. James Cooley (Figure 4) is the owner and operator of Strawberry Hill and also serves as the industry representative for SC on the SRSFC steering committee. Strawberry Hill has 75 acres of strawberries (Figure 5) in addition to 38 acres of blackberries (Figure 6). They also grow peaches and have a roadside stand as well as a restaurant and gift shop. The highlight of the field tour was the dinner provided by Strawberry Hill at their restaurant and cooked by the proprietor James Cooley.

Figure 4

Figure 5

Figure 6

The second day of training was held at the Hilton University Place in Charlotte and consisted of classroom instruction in the morning followed by hands on exercises in the afternoon. Barclay Poling, NC State, gave an update on plasticulture strawberries; Jim Ballington, NC State, gave a presentation on strawberry breeding; and Rob Welker provided an update on methyl bromide alternatives in the morning session. The afternoon session was a pest management workshop focusing on strawberry diseases and insects. Frank Louws and Mahfuzur Rahman of NC State conducted the disease workshop and Hannah Burrack, NC State, conducted the insect workshop. Following the training agents had an option to attend the Southeast Strawberry Expo on November 7-8 at the same location. Gina Fernandez, NC State, and Jeremy Pattison, VA Tech and now at NC State, shared the duties in organizing the training. All the presentations given at the training and photos from the field tour can be viewed at www.smallfruits.org/CoAgentTraining/index.htm.

Management of Gray Mold and Anthracnose with Reduced Spray Schedule

Mahfuzur Rahman and Frank Louws,
Department of Plant Pathology, North Carolina State University, Raleigh, NC27595

Gray mold of strawberry caused by *Botrytis cinerea* and anthracnose fruit rot or black spot caused by *Colletotrichum acutatum* are the two most important diseases in strawberry production in North Carolina and the Southeast in most years. Gray mold is a problem not only in the field, but also during storage, transit, and marketing of strawberries, due to the onset of severe rot as the fruits begin to ripen. Other parts infected by the fungus include leaves, crowns, petals, flower stalks, and fruit caps. Disease is most severe during bloom and harvest in seasons with lengthy periods of cloud and rain. Botrytis primarily enters the field on transplant foliage. The fungus can live in the green tissue but be latent or dormant without causing any symptoms. As the infected strawberry leaf begins to die (senesce), the pathogen goes into an active stage, colonizing the leaf and obtaining its nutrients from the dead tissue (Figure 1). Spores then form and, once environmental conditions are appropriate (between 65-75^0 F, and damp or rainy weather), they are dispersed by water splash and/or wind onto newly emerging leaves or blossoms. Immature fruits become infected primarily through blossom infections. Once the berries begin to ripen, the fungus is able to colonize the fruit and sporulate, producing the mold symptoms often seen in the field.

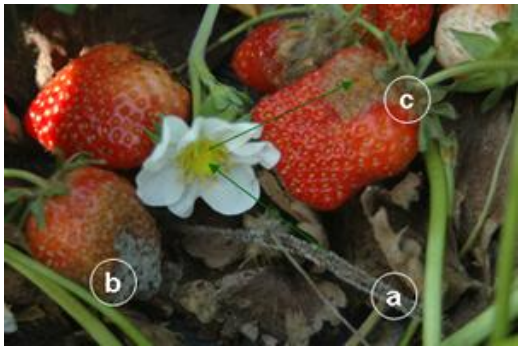

Figure 1. *Gray mold on different parts of strawberry; a) Sporulation on dead petiole and leaf; b) fruit infection from colonized dead tissue; c) lesion appearance from internal infection that have occurred through flower parts such as stigma.*

Disease management:

I) CULTURAL CONTROL
Excess nitrogen has been shown to increase fruit rot when weather conditions are favorable. To avoid over-fertilization, base fertilizer programs on leaf tissue nutrient analysis reports. Research has demonstrated increasing nitrogen levels beyond an optimum level does not increase yield but does increase fruit rot incidence. Allow adequate spacing between plants to improve airflow in the canopy. However, manage plant spacing for optimum yields rather than to manage disease. Removal of dying tissue from the field may be helpful in the fall, but is likely of most benefit in the early spring, just prior to bloom, to help lower inoculum levels. Early spring growth of foliage sometimes can be trapped underneath the plastic where relative humidity can reach close to saturation during periods of cloud and rain supporting rapid colonization of the senesced as well as live tissues by *B. cinerea* to cause severe petiole rot. Plant mortality from this kind of heavy infection is not uncommon. Use of row cover also has the potential to increase relative humidity around the plant canopy. If weather remains damp and humid in the early spring and *Botrytis* growth is detected, row cover use needs to be minimized or intermittently removed to allow air circulation. After harvest fruits should be monitored for disease, and infected berries removed. Rapid removal of field heat and keeping fruit at around 34^0 F and increasing carbon dioxide levels during shipping (12-15 % concentration in gastight storage bags) when harvested will help keep *B. cinerea* down.

II) CHEMICAL CONTROL
Fungicides play a major role in the management of this disease. Fungicide applications are critical in problem fields during early and full bloom. These fungicides are targeted to limit flower infection that leads to fruit infection, and should limit the need for late season applications to the fruit. A few well-timed sprays are less costly and more effective in controlling gray mold than frequent fungicide applications through harvest. Fewer sprays during harvest should also provide strawberry pickers a sense of exemption

from chemical residues on the berries they are picking. Results from a multiple year study in North Carolina on fungicide schedules based on the information generated on Botrytis infection biology and resistance management produced consistent results to suggest comparable gray mold control from reduced number of applications as opposed to season long spray program (Table 1).

In this study in 2008, gray mold incidence was high due to rain and prolonged foliar and floral wetness periods at the beginning of the harvest season. At the end of the season, however, none of the treatments had any gray mold incidence. *A reduced spray schedule (4 applications) showed statistically similar efficacy as a season long schedule (9 or 14 applications).* Combinations of fall and spring applications of Captan + Topsin-M showed superior disease suppression generating the highest marketable yield.

Anthracnose fruit rot:

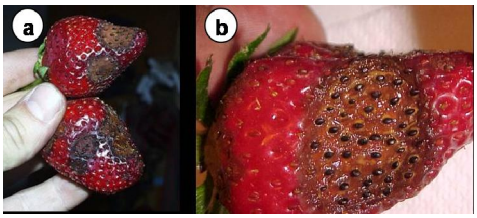

Figure 2. *Anthracnose fruit rot or black spot on strawberry; a) Under low humidity; b) Under high humidity showing abundant spores on lesion.*

Control of the disease is best achieved when an integrated approach is adopted comprised of the following components:

I) USE DISEASE-FREE PLANTS

The disease has been associated with asymptomatic plants imported from transplant supply nurseries. Thus, the use of disease-free plants is the most important management strategy for controlling this disease. Currently there is no rapid detection method for diagnosing anthracnose-infected transplants prior to planting. Plants have reduced risk of disease if they have been micropropagated and then entered into a strict plant certification program. With the advent of improved detection protocol it will be possible to trace infection in nursery stock in the near future. Evaluation of the health of nursery stock by 'grow out' assays will also make an impact by ensuring disease free plants moving to the fruit growers field.

2. MONITOR AND MANAGE

Periodic scouting of a field, especially during warm and wet weather will enable early detection of anthracnose. If the problem seems to be associated with hot spots in the field, remove and destroy (bury or burn) infected plants and surrounding plants (5 to 10 foot radius). Killing the plants with herbicide will initiate spore production by the pathogen, and if these plants are not removed the problem will be aggravated.

Nitrogen levels should be kept at the required level, since high nitrogen levels in the soil favor fungal development. Keep foliage dry and reduce water splash by use of drip irrigation to help lower conidial dispersal and spread of the pathogen. Use nitrate source for nitrogen instead of ammonium. Ammonium form of nitrogen is readily accessible to the pathogen.

- Avoid excess overhead irrigation (e.g. for evaporative cooling) and do not over water or over fertilize.
- Always pick the infested area last and do not let personnel or equipment move from an infested area to clean areas in order to limit spread of the pathogen.
- Do not work plants when wet.

3. CHEMICAL CONTROL

In the presence of inoculum in the field and rainy weather during bloom, multiplication and dispersal is rapid that makes chemical control an obvious requirement. With the advent of strobilurin (now called QoI) fungicides, satisfactory level of control can be achieved by following a well timed schedule by rotating with products for inhibiting resistance development. Results from our study under high disease pressure condition indicated that 4 applications of chemicals starting at 10% bloom provide statistically similar control as season long applications (Table 2). This result however, needs to be taken with caution as this work was done only for one year and is being confirmed in the second year in 2009.

Anthracnose fruit rot incidence in this study was very high due to wind driven rain splashing at the beginning of the season. At the end of the

season, non-treated control plots had 100% of the fruits diseased. All treatments except Actinovate significantly reduced disease incidence compared to non-treated control. In the case of Milsana, all the applications except spray #1 & 2 were made as a tank mix with Captan and Topsin-M and the direct contribution of Milsana to disease control was difficult to determine. *The Pristine-based reduced fungicide program (4 applications) provided disease control and fruit yields statistically similar to a season long spray schedule (9 applications).* Only Pristine based schedules and Milsana gave significantly higher yield compared to the non-treated control.

In summary, growers may prefer not to spray during the harvest time. Our research has shown that a reduced spray schedule of 4 applications beginning at early bloom offers control of Botrytis and anthracnose similar to a season long program. We have several years of work for Botrytis and are confident to make this a standard recommendation. However, more research is needed for anthracnose management and is included in our future plan of work.

Bramble Bramble (Caneberry) Seasonal Checklist

Gina Fernandez, Small Fruit Specialist
North Carolina State University

This checklist was originally developed for blackberry growers in North Carolina. Many of the items apply to raspberry production as well. You may have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Bramble Management Guide and the Southeast Regional Bramble Production Guide at: http://www.smallfruits.org/SmallFruitsRegGuide/index.htm

WINTER

Plant growth and development

- √ Plant is "dormant"
- √ Some differentiation is occurring in the flower buds

Pruning and trellising

- √ Pruning should occur in late winter. However, in some areas winter ice storms can do tremendous damage to plants and trellis systems. If you produce blackberries in one of these areas, pruning can take place early winter to help avoid severe damage.
- √ **Make trellis repairs after plants have defoliated but before pruning and training.**

Erect types

- √ Prune out the spent floricanes
- √ Tie canes to wires in a fan shape
- √ Cut lateral branches back to 8-12"
- √ Thin canes to 6-8 canes/ hill (4 ft spacing)

Trailing types

- √ prune out spent floricanes
- √ tie or weave canes to wire so that they do not overlap
- √ prune side laterals to 12-18"
- √ thin canes to 6-8 hill (6-8ft spacing)

Primocane fruiting raspberries

- √ Prune (mow) primocane fruiting types to ground level

Weed control

- √ Many summer weed problems can be best managed in the fall and winter using preemergent herbicides. Determine what weeds have been or could be a problem in your area. Check with local extension agent for cultural or chemical means to control these weeds.
- √ Establishing new plants into rows of black plastic or landscape cloth can reduce weed problems significantly

Insect and disease scouting

Listed are insects and diseases that are present during this season. Control of these pests may occur at this time or in another season. Check the Southern Regional Bramble integrated Management Guide for recommendations. www.smallfruits.org

- √ Scout fields for insect and disease damage and remove those canes
- √ Remove wild brambles within 600 ft of your planting during the winter
- √ Apply liquid lime sulphur or Bordeaux for disease control

Planting

- √ Growers in warmer regions can plant in December.
- √ Take soil tests to determine fertility needs for spring plantings.
- √ Prepare list of cultivars for next years new plantings. Find the commercial small fruit nursery list at http://www.smallfruit.org

Nutrient management

- √ Place nitrogenous fertilizers in row before new canes emerge in spring
  - Raspberries: Apply 500-800 lbs of 10-10-10 per acre in split applications. Apply half in Feb-March and the remainder in April-May. Spread uniformly across the row or side dress with half on each side of row in a 3 ft wide band.
  - Blackberries: In established plantings apply 60 to 80 lb/acre N. Nitrogen can be applied in split or single applications. If using a split application, apply the first portion at bud break and the remainder just after harvest. Ammonium nitrate is the most common form of N used on blackberries.

Water management

- √ Make repairs to irrigation system (check pumps, lines, etc)
- √ Plants generally do not need supplemental water in winter

Marketing and miscellaneous

- √ Order containers for next season
- √ Make contacts for selling fruit next season
- √ Attend grower meetings:
  - SOUTHEAST REGIONAL FRUIT AND VEGETABLE GROWERS CONFERENCE in Savannah GA January 8-10, 2009 (http://www.gfvga.org/conferences/2007FVWC/ConferenceMain.htm) . There will be a session for brambles at the meetings.

Quarterly Strawberry Plasticulture Checklist

Gina Fernandez, Small Fruit Specialist
North Carolina State University

This checklist was originally developed for growers in North Carolina. You will have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Strawberry Management Guide and the Southeast Regional Strawberry Plasticulture Production Guide at:
http://www.smallfruits.org/SmallFruitsRegGuide/index.htm

Winter (Dec-Feb)

- ✓ Check all equipment (replace hoses etc)
- ✓ Get drip and overhead irrigation system hooked up, check your sprayer, replace hoses etc.
- ✓ Keep deer out of the strawberry patch. They can do serious damage to
- ✓ plants and plastic
- ✓ Examine plants for spider mite damage, they can be mistaken for winter damage
- ✓ Get ready for leaf tissue analysis in late February
- ✓ Spray ryegrass in late February/March
- ✓ Order chemicals and fertilizer for spring
- ✓ Scout crops for insects, mite and leaf diseases
- ✓ Scout for weeds, vetch in holes is not killed by winter temperatures
- ✓ Spray row middles with grass herbicide when ryegrass is 10-12 inches tall
- ✓ Purchase digital thermometer
- ✓ Calibrate thermometers in 32F water bath
- ✓ Purchase row covers
- ✓ Monitor weather forecasts closely
- ✓ Check frost alarm to see that it is working properly
- ✓ Get pumps, hoses and pipe ready for frost protection (First date is usually early March in NC)

- ✓ Order picking containers
- ✓ Prepare signs for stands, roadside directions, and on-farm use
- ✓ For companion crops, order seeds and locate/prepare greenhouse facility for growing transplants
- ✓ If selling fruit at wholesale markets, line up buyers now.

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Editor and Contributor ..... Tom Monaco

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Table 1. Evaluation of fungicides to control Botrytis fruit rot on strawberry cultivar Chandler, 2008.

Treatment and rate (amount of formulation)/Acre[w]	Schedule [x]	Gray mold incidence (%)[y,z]	Marketable Yield (lb/A)[z]
Non-treated……..	xxx	17.8 a	34960 bc
Switch 62.5 WG, 12.0 oz (experimental control only)……	Spray# 1-9	9.1 bc	36657 ab
Captan 50 WP, 4.0 lb +Topsin-M 70W, 1.1 lb Pristine WG, 23.0 oz Switch 62.5 WG, 11.0 oz Pristine WG, 23.0 oz……..	Spray# 1 Spray#2 Spray#3 Spray# 4	7.3 c	36103 abc
Captan 50 WP, 4.0 lb +Topsin-M 70W, 1.1 lb Pristine WG, 23.0 oz Switch 62.5 WG, 11.0 oz……..	Spray# 1 Spray# 2,4,6,8 Spray# 3,5,7,9	6.1 c	37025 ab
Captan 50 WP, 4.0 lb +Topsin-M 70W, 1.1 lb Pristine WG, 23.0 oz Captan 50 WP, 4.0 lb……..	Spray# 1 Spray# 2,4,6,8 Spray# 3,5,7,9	6.2 c	34430 c
Captan 50 WP, 4.0 lb +Topsin-M 70W, 1.1 lb……....	Fall spray# 1-5 Spring # 1-9	6.2 c	38379 a

[w]Plus signs "+" indicate tank mixes of two or more products.
[x]Numbers indicate week of application during a 5 week period in the fall from November 18th to December 23rd, 07 and 9-week period in the spring from 7 April through 27 May, 08.
[y]Incidence of gray mold as a percentage of all marketable fruit harvested.
[z]Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD test ($P \leq 0.05$). <<Back to article

Table 2. Evaluation of fungicides to control anthracnose fruit rot on strawberry cultivar Chandler, 2008.

Treatment and rate (amount of formulation)/Acre[w]	*Schedule*[x]	Anthracnose Incidence (%)[yz]	Marketable Yield (lb/A)
Not-treated……..	xxx	46.72 a	12,685 cd
Captan 50 WP 4.0 lb +Topsin-M 70W 1.1 lb Pristine WG 1.45 LB CaptEvate 68WDG 4.5 lb Abound 12 fl oz……..	Spray# 1 Spray# 2,4 Spray# 3,5,7,9 Spray# 6,8	21.60 c	20,151 a
Captan 50WP 4.0 lb + Topsin M 70 W 1.1lb… Pristine WG 1.45 lb CaptEvate 68WDG 4.5 lb……	Spray# 1 Spray# 2,4 Spray# 3	29.87 bc	18,130 ab
K-Phite 3pts +Captan 50WP 4.0 lb……	Spray #1-9	30.60 bc	16,945 abcd
Actinovate WYEC 108……	Spray#1-9	39.78 ab	11,456 d
Milsana 1% v/v + NuFilm-P at 0.02%..... Captan 50 WP 4.0 lb +Topsin M 70W 1.1 lb; Milsana 0.5% v/v + NuFilm-P 0.01% + Captan 50WP 2.0 lb + Topsin M 70 W, 0.52 lb	Spray#1-2 Spray#3-4 Spray#5-9	21.14 c	20,046 a

[w]Plus signs "+" indicate tank mixes of two or more products.
[x]Numbers indicate week of application during a 5 week period in fall from 18 Nov to 23 Dec 2007 and 9-week period in spring from 7 Apr through 27 May 2008.
[y]Incidence of anthracnose as a percentage of total (marketable + diseased) fruit harvested.
[z]Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD test ($P \leq 0.05$).

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