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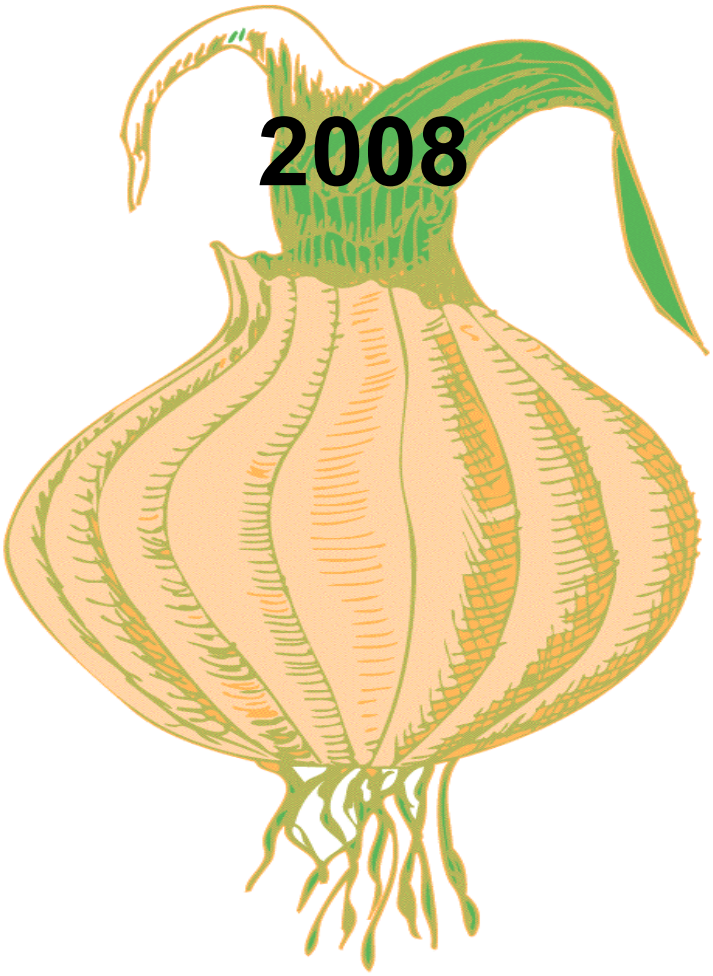
GEORGIA ONION RESEARCH-EXTENSION REPORT

2008



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J. Scott Angle, Dean and Director

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Vidalia Onion Committee

NEW DISEASE ON VIDALIA ONIONS – 'TWISTER' CAUSED BY *COLLETOTRICHUM GLOEOSPORIOIDES*

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Introduction

In the fall of 2007, onion seedlings with twisted and distorted leaves were observed in several seedbeds in the Vidalia onion-growing area. The seedlings had no signs of any pathogen and tested negative for known viral and bacterial pathogens. Chemical injury was considered, but the lack of an aggregated pattern of symptoms in the seedbeds made this an unlikely possibility. The causal agent identified in the Vidalia onion seedlings was *Colletotrichum gloeosporioides.* An onion disease with similar symptoms had been reported in 1969 from Nigeria and later from Brazil (Hill, 2008). The causal agent identified in these countries was also *Colletotrichum gloeosporioides*.

Colletotrichum gloeoporioides is a fungal pathogen with a wide host range that is found around the world on many crops including tomatoes, peppers and strawberries. The fungus grows best at high temperatures and high humidity. In the fall of 2007, temperatures reached the upper 70s to low 80s on several days and overhead irrigation provided high humidity.

Materials and Methods

Symptomatic onion seedlings were collected from seedbeds in October 2007. The seedlings were surface-sterilized with bleach and 70% ethanol, rinsed in sterile water and plated onto potato dextrose agar (PDA) to test for fungal pathogens. The plates were incubated at 27C. The fungal colonies that emerged were viewed under a light microscope and identified based on spore morphology and fruiting body formation. In addition, PCR was conducted with primers specific to the internal transcribed spacer region (ITS) that is specific for each species. The PCR product was sequenced directly. Sequencing was done by University of Georgia Sequencing and Synthesis facility (Athens, GA, USA). The

sequence of the ITS region of the fungal isolate were compared with all known fungal sequences in the NIH GenBank library.

To determine pathogenicity of the isolated *Colletotrichum gloeosporioides*, onion seedlings were spray inoculated with a spore suspension, kept in plastic bags with a moist paper towel for 24 hours to create high humidity and placed in a greenhouse. Negative controls were sprayed with water. The plants were observed for 5 weeks.

To determine if the Colletotrichum isolate from onion was host specific or if it would infect other crops, a host range study was conducted. Tomatoes, peppers, eggplants, mangoes and avocadoes, known hosts for *Colletotrichum gloeosporioides*, were stab-inoculated with a toothpick dipped in spores. Negative controls were stabbed with a sterile toothpick. After inoculation, the fruits and vegetables were placed in a plastic bag with a moist paper towel for 24 hours to maintain high relative humidity and placed in a room at 23C. The fruits and vegetables were monitored every day for 10 days.

Results & Discussion

Five days after the surface-sterilized seedlings were plated onto PDA, the emerging fungi were viewed under the microscope and identified as *Colletotrichum gloeosporioides* based on spore morphology and type of fruiting body. No other fungi grew out. *C. gloeosporioides* grew out from the neck of the plants, nothing grew out from the leaves or roots. To confirm the identification, DNA was extracted from a culture and the ITS region was sequenced. The sequence was then compared to other sequences in NIH GenBank library. There was a 99% match with *Colletotrichum gloeosporioides* sequences in GenBank confirming the identification.

The seedlings inoculated with a spore suspension developed characteristic twisted and distorted leaves 3 weeks after inoculation and *C. gloeosporioides* was successfully re-isolated.

The host range study showed that the onion isolate of *C. gloeosporioides* can infect all inoculated fruits and vegetables – tomatoes, peppers, eggplants, mangoes and avocadoes. This indicates that the pathogen has most likely been in area prior to the outbreak and that the unusually warm temperatures in combination with humidity created by the overhead irrigation led to the outbreak. There were no indications that mature onions in spring 2008 were affected by *C. gloeosporioides.*

Colletotrichum gloeosporioides is in the same genus as *Colletotrichum circinans* that causes smudge on onions.

References:

Hill, J. P. Compendium of Onion and Garlic Diseases. 2nd ed. The American Phytopathological Society, St. Paul, MN, 2008.

EFFECT OF DOUBLE-CROPPING ONIONS BEHIND EITHER PEARL MILLET (*PENNISETUM GLAUCUM*) OR CORN (*ZEA MAYS*), YEAR 2.

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Introduction

Sour skin of onion, caused by the soilborne bacterium *Burkholderia cepacia*, continues to be a postharvest disease problem in Georgia. It is particularly severe if there are above normal temperatures at harvest. Preliminary studies in New York (Mark et al., 1999; Haudenshield and Lorbeer, 2003) have indicated that crop rotations with certain crops, e.g. pearl millet (*Pennisetum glaucum*), may suppress bacterial populations, thus reducing disease. In addition, following onions behind other crops, e.g. corn (*Zea mays*) increases soilborne populations of *B. cepacia*. Consequently, this study evaluated corn and pearl millet in a double-cropping scheme with Vidalia sweet onions to determine what effect these crops may have on soilborne populations of *B. cepacia* and subsequent sour skin levels. Data presented are from the second year of the study

Materials and Methods

The experiments were conducted at the University of Georgia's Blackshank Farm (BSF), at the Coastal Plain Experiment Station, Tifton, Ga. Experiments were conducted during the 2007-2008 season. The soil at the BSF was a Tifton Sandy Loam soil (a fine loamy, siliceous thermic Plinthic Paledults) with a pH of 6.5 to 6.8. Soil was harrowed and raised plant beds were formed with a rototiller and bedshaper. Seeds of onion cultivar 'Pegasus' were direct seeded ~ 8-10 cm apart within rows on beds having three rows, with a 0.23

m separation between rows. Standard weed control, fertilizer application, insect control and disease control practices were according to the University of Georgia Cooperative

Extension recommendations. Treatments were arranged in a randomized complete block design. Each treatment consisted of five three-row beds ~20 m in length, with a 1.8-m separation between the centers of adjacent beds. Treatments consisted of planting onions following a summer crop of either pearl millet (*Pennisetum glaucum*) or corn (*Zea mays*).

The pearl millet and corn crops were in the same location as the previous year.

Because of problems with weeds and stand loss to cold and other factors, harvest practices were altered from the previous year. Approximately 100 onions from each plot were harvested when ~ 75% of the onions were down. Onions were air dried in the field 48 hrs after undercutting and prior to clipping of roots and foliage. Onions were removed from the field and temporarily stored in a pole barn on the Tifton Campus where they were graded and classified as either marketable or as a cull.

Results and Discussion

As observed in the previous year, the primary disease observed in onion bulbs at postharvest was sour skin, caused by the bacterium *Burkholderia cepacia*. In this study, we demonstrated that double-cropping onions behind pearl millet reduced sour skin incidence and increased marketable yield when compared with onions grown following corn (Table 1). These results represent a second year of data and appear to confirm previous results. Future research efforts in microplots, field plots and on farm sites will be directed towards evaluating pearl millet in a double-cropping/crop rotation scenario with winter crops, e.g. carrot, also shown to suppress *B. cepacia* populations and compare disease levels with a standard double-cropping (e.g. soybean)/continuous onion production system.

References:

1. Mark, G.L., J.W. Lorbeer, and N.A. Gudersheim. 1999. Characterization and quantification of *Burkholderia cepacia* isolated from onions and organic soil previously cropped to onions. Phytopathology 890:S48

2. Haudenshield, J.S. and J.W. Lorbeer. 2003. Mediation of *Burkholderia cepacia* populations in organic soils by winter cover crops. Intl. Cong. Plant Pathology, Feb. 3-7, 2003. Christ Church New Zealand.

Table 1. Yields and grades of onions (cv. Pegasus) harvested from three 50' rows in plots double-cropped behind either pearl millet or corn.

Treatment	Rep	# Bulbs	# Culls[1]	% Culls[1]
Millet	1	115	22	19
Double-crop	2	101	29	29
	3	118	52	44
	4	108	12	20
Total		442	125	
Corn	1	115	65	57
Double-crop	2	94	50	53
	3	102	41	40
	4	104	48	46
Total		415	204	
Millet Mean		111	31*	28**
Corn Mean		104	51	49

[1]Primary cause of culls was sour skin caused by the bacterium Burkholderia cepacia
*Significantly different $P = 0.06$
**Significantly different $P = 0.02$

EFFECT OF FUNGICIDE DIP TREATMENTS ON FUNGAL DISESES AND YIELD OF TRANSPLANTED SWEET ONIONS

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Introduction

Several fungal diseases of sweet onion cause significant losses to growers each year in Georgia. Botrytis neck rot (BNR), caused by the fungus, *Botrytis allii*, can be soil borne or seed borne. BNR is predominantly a post harvest disease and is the most devastating disease of sweet onions in Georgia. Losses from BNR can be 70% of the total crop in bad years. Purple blotch (PB) caused by the fungus, *Alternaria porri*, and Stemphyllium leaf blight (SB), caused by the fungus, *Stemphyllium vesicarium*, are foliar pathogens of sweet onions and reduce yield and bulb size of infected onions. These two diseases are common in most years in Georgia and can cause severe losses. Pink root (PR) is caused by the fungus, *Phoma terrestris*. This disease is soil borne and infects the roots of onions. Although pink root does not rot onion bulbs, the disease can cause significant losses. The purpose of this study is to evaluate fungicide dip treatments for the control of fungal diseases of sweet onion in Georgia.

Materials and methods

This trial was conducted at the Vidalia onion and vegetable research and educational center in Lyons, Georgia. Onions beds were on 6ft. centers with four rows in each bed with plant spacing 6 inches within each row and 12 inches between rows. Plots were 20 feet long with 5 foot unplanted borders. Three varieties of onions (Sweet Vidalia, Savannah Sweet, and Ohoopee Sweet) were transplanted on December 10, 2007, and production guidelines for growing sweet onions published by the University of Georgia Extension Service were followed except for fungicide applications. The trial contained 21 treatments replicated four times in factorial design, factor one being variety and factor two being fungicide treatment.

Prior to planting, 50 onion transplants of each variety were tested for latent infections of BNR. This was accomplished by placing transplants in cold storage for a three week incubation period, removing the onions and cutting them longitudinally and placing them in moist chambers under growth lights

for two weeks. After this period, they were rated for BNR macroscopically and microscopically.

Onion transplants were treated with fungicide dips on December 10, 2007 by dipping whole bundles of onions (100-150 plants/bundle) in buckets containing fungicide treatments. Onions were submerged above the collar to the base of the outside leaves for one second. Foliar fungicide treatments were initiated on February 14, 2007 and continued on a three week spray schedule for a total of three applications. Foliar sprays were conducted using a Lee Spider Spray Trac Hi-Boy with TX-18 hollow cone nozzles calibrated to deliver 40 gallons per acre at 40-60 psi. Ten onions were pulled from the outside rows each of the transplant dip treated plots and from the untreated checks on February 8, and rated for PR and BNR. PR incidence was recorded by examining roots for visible signs of the disease. BNR was rated by processing onions in the same manor as the transplants (above). Onion plots were rated for PB severity on April 17, using a 0-10 scale where 0 is the absence of disease and 10 is 100% of the leaf area infected. Onions were undercut on May 15, 2008 and allowed to field cure for one week before clipping and bagging. Onions were graded and weighed on May 22, and stored in a cold room for two months after which onions were stored at room temperature for one week and evaluated for post harvest rots.

Results and Discussion

Latent infections of BNR were not detected in any of the onion transplants tested in this trial prior to planting or in any of the onions tested on February 8. In early February, however, visible differences between the untreated checks and the fungicide dip treatments with Topsin and Endura were observed, where the fungicide treated plots had markedly more vigor and fewer stand losses than the untreated plots. PR incidence was significantly higher in the untreated checks than the Topsin or Endura dip treatments (Table 2), and stand loss was significantly higher in the variety Sweet Vidalia than Savannah Sweet or Ohoopee Sweet (Table1).

Onion plots in this test had very little foliar disease until early April when PB/SB and Botrytis leaf blight (BLB) were noticed. PB/SB was more severe in Ohoopee Sweet than Sweet Vidalia or Savannah Sweet (Table 1). Also, onions treated with Topsin dips + Topsin foliar sprays had significantly more PB/SB than the other treatments and the untreated check (Table 2). There was no difference in BLB between treatments and the untreated check (data not shown).

Onion yields ranged from 28,000 to 51,000 pounds per acre, and yields were significantly greater in Savannah Sweet than Ohoopee Sweet or Sweet Vidalia (Table 1). The increased yield of Savannah Sweet was probably due to the lack of stand loss caused by PR compared to Sweet Vidalia and the decreased severity of

PB/SB compared to Ohoopee Sweet (table 1). Test plots treated with Endura dips and Endura dips + Pristine foliar sprays out yielded all other treatments and the untreated check, while plots treated with three foliar sprays of Topsin yielded significantly less than the check (Table 2). Endura dip treatments were effective at controlling PR and increasing yields, and Endura seems to have more promise as a transplant dip treatment than Topsin. There were few post harvest rots in any of the treatments, and there were no differences in post harvest rots between treatments and the untreated checks (data not shown).

Table1. Effect of variety on fungal diseases and yield

Variety	Pink Root[1]	Stand Count[2]	PB/SB[3]	Green weights[4]	Marketable Yield[5]
Sweet Vidalia	23	72.1 a[6]	2.4 b	48.8 a	42.1 a
Savannah Sweet	13	78.2 b	2.7 b	62.1 c	57 c
Ohoopee Sweet	11	79.7 b	3.4 a	54.6 b	46 b

[1] Pink root incidence 2/14/08
[2] Number of living plants middle two rows 2/14/08
[3] Purple blotch and Stemphyllium leaf blight severity 4/18/08 0-10 scale where 0= no disease and 10= total leaf area diseased
[4] Weights of onions harvested from middle two rows before drying and grading
[5] Weights of onions harvested from middle two rows after grading
[6] Means in columns with the same letter(s) are not significantly different according to mean separation by Fisher's protected LSD at P<0.05

Table 2. Effect of treatment on fungal diseases and yield

Treatments and Rates	PR[1]	Stand Count[2]	PB/SB[3]	Green Weights[4]	Marketable Yield[5]
Topsin dip 20floz/10gal	0 b[6]	79 b	3.5 b	56.8 c	51 b
Endura dip 2.3oz/10gal	0 b	80 b	2.2 b	65.4 d	58.2 c
Topsin dip 20floz/10gal Topsin Foliar	.	.	4.6 a	51 ab	40.2 a
Endura dip 2.3oz/10gal Pristine Foliar 14.5oz/ac	.	.	1.8 b	65.3 d	57.5 c
Topsin Foliar	.	.	3.2 b	46.6 a	40.6 a
Pristine Foliar 14.5oz/ac	.	.	2 b	49.1 ab	44.4 ab
Untreated	50 a	71 a	2.8 b	52.1 b	46.7 b

[1] Pink root incidence 2/14/08
[2] Number of living plants middle two rows 2/14/08
[3] Purple blotch and Stemphyllium leaf blight severity 4/18/08 0-10 scale where 0= no disease and 10= total leaf area diseased
[4] Weights of onions harvested from middle two rows before drying and grading
[5] Weights of onions harvested from middle two rows after grading
[6] Means in columns with the same letter(s) are not significantly different according to mean separation by Fisher's protected LSD at P<0.05

2008 VIDALIA ONION FUNGICIDE SCREENING TRIAL

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Introduction

Botrytis leaf blight (*Botrytis squamosa*), purple blotch (*Alternaria porri*), and Stemphylium blight (*Stemphylium vesicarium*) are all fungal diseases of onion foliage. These diseases can cause severe losses in years when weather conditions are favorable for disease development. Many fungicides and fungicide spray programs are available to growers for suppressing losses to these diseases, however, new fungicides are constantly becoming available for use and need to be evaluated prior to being labeled. The objective of this research is to further evaluate new and emerging fungicides and compare their efficacy with currently labeled compounds.

Materials and Methods

Six rows of 'Savannah Sweet' onions were transplanted to 6-ft beds (panels) on 11 Dec at the Vidalia Onion and Vegetable Research Center located in Lyons, GA. The fertility program for these onions was consistent with University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with six replications. Fungicide/bactericide treatment plots were 20-ft long and were separated on each side by non-treated border panels. Plot ends were separated by a 3-ft bareground buffer. Fungicide treatments were applied with Lee Spider Spray Trac® calibrated to deliver 40 gal/A at 75-80 psi through TX-18 hollow cone nozzles. Onions were harvested on 13 May by digging the two center rows of each panel and allowing them to field dry until weighed and bagged.

Results and Discussion

Disease pressure was light in 2008 with few foliar diseases causing significant damage until late-April. All fungicide programs significantly reduced the severity of purple blotch by 23 Apr. Rovral and Quadris applied alone or in combination with Actigard showed the greatest suppression of purple blotch as well as the experimental fungicide V-10116 applied with a non-ionic surfactant.

Botrytis leaf blight was significantly suppressed by all treatments by 23 Apr with Rovral and Qudaris applied alone or with Actigard giving the greatest disease reductions. Bravo WeatherStick applied full-season also suppressed Botrytis leaf blight as good or better than the most effective treatments. Yield was overall very variable across treatments with little benefit demonstrated by any treatment other than Pristine applied full-season. No treatments yielded significantly less than the non-treated plots however, demonstrating that none of the fungicides or fungicide programs significantly reduced yield.

Table 1. Effect of fungicides and fungicide programs on foliar diseases of onion and yield.

Treatment, rate/A and spray timing[1]	Purple Blotch[2] 4/23	Botrytis Leaf blight[3] 4/23	Field Yield[4] 5/14
Actigard, 0.75 oz + NIS[5], 0.25% v/v (1-14)	33.3 bc[6]	43.3 b	1000 g
Actigard, 0.75 oz + Rovral, 1.5 pt + NIS, 0.25% v/v (1-14)	11.7 ghi	15.8 fg	1258 ab
Actigard, 0.75 oz + Quadris, 12.3 fl oz + NIS, 0.25% v/v (1-14)	7.5 i	10.0 g	1128 b-g
Actigard, 0.75 oz + Kocide 3000, 1.0 lb + NIS, 0.25% v/v (1-14)	24.2 d-f	26.7 de	1036 fg
Rovral, 1.5 pt + + NIS, 0.25% v/v (1-14)	13.3 g-i	17.5 fg	1158 b-f
Quadris, 12.3 fl oz + NIS, 0.25% v/v (1-14)	10.8 hi	11.7 fg	1246 a-c
Kocide 3000, 1.0 lb + NIS, 0.25% v/v (1-14)	36.7 b	45.0 b	1139 b-f
Kocide 3000, 1.0 lb (1-14)	34.2 b	41.7 bc	1070 e-g
Tanos, 8.0 oz + Manzate, 2.0 lb (1,3,5,7,9,11,13)			
Manzate, 3.0 lb (2,4,6,8,10,12)	38.3 b	46.7 b	1182 a-e
Tanos, 8.0 oz + Kocide 3000, 1.0 lb (1,3,5,7,9,11,13)			
Kocide 3000, 1.0 lb (2,4,6,8,10,12)	38.3 b	48.3 b	1105 d-g
Tanos, 8.0 oz + ManKocide, 2.0 lb (1,3,5,7,9,11,13)			
ManKocide, 2.5 lb (2,4,6,8,10,12)	35.0 b	46.7 b	1124 c-g
V-10116, 3.0 oz (1-14)	38.3 b	48.3 b	1139 b-g
V-10116, 4.0 oz (1-14)	25.0 c-e	33.3 cd	1183 a-e
V-10116, 3.0 oz + NIS, 0.25% v/v (1-14)	15.8 f-i	26.7 de	1156 b-f
Bravo WeatherStik, 1.5 pt (1-14)	20.0 e-g	12.5 fg	1070 d-g
Manzate, 3.0 lb (1-14)	31.7 b-d	48.3 b	1161 b-f
Pristine, 14.5 oz (1-14)	20.0 e-g	19.2 ef	1312 a

Pristine, 14.5 oz (1,3,5) Rovral, 1.5 pt (7,9,11) Bravo WeatherStik, 1.5 pt (2,4,6,8,10,12,13)	17.5 e-h	28.3 d	1203 a-d
Non-treated	51.7 a	58.3 a	1098 d-g

[1]Spray dates are as follows: 1 = Jan 15th, 2 = Jan 24th, 3 = Jan 30th, 4 = Feb 7th, 5 = Feb 14th, 6 = Feb 20th, 7 = Feb 28th, 8 = Mar 6th, 9 = Mar 13th, 10 = Mar 21st, 11 = Mar 27th, 12 = Apr 2nd, 13 = Apr 9th, 14 = Apr 17th.
[2]Percentage (1-100) of the leaf area affected by *Alternaria porri.*
[3]Percentage (1-100) of the leaf area affected by *Botrytis squamosa*.
[4]Yield in 40 lb bags per acre on 13 May.
[5]NIS=non-ionic surfactant.
[6]Means followed by the same letter(s) are not significantly different according to Fisher's LSD test at ($P<0.05$).

ANNUAL REPORT OF THE VIDALIA ONION RESEARCH LABORATORY
UNIVERSITY OF GEORGIA - TIFTON CAMPUS

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Introduction

Another stage in the evolution of the Vidalia Onion Research Laboratory has begun with the completion of renovations and additions that started in 2007. Now under one roof, lab equipment is no longer divided between two distant labs. Also, additional lab, warehouse, and office space was made. This report was created to present the changes as well as the post harvest activities and cold storage usage at the Onion lab.

Results and Discussion

The main focus of the renovations was the labs. The main lab was repainted, refurnished, redesigned, and resealed. New equipment such as an HPLC, high speed centrifuge, filtered PCR enclosure, real-time PCR system, gel imager, spectrophotometer, -80EF freezer, and water filtration system was also installed. Thus far, this new equipment has been used to investigate chemical effects on ripening of tomatoes and peaches, and identify antioxidants in pomegranate juice. In addition to the main lab, a shared lab was created for sample evaluation in an air-conditioned space.

Two additional offices were built bringing the total number to six. These offices were needed to house additional horticulture staff members who now call the Onion lab home. On the warehouse floor, more work stations were created to meet specific needs, such as sample weighing, grading, and storage. Also, more space was dedicated for the use of the ovens, mill grinder, and furnace. This added space for the drying ovens now make drive-up load and unloading possible.

Post harvest activities continue to increase. The shared lab was utilized to weigh and evaluate crops ranging from strawberries, blueberries, and camellias to corn, bell pepper, cantaloupe, and watermelon. The sizer and grading line were kept active with tomatoes and onions. The work stations were well used evaluating crops such as tomatillo, tomatoes, bell peppers, watermelons, cantaloupes, basil, squash, pumpkins, green beans, and onions.

Cold storage and controlled atmosphere, CA, facilities at the Onion lab continue to be in great demand (see Tables 1 and 2). Of the fourteen CA rooms available, eleven were used for CA and three for cold storage. All of the cold storage coolers, especially the large drive-in cooler, were used.

Table 1. List of experiments requiring CA.

Researcher(s)	Crop	Experiment(s)	No. of Rooms Used	Storage Specifications	Duration
Boyhan Torrance	Onion	Variety Trial No Spray Storage Intervals	4 2 1	34EF+70% RH 3% O_2+5% CO_2+92% N_2	4 Months 4 Months 2 & 3 Months
Boyhan Krewer	Pumpkin	Storage	1	50EF+60% RH 3% O_2+5% CO_2+92% N_2	3 Months
MacLean	Onion	Sulfur Dioxide Treatment	1	34EF+70% RH 3% O_2+5% CO_2+92% N_2	3 Months
Langston Sanders	Onion	Fungicide	1	34EF+70% RH 3% O_2+5% CO_2+92% N_2	4 Months

Table 2. Cold storage users and usage.

Researcher(s)	Crop(s)	Storage Specifications	Duration
MacLean	Onion	34EF+70% RH	3 Months
	Blueberry	34EF+80% RH	4 Months
	Tomato	55EF+80% RH	2 Months
	Pear	33EF+90% RH	4 Months
	Muscadine	34EF+80% RH	3 Months
	Peach	54EF+80% RH	2 Months
	Pomegranate	41EF+90% RH	2 Months
	Apple	41EF+90% RH	3 Months
	Banana	60EF+90% RH	<1 Month
Boyhan	Onion	34EF+70% RH	1 Month
Torrance		34EF+70% RH	4 Months
Langston	Onion	34EF+70% RH	1 & 2 Months
Sanders		36EF+≥80% RH	4 Months
Riner	Onion	34EF+70% RH	3 Months
Johnson	Onion	34EF+70% RH	3 Months
Li	Onion	36EF+≥80% RH	6 Months
	Blueberry	38EF	4 Months
Riley	Onion	36EF+≥80% RH	4 Months
	Bell Pepper	36EF+≥80% RH	3 Months
	Tomato	36EF+≥80% RH	<1 Month
Diaz	Tomato	36EF+≥80% RH	<1 Month
	Bell Pepper	36EF+≥80% RH	<1 Month
	Various Vegetable Seed	45EF+50% RH	12 Months
Kelley	Cantaloupe	36EF+≥80% RH	<1 Month
Hawkins	Onion	36EF+≥80% RH	4 Months
Mayfield	Corn	36EF+≥80% RH	3 Months
Ruter	Camellia Seed	44EF	10 Months
	Lorepetlum	44EF	< 1 Month
	Callicarpa	44EF	< 1 Month
Conner	Pecan	34EF+70% RH	12 Months
Wells	Crimson Clover Seed	45EF+50% RH	12 Months

SHORT-DAY ONION VARIETY TRIAL, 2008

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Introduction

As part of an ongoing assessment of existing and new onion varieties, the University of Georgia conducts onion trials each year. These trials assess yield and bulb characteristics along with response to insect and disease pressure when conditions permit.

Information from these trials is used in part to determine suitability of a particular variety for use as a Vidalia onion variety. Recommendations, however, are ultimately made by the Georgia Department of Agriculture.

Materials and Methods

There were 68 varieties in the trial in the 2007-08 season. Plantbeds were sown on 19 Sept. 2007 in high density plantings of 60 seed/linear foot. Plantbeds were grown according to University of Georgia Cooperative Extension Service recommendations for plantbed onions (Boyhan and Kelley, 2007).

Onions were transplanted on 26-27 Nov. 2007 to their final spacing of four rows on a prepared bed with 6 ft. between beds. Between-row spacing was 12 inches with a 5.5 inch in-row spacing. Plants were grown according to University of Georgia Cooperative Extension Service recommendations for weed, disease, and insect control, as well as overall fertility (Boyhan and Kelley, 2007).

The experiment was a randomized complete block design with four replications. Each plot was 25 feet long with a 5 ft in-row alley. Each plot was harvested when deemed mature for that variety. Onions were pulled and laid on the ground for two days prior to clipping the tops and roots from the bulbs. The

bulbs were immediately weighed to determine total yield.

The first and second harvest were heat cured for 24-48 hours at 95 deg. F. with all subsequent harvests field cured only. Onions were then graded into colossal (>4 in.), jumbo (>3 & <4 in.), and medium (>2 & <3 in.) sizes. Cull onions included damaged, diseased or onions below 2 inches in size. All three weight classes were weighed and results recorded.

Approximately 50 lbs of onions were transported to the Vidalia Onion Research Laboratory in Tifton, Georgia for controlled atmosphere storage (5% CO_2, 3% O_2, at 70% relative humidity and 34°F), which will be evaluated later this year. A 25-bulb sample was sent to National Onion Labs in Collins, Georgia to determine pungency using a pyruvate test as developed by Schwimmer and Weston (1961) and modified by Randle and Bussard (1993). In addition, they recorded soluble solids or percent sugar content.

Results and Discussion

There were very few seedstems or doubles this year so neither were recorded. This was the second year where an appreciable number of red varieties were entered in the trial so that a better understanding of the potential for these types of onions can be assessed. This is by far the largest trial held to date with 68 entries evaluated. This compares to 49 entries the previous year. The 68 varieties represent 12 different seed companies, which is also a record. We had our grading equipment upgraded at the end of the 2007 season so that grade classes of medium, jumbo, and colossal could be weighed.

The fertility program used this year involved 10-10-10 and 15.5-0-0, which supplied 112N-50P-50K. This was not enough fertilizer. Research has shown that 125-150 lbs/acre nitrogen is required for onion production and there is evidence that even greater amounts of nitrogen can have positive effects on yield. High applications of phosphorus are unwarranted with onions. Phosphorus can be limiting during cool weather and is often applied as a 'pop-up' in liquid form during spring transplanting in other crops. High phosphorus applications to onions certainly increases top size and produces greener color in the leaves, but this has not translated into higher yields. In addition, potassium has been shown to be only weakly associated with onion yield. A better approach to fertilization would be to preplant incorporate 400-500 lbs/acre of 10-10-10 with 12% sulfur. This would supply 40-50 lbs of N-P-K, which should be very close to the sufficiency range for phosphorus. Most cultivated soils in south Georgia test high (61-100 lbs/acre) or very high (100+ lbs/acre) for phosphorus and under such conditions phosphorus recommendations for onions are 60 and 30 lbs/acre, respectively. If additional phosphorus is required, applications of diammonium phosphate, superphosphate, or one of several other sources of phosphorus can be used, but application rates of 100 or more lbs/acre is unwarranted on most cultivated soils. Additional potassium, as recommended by the

soil test, can be supplied as potassium chloride, potassium magnesium sulfate, or potassium nitrate to name a few sources. Remember that potassium magnesium sulfate will also supply additional sulfur so this should be applied early or perhaps not at all on heavier soils since sulfur is known to increase onion pungency. Potassium nitrate can be a relatively lightweight material so application should not be attempted during windy conditions.

In the 2006-07 season, onions were harvested during a 9 day period. This was done to minimize late season bacterial disease problems, which it did, but may have given a skewed view of onion variety potential. This season we have gone back to harvesting onions over a longer period (27 days) reflecting more closely the actual harvest window. This did result in greater problems with sour skin late in the season. This is reflected in the percent marketable onions of 70% for onions harvested on or before 5 May 2008 and 54% marketable for onions harvested on 12 May 2008 or after.

All of the onions harvested on 29 April 2008 were destroyed when a dryer malfunctioned. These onions were cooked when the dryer did not cycle off as it normally would under thermostatic control, consequently no graded yield or postharvest testing could be measured.

The total yield ranged from 518-1,130 50-lb bags/acre with an average of 786 50-lb bags/acre. This was slightly down from the previous season, which averaged 796 50-lb bags/acre. Colossal yields ranged from 21-285 50-lb bags/acre, jumbo yields ranged from 118-500 50-lb bags/acre, and medium yields ranged from 14-99 50-lb bags/acre. Finally, percent marketable onions ranged from 27-90% with an average of 61%.

'Century', 'XP 07956013', 'NUN 1003', 'XP 07552015', 'XP 07952011', 'XP 07956019', and 'Miss Megan' all had total yields greater than 1,000 50-lb bags/acre. Evaluating the varieties for total marketable yield, 'Sapelo Sweet' had the highest yield with 723 50-lb/acre bags across all size classes (colossal, jumbo, & mediums). This does not differ statistically from 'J 3003', which had a combined yield of 553 50-lb bags/acre. It is interesting to note that none of the varieties with the best total yield were among the best for total graded yield. This reflects in part that three of the over 1,000 50-lb bags/acre varieties were harvested on 29 April 2008 when no graded yield data could be collected. It also reflects relatively low percent marketable onions among others in this category that may have been affected by late season bacterial diseases.

Some of the varieties with the best percent marketable yields had below average total yields. Of the varieties with 80% or better marketable yields the average total yield was 663 50-lb bags/acre, which is more than 100 50-lb bags/acre lower than the average overall. All of the varieties with 80% or greater marketable yields were harvested on 5 May 2008. This year it is impossible to assess the early varieties because so many were lost, but the mid-season varieties certainly did better than late season for marketable yield. Onions will continue to increase in size with

tops down resulting in greater yield, but also increasing the likelihood late season bacterial diseases such as sour skin getting a foothold. In our experience there is a three week window to harvest all the onions from the time the first early variety is harvested to when the harvest should be complete. The harvest maturity appears to span approximately four weeks, but late varieties harvested in the final week are the most prone to disease problems. Most of these late harvested onions would be disposed of under normal commercial operations.

There were 16 red varieties in the trial including two intermediate-day varieties. In general the red varieties matured later and had a lower average total yield compared to the onions in general. In the past, red varieties that were evaluated tended to have poor shape with many exhibiting a torpedo shape (vertical axis longer than horizontal axis). The onions evaluated in recent seasons (2006-07 & 2007-08) have exhibited a traditional Granex shape. Although we don't have taste tests to compare these varieties with traditional yellow Granex types, their pyruvate analysis and sugar content has been comparable. After next season's variety trial, it may be time for the Vidalia Onion Committee to seriously consider opening the marketing order to red onions.

There was only one white variety in the trial, XON-565W from Sakata. The total yield was lower than the overall average, but it did have a high percentage of marketable onions after grading. We will need to conduct more extensive tests with white onion before drawing any conclusions about including them as Vidalia onions. Certainly from a marketing standpoint including reds and whites could help Vidalia onions expand into other markets.

The intermediate-day onions had an unusual growth habit compared to the short-day onions. Total yields were lower for these varieties compared to the trial overall. They were of course harvested on the last harvest date and would be judged immature based on the stiffness in the necks. Intermediate-day onions may become a source of revenue for growers wishing to grow such transplants for onion producing regions further north.

In conclusion, the trial went relatively smoothly this year with a few glitches, most notably the dryer malfunction. Because of the number of varieties involved, we are probably near the upper limit on what can be reasonably handled at the farm. Changes this season include two sowing and transplanting dates and the reds and whites are going to be split out into a separate trial.

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Table 1. Vidalia Onion Variety Trial, 2008.

No.	Entry	Company	Onion type	Harvest date	Yield				Marketable (%)	Pungency (um /gfw)	Sugar (%)
					Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)			
					(50-lb bags/acre)						
1	J 3001	Bejo Seed	Yellow	5/12/08	745	106	305	47	61%	3.5	8.9
2	J 3002	Bejo Seed	Yellow	5/12/08	532	21	184	75	53%	3.9	9.9
3	J 3003	Bejo Seed	Yellow	5/12/08	980	161	354	38	56%	3.2	9.9
4	J 3004	Bejo Seed	Red	5/5/08	812	98	496	57	80%	3.1	10.7
5	J 3005	Bejo Seed	Yellow	5/12/08	725	91	410	59	77%	2.3	9.3
6	Georgia Boy	D. Palmer	Yellow	5/5/08	646	60	389	87	83%	3.2	11.1
7	Miss Megan	D. Palmer	Yellow	5/20/08	1,006	285	206	28	52%	3.3	9.9
8	Mr. Buck	D. Palmer	Yellow	5/12/08	989	188	354	39	59%	2.9	9.6
9	Ohoopee Sweet	D. Palmer	Yellow	5/12/08	721	65	224	42	46%	4.1	10.9
10	Pinot Rouge	D. Palmer	Red	5/12/08	566	29	261	89	67%	3.5	12.3
11	Sapelo Sweet	D. Palmer	Yellow	5/5/08	968	189	500	34	75%	3.3	10.8
12	RGH-705700	Dessert	Red	5/20/08	799	107	237	38	48%	2.8	9.9
13	RGH-707700	Dessert	Red	5/20/08	749	100	303	49	60%	3.4	9.7
14	RGH-707704	Dessert	Red	5/5/08	548	34	332	99	85%	2.9	11.7

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No.	Entry	Company	Onion type	Harvest date	Yield				Marketable (%)	Pungency (um /gfw)	Sugar (%)
					Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)			
					(50-lb bags/acre)						
15	YGH-105101	Dessert	Yellow	5/5/08	797	127	450	62	80%	3.0	10.4
16	YGH-108101	Dessert	Yellow	5/12/08	793	74	319	58	57%	3.1	9.6
17	YGH-114101	Dessert	Yellow	5/12/08	809	80	250	30	45%	3.1	9.8
18	YGH-15082	Dessert	Yellow	5/5/08	614	34	347	74	74%	2.9	10.9
19	YGH-15085	Dessert	Yellow	5/20/08	826	90	196	34	39%	3.1	8.9
20	YGH-15094	Dessert	Yellow	5/12/08	719	35	239	65	47%	3.2	9.4
21	HSX-8044R	Hortag Seed	Red	5/12/08	709	133	355	44	75%	3.1	10.4
22	Caramelo (1000)	Nunhems	Yellow	5/5/08	784	170	404	47	79%	3.2	10.2
23	Lambada (3004)	Nunhems	Red	5/12/08	763	52	357	36	58%	3.8	11.6
24	Mata Hari	Nunhems	Red	5/20/08	891	145	399	43	66%	4.9	10.2
25	Nirvana	Nunhems	Yellow	5/5/08	661	64	357	52	72%	3.3	9.9
26	NUN 1002	Nunhems	Yellow	4/29/08	959	-	-	-	-	-	-
27	NUN 1003	Nunhems	Yellow	4/29/08	1,070	-	-	-	-	-	-

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No.	Entry	Company	Onion type	Harvest date	Yield				Marketable (%)	Pungency (um /gfw)	Sugar (%)
					Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)			
					(50-lb bags/acre)						
28	NUN 1004	Nunhems	Yellow	4/29/08	844	-	-	-	-	-	-
29	NUN 1005	Nunhems	Yellow	5/5/08	821	109	313	38	56%	2.4	9.1
30	NUN 1006	Nunhems	Yellow	5/12/08	781	107	286	43	56%	2.8	10.2
31	NUN 3001	Nunhems	Yellow	5/12/08	817	42	447	36	64%	4.2	11.4
32	NUN 3006	Nunhems	Yellow	5/20/08	821	133	425	46	74%	3.9	8.8
33	Sweet Caroline	Nunhems	Yellow	5/5/08	901	132	354	45	59%	3.7	10.2
34	Sweet Vidalia	Nunhems	Yellow	5/5/08	891	169	342	48	63%	4.2	10.2
35	Sweet Harvest	Sakata	Yellow	5/5/08	970	184	294	43	54%	3.8	10.3
36	Sweet Jasper	Sakata	Yellow	5/5/08	851	113	425	24	66%	3.7	10.9
37	XON 780R	Sakata	Red	5/5/08	531	38	353	85	90%	3.0	10.8
38	XON-403Y	Sakata	Yellow	5/5/08	775	150	306	59	66%	3.2	10.0
39	XON-408Y	Sakata	Yellow	5/5/08	838	116	295	55	56%	2.7	11.2
40	XON-565W	Sakata	White	5/5/08	518	52	287	97	84%	3.6	12.4
41	Century	Seminis	Yellow	5/20/08	1,130	238	236	24	44%	3.2	9.5

Table 1. Vidalia Onion Variety Trial, 2008.

No.	Entry	Company	Onion type	Harvest date	Yield (50-lb bags/acre) Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)	Marketable (%)	Pungency (um /gfw)	Sugar (%)
42	Golden Eye	Seminis	Yellow	5/5/08	838	121	428	62	73%	3.2	10.7
43	Granex 33	Seminis	Yellow	5/5/08	543	27	266	82	69%	3.6	10.1
44	Granex Yellow PRR	Seminis	Yellow	-	-	-	-	-	-	-	-
45	Linda Vista	Seminis	Yellow	5/20/08	640	37	118	21	27%	3.7	9.1
46	Savannah Sweet	Seminis	Yellow	5/5/08	791	149	469	63	86%	2.8	9.2
47	XP Red (XP 07597000)	Seminis	Red	5/20/08	707	79	187	47	44%	3.2	10.6
48	Honeybee F1	Shamrock	Yellow	4/29/08	896	-	-	-	-	2.6	8.8
49	SSC 1535 F1	Shamrock	Yellow	4/29/08	602	-	-	-	-	-	-
50	Sugar Belle F1	Shamrock	Yellow	5/5/08	609	99	278	63	72%	3.4	10.1
51	Sweet Deal F1	Shamrock	Yellow	4/29/08	864	-	-	-		2.5	8.6
52	Candy Ann	Solar Seed	Yellow	4/23/08	739	131	288	38	62%	2.7	9.3
53	Candy Kim	Solar Seed	Yellow	4/24/08	665	47	360	49	69%	2.5	9.1
54	FDI 201	Tanimura &	Red	5/20/08	697	143	256	39	63%	3.5	10.2

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No.	Entry	Company	Onion type	Harvest date	Yield (50-lb bags/acre) Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)	Marketable (%)	Pungency (um /gfw)	Sugar (%)
		Antle	Interm.								
55	FDI 206	Tanimura & Antle	Red Interm.	5/20/08	544	39	166	79	52%	4.1	10.9
56	FDS 103	Tanimura & Antle	Red	5/5/08	605	43	348	83	78%	3.0	10.7
57	FDS 108	Tanimura & Antle	Red	5/20/08	840	152	330	35	62%	3.0	9.9
58	WI-129	Wannamaker	Yellow	4/29/08	812	-	-	-	-	2.5	8.8
59	WI-131	Wannamaker	Yellow	4/29/08	936	-	-	-	-	-	-
60	XP 07956019	Seminis	Yellow	4/29/08	1,012	-	-	-	-	2.5	9.2
61	XP 07956013	Seminis	Yellow	4/29/08	1,089	-	-	-	-	-	-
62	XP 07552015	Seminis	Yellow	5/5/08	1,032	197	247	14	44%	2.4	9.2
63	XP 07952011	Seminis	Yellow	5/5/08	1,025	115	234	18	36%	2.8	9.8
64	DPXLLC 07-1431	DP Seeds	Yellow	5/20/08	686	43	189	34	39%	3.2	8.6
65	DPXLLC 07-	DP Seeds	Red	5/20/08	616	36	234	38	50%	3.0	9.8

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					Total	Colossal (≥4 in.)	Jumbo (≥3 & <4 in.)	Medium (≥2 & ≤3 in.)			
					(50-lb bags/acre)						
	3067										
66	DPXLLC 07-3066	DP Seeds	Red	5/20/08	883	70	185	31	32%	3.0	10.0
67	DPXLLC 07-1429	DP Seeds	Yellow	5/5/08	674	86	371	76	79%	3.3	11.1
68	DPXLLC 07-1432	DP Seeds	Yellow	5/20/08	703	86	142	31	37%	3.5	9.1
69	DPXLLC 07-1430	DP Seeds	Yellow	5/5/08	716	71	350	60	67%	3.0	11.0
			Coefficient of Variation		***18%***	***61%***	***24%***	***41%***		***10%***	***4%***
			Fisher's Protected LSD with Bonferroni adj. for 5 comparisons (p≤0.05)		***232***	***103***	***124***	***34***		***0.5***	***0.7***

VIDALIA ONION NO-SPRAY TRIAL, 2008

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Introduction

Beginning in the 2005-06 season, a selection of varieties was chosen to grow in a trial without the use of any pesticides to assess their disease resistance (Boyhan et al., 2006). This was continued in the 2006-07 season (Boyhan et al., 2007). Varietal differences were discernable in both the 2005-06 and 2006-07 seasons. Interestingly, onion plants in the no-spray trial in 2006-07 had fewer foliar blemishes than onions in the regular variety trial, but when these varieties were removed from controlled atmosphere storage, the unsprayed onions had much lower percent marketable onions compared to the same varieties in the conventional variety trial.

The no-spray trial in 2007-08 was initially setup to evaluate onions sprayed conventionally to unsprayed onions and onions that were sprayed at the end of the season. Due to a miscommunication, the trial only evaluates unsprayed onions to onions sprayed twice at the end of the season.

Materials and Methods

Conventionally produced 8-week-old onion transplants were transplanted on 27 Nov. 2007 to their final spacing of 5.5 inches in-row and 12 inches between-row on beds formed on 6-ft centers. Onions were grown according to University of Georgia Cooperative Extension Service recommendations (Boyhan and Kelley, 2007).

The experimental design was a split-plot experiment with sprayed

versus no-spray as the main plot effect and the subplot effect varieties. The experiment was arranged to facilitate spraying with four replications. Onion fertility, weed control, and irrigation followed University of Georgia Cooperative Extension service recommendations for dry bulb onion production (Boyhan and Kelley, 2007).

The main plots consisted of an unsprayed treatment and treatments sprayed with one application of Pristine fungicide on 18 March 2008 at 18 oz/acre.

Onions were harvested when judged mature for a particular variety. Harvested onions were field cured for a minimum of two days, had their tops and roots removed and immediately weighed. Onions were then graded into colossal, jumbo, and medium size classes.

Results and Discussion

There were no differences in total or graded yields based on whether or not fungicides were used. There were, however, significant differences between varieties. The highest yielding variety was 'WI-129' with 833 50-lb bags/acre, which was significantly greater than 'Golden Eye' with 639 50-lb bags/acre. 'Century' had the highest yielding total of colossal (≥ 4 inches) onions with 159 50-lb bags/acre, which was significantly greater than all other varieties. 'Savannah Sweet' had the greatest amount of jumbo (≥3 & <4 inches) onions and differed significantly from 'Golden Eye'. The greatest yield of medium (≥2 & <3 inches) sized onions was with 'Pinot Rouge' with 112 50-lb bags/acre, which was greater than all other varieties.

The percent marketable onions was highest with 'Sweet Vidalia' at 83%, which did not differ from any other variety except 'Ohoopee Sweet'. There was no graded yield data collected for 'WI-129' because of a malfunction with a dryer that destroyed these onions during curing.

In previous experiments evaluating onions without fungicides, there were differences between the varieties, but no direct comparison were made with fungicide sprayed onions (Boyhan et al., 2007). In this study, there were suppose to be three treatments involving fungicide sprays. One was without fungicides, one with the normal fungicide applications, and one with fungicide application right before harvest. Unfortunately, due to a miscommunication, the routine fungicide applications were not done, but the end of season spray was evaluated. The fact there were no differences between fungicide treated and untreated onion is not surprising because such results have been seen previously (Langston Jr., 2003; Seebold et al., 2004) and do suggest that fungicide applications are being overused.

Interestingly, in the 2006-07 season the no-spray trial coming out of storage showed much lower percent marketable onions compared to the standard variety trial (Boyhan et al., 2007). No direct comparison

between experiments could be made, however, so it will be interesting to see how the onions in the no-spray trial will respond this year when removed from controlled atmosphere storage.

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Table 1. No spray experimental results, 2007-08.

Variety	Harvest date	Total yield	Colossals (≥4 in.)	Jumbos (≥3 - <4 in.)	Mediums (≥2 - <3 in.)	Marketable
		(50-lb bags/acre)				(%)
Pinot Rouge	5/14/08	447	10	194	112	71%
Georgia Boy	5/14/08	589	39	256	76	63%
Ohoopee Sweet	5/14/08	567	29	197	86	55%
Sweet Vidalia	5/8/08	605	102	325	74	83%
WI-129	5/1/08	833	-	-	-	-
Sugar Belle	5/8/08	471	37	220	77	71%
Golden Eye	5/8/08	639	73	309	70	71%
Century	5/22/08	810	159	325	56	67%
Savannah Sweet	5/14/08	759	86	411	58	73%
Spray treatment						
No fungicides		650	66	283	77	66%
End of season fungicides		612	66	272	74	67%
Probabilities						
Variety		0.000	0.000	0.000	0.000	0.002
Spray treatment		0.292	0.958	0.383	0.448	0.452
Variety x Spray treatment		0.318	0.750	0.223	0.761	0.191
Fisher's Protected LSD (*P*=0.05) for varieties		141	48	91	24	24%

EVALUATION OF CULTURAL PRACTICES AND VARIETIES' EFFECT ON BACTERIAL ONION DISEASES

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Introduction

Late season bacterial diseases such as sour skin have been a serious problem in onion production. Delayed harvest and late maturing varieties are prone to these diseases, which render the varieties unmarketable.

This experiment was setup to determine differences in late season bacterial disease incidence as affected by variety selection, harvest date, fumigation, and type of irrigation (overhead versus drip).

Materials and Methods

The experimental design was a split-split plot design with four replications. Eight-week-old onion seedlings were transplanted on 20 Dec. 2007 to their final spacing of 5.5 inches in-row and 12 inches between-row. The experimental unit or plot size consisted of 30 ft of planted bed of which 15 ft was harvested when varieties were judged mature and 15 ft was harvested late.

The main plot effect was fumigation with metam-sodiium (Vapam), which was applied in late August. The subplots consisted of three different varieties, Savannah Sweet, WI-129, and Ohoopee Sweet. The sub-subplots consisted of harvest dates. Onions were harvested when judged mature for the specific variety, which was 1 May 2008 for 'WI-129', 9 May 2008 for 'Ohoopee Sweet', and 20 May 2008 for 'Savannah Sweet'. In addition, these varieties were harvested late on 10 June 2008.

Harvested onions were graded into size classes of medium (≥2 and <3 inches), jumbos (≥3 and <4 inches), and colossals (≥4 inches). Onions were culled that were undersized, damaged, diseased, or severely misshapened.

Results and Discussion

There were no differences in total yield based on variety, harvest date, or fumigation (Table 1). There was a significant difference in harvested colossal onions based on harvest date with the later harvested onions having more colossal onions. Varieties were marginally significant at 0.057 probability with 'Savannah Sweet' having more colossal onions then either 'WI-129' or 'Ohoopee Sweet'. There were no fumigation or interaction effects with colossal onions. Later harvested onions also had significantly more jumbo sized onions then those onions harvested at variety maturity. There were no differences based on variety or fumigation and there were no interaction effects. Finally, there were significant differences with medium onions for varieties and harvest date. 'Ohoopee Sweet' had more medium onions then either of the other two varieties. In addition, onions harvested at maturity had more medium sized bulbs compared to the late harvested varieties. Fumigation as well as interactions were not a factor in harvested medium onions.

This experiment was also to include overhead versus drip irrigation as treatments, but the farm drip irrigation system was not installed in time. It was hypothesized for this experiment that drip irrigation might reduce the incidence of late season bacterial diseases compared to overhead irrigation. Of course nothing can be done about rain, but during onion harvest conditions are traditionally dry.

The effect of metam-sodium (Vapam) fumigation on increasing yield is well known (Sumner et al., 1997). The lack of fumigation effect in this case is not surprising because the fumigation was done in August, which was four months prior to transplanting. Normally fumigation with metam-sodium would be done three weeks prior to planting.

The increase in yield with later harvested onions is not surprising as this has been shown to be the case in previous studies if late season bacterial diseases don't infect the onions (Boyhan et al., 2004). When onions are infected with these diseases there will be a dramatic drop in the percent marketable onions as many bulbs are culled in the grading process (Boyhan et al., 2007).

In conclusion this experiment as with last year's experiment did not show any beneficial effect of the factors measured for the control of late season bacterial disease. A more carefully conducted experiment with soil fumigation closer to the time of transplanting and the inclusion of a properly installed and operated drip irrigation system may shed some light on controlling this problem.

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Table 1. Effect of variety, harvest date, and fumigation on yield and graded yield of short-day onions.

Varieties	Total yield	Colossal	Jumbos	Mediums
	(50-lb bags/acre)			
Savannah Sweet	475	61	275	83
WI-129	437	34	218	86
Ohoopee Sweet	434	29	217	110
Harvest date				
At maturity	416	20	205	137
Post-maturity	461	65	268	47
Soil fumigation				
Vapam	441	41	226	98
No vapam	446	43	247	88
Probabilities				
Varieties	0.948	0.057	0.178	0.002
Harvest date	0.287	0.000	0.030	0.000
Soil fumigation	0.765	0.803	0.568	0.368
Variety x Harvest date x Soil fumigation	0.508	0.119	0.970	0.585
Varieties x harvest date	0.376	0.142	0.290	0.045
Varieties x Soil fumigation	0.639	0.256	0.513	0.335
Harvest date x Soil fumigation	0.975	0.359	0.427	0.335

EVALUATION OF SURROUND (KAOLIN CLAY) ON ONIONS

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Introduction

Surround (Engelhard Corp., Iselin, NJ) is a 95% kaolin clay product that according to its label can be used to suppress a number of insects including thrips, aphids, and a number of others. It is also used to reduce sunscald on fruit such as watermelons. There are both rain fast and non-rain fast formulations of the product.

Onions are usually harvested and field cured for several days where the onions are allowed to lay on top of the ground and dry down. If there is a delay in gathering these onions there is the potential for sunscald where the outer scales turn dark and the outer rings soften rendering the bulb unmarketable. With the production of more red onions, they are particularly prone to sunscald with exposed areas turning gray with extended exposure to sunlight.

This preliminary evaluation looked at the feasibility of application and potential to reduce sunscald incidence.

Materials and Methods

This experiment was not initiated until after all the onions had been transplanted at the farm therefore a section of border row onions were used. These onions were not identified as to variety. The experiment was a randomized complete block design with four replications. The experimental unit was 30 ft. of planted bed. Onions were planted on beds in four rows with 12 inches between-rows and 5.5 inches in-row with beds formed on 6-ft centers. There were two treatments one with Surround and one without. They were grown according to University of Georgia Cooperative Extension Service recommendations (Boyhan and Kelley, 2007).

These onions were undercut and laid on the soil surface on 5 May 2008. Non-rain fast Surround was applied on 7 May 2008 with a pump up backpack sprayer (Solo Backpack Sprayer, Newport News, VA) to runoff. The application rate was the equivalent of 50 lbs/acre in 100 gallons of water. Because of overhead irrigation and rain events the

Surround had to be reapplied twice on 12 and 22 May 2008.

Onions had their tops and roots removed, weighed, graded, and had graded weights recorded on 10 June 2008. Onion grades included mediums (≥2 and <3 inches), jumbos (≥3 inches and <4 inches), and colossals (>4 inches). The percent marketable onions is the sum of all graded onions divided by the total weight. The percent marketable onions were transformed with x^3 where x represents the data points to normalize the distribution.

Results and Discussion

There were no differences in total or graded yields between treated and untreated onions (Table 1). There was a slight difference in percent marketable onions with the untreated onions having a slightly greater amount of marketable onions. This was primarily due to an anomaly with transformed data that suggests a greater degree of precision then is probably in the data.

No assessment of individual onions for sunscald injury was done in this trial. The Surround treatment, at least, did not cause any adverse effect on the onions. Figures 1 and 2 show the product on onions after the material has dried. Coverage was very good at the suggested rate. In another study on onions it was found to have an affect on reducing sunscald on red onions (Geary et al., 2003). The rate in this related study was at 25 lbs/acre in 30 gallons of water.

The product used in this study was the non-rain fast formulation, which required reapplication after rain or irrigation events. Reapplication would be costly in an on-farm situation. The rain fast material, which was applied on watermelons later that summer, persisted on the fruit. This may be a problem postharvest as this would be of concern at the retail level. The onions, however, are brushed in the grading process, which should remove most of this residue.

Plans are underway to conduct a more extensive assessment of Surround on onions this spring with applications to yellow, white, and red onions. In conclusion, it is too early to make any recommendations concerning this product.

Literature Cited

Boyhan, G.E. & W.T. Kelley (eds.). 2007. Onion production guide. Univ. of Ga. Coop. Ext. Serv. Bul. 1198.

Geary, B., D. Beck, and M. Thornton. 2003. Evaluation of Surround treatments on storage onions - 2003. Univ. of Idaho Internal Rpt. 2003-2:1-5.

Table 1. Yield results of Surround applied onions.

Entry	Total yield	Colossal	Jumbo	Mediums	Marketable
	(50-lb bags/acre)				(%)
No Surround	623	107	353	102	90%
Surround	682	126	341	92	82%
Probability	0.485	0.694	0.477	0.353	0.038
Coefficient of Variation	16%	53%	6%	13%	10%

Figure 1. Onions after Surround application, which has been allowed to dry.

Figure 2. Close-up of onions showing both Surround treated and untreated bulbs.

EVALUATION OF FERTILITY PROGRAMS IN ONION PRODUCTION

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Introduction

The evaluation of fertility programs for onions has been an ongoing endeavor at the Vidalia Onion and Vegetable Research Center. Fertilizer companies are interested in assessing their products and fertility programs in general. Again this year a fertility experiment was conducted.

Nitrogen, phosphorus, and potassium fertilizer requirements has been worked out for onions (Boyhan et al., 2007). This has resulted in reducing the recommendation of both phosphorus and potassium to be inline with soil nutrient status for these elements. The University of Georgia soil test recommendations for dry bulb onions have been changed to reflect this new information.

The objective of this experiment was to assess proposed fertility programs and products from several companies to current recommended standards.

Materials and Methods

Variety Century seedlings were transplanted to their final spacing of 12 inches between-row and 5.5 inches in-row on 3 Dec. 2007. Each experimental unit consisted of four rows planted on beds prepared on 6-ft centers. Each experimental unit or plot was 25 ft long. Treatments were applied by hand on the indicated dates. The experiment was arranged in a randomized complete block design with four replications. Table 1 lists details about each treatment, which are numbered 1-21. The material, amount per acre, date of application and amount of N, P, K, and S applied per acre are listed. Leaf samples were collected from each experimental unit on 25 Feb. 2008 and sent to the University of Georgia Soil Test Lab for a full suite analyses.

Treatments 12-15 had liquid fertilizer foliar applied in addition to the granular material applied. The dates of application are listed in the left hand column for these treatments. Treatments 18-20 had some materials applied that did not supply N, P, K, or S or the rate was so low as to be

negligible therefore there is nothing listed in those columns.

Results and Discussion

Treatment 16, which included GP-G54 (11-0-0) from Georgia Pacific had the highest total yield at 1,184 50-lbs/acre (Table 2). This was significantly greater than treatment 19 with HM0744 from Helena Chemical.

The highest colossal yield was with treatment 2 with 467 50-lb bags/acre, which was greater then treatment 19, which had 227 50-lb bags/acre. Treatment 2 also had the greatest jumbo yields at 343 50-lb bags/acre, which did not differ from most of the treatments with the exception of treatments 4, 5, 9, and 10. The greatest number of mediums was with treatment 8, which differed only from treatments 3 and 4.

Marketable yield, which is the total colossal, jumbo, and medium onions divided by the total yield ranged from 19-77%. The highest total marketable yield was with treatment 2 with 832 50-lb bags/acre, which differed from treatment 15.

Leaf tissue nitrogen ranged from 2.84-3.85% with treatment 8 having the highest value, which differed from all other treatments except treatment 2 (Table 3). Leaf tissue phosphorus levels ranged from 0.32-0.61% with the highest leaf phosphorus amount in treatment 16, which differed only from treatments 10, 12, 19, and 21. There were no differences in either potassium or calcium content between the treatments. Sulfur content ranged from 0.24-0.73% with treatment 3 having the highest content, which was significantly greater then other treatments with the exception of treatments 2, 4, 18, and 19. The highest leaf tissue magnesium levels occurred with treatment 10, which did not differ from treatments 6, 9, or 12. Finally, zinc levels ranged from 13.5-23.1 ppm with treatment 4 having the highest level, which differed from treatment 14.

Treatments 5-10 did not have sulfur fertilizer applied as an oversight in the experiment. Because of this it is difficult to make any assessment of these treatments. The Avail product is suppose to make phosphorus more available to the plant over the entire season.

The Georgia Pacific products are represented by treatments 12-17. Treatments 12-15 include a slow release liquid fertilizer that was foliar applied. These products have worked well as soil applied fertilizers and appear to work well foliar applied. Foliar application may be convenient for application as a tank mix with other chemicals such as fungicides. Foliar feeding especially with macronutrients such as nitrogen has not been shown to be effective with most of the material washed from the plant by irrigation or rain and taken up by the roots. Multiple applications of fertilizers such as nitrogen, which is highly leachable, is more efficient but also more costly.

The Helena Chemical programs apply sufficient nutrients. The addition of Phos-K-Mag and Phos-Cal-Zinc, although nutrients, are applied in such small quantities, it is unlikely they have any affect on the crop. The HM0744 product is of unknown formulation.

Overall the fertility experiment this year had problems with flooding in one part of the field and onset of late season bacterial diseases. It is difficult to assess these fertility programs because there are not a wide range of fertilizer rates applied. Usually a relatively wide range of fertilizer rates is required even with a highly response element like nitrogen. In conclusion, many of these products would be appropriate in an onion fertility program as long as they met the required nitrogen, phosphorus, potassium, and sulfur requirements of the crop as determined by soil test recommendations.

Literature Cited

Boyhan, G.E., R.L. Torrance, and C.R. Hill. 2007. Effects of nitrogen, phosphorus, and potassium rates and fertilizer sources on yield and leaf nutrient status of short-day onions. Hortscience 42:653-660.

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
1	Standard	10-10-10-12S	250	12/3/07	25	25	25	30
		10-10-10-12S	250	1/15/08	25	25	25	30
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**112**	**50**	**50**	**60**
2	Standard (preplant)	10-10-10-12S	250	12/3/07	25	25	25	30
		10-10-10-12S	250	1/15/08	25	25	25	30
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**112**	**50**	**50**	**60**
3	Old Standard	5-10-15-9S	400	12/3/07	20	40	60	36
		18-46-0	150	12/12/07	27	69	0	0
		5-10-15-9S	200	1/15/08	12	24	36	10
		5-10-15-9S	200	1/28/08	12	24	36	10
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**133**	**157**	**132**	**56**

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
4	Old Standard (preplant)	5-10-15-9S	400	12/3/07	20	40	60	36
		18-46-0	150	12/12/07	27	69	0	0
		5-10-15-9S	200	1/15/08	12	24	36	10
		5-10-15-9S	200	1/28/08	12	24	36	10
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**133**	**157**	**132**	**56**
5	Preplant wo/Avail (75 lbs P)	18-46-0	163	12/3/07	29	75	0	0
		13.75-0-46	250	1/15/08	34	0	115	30
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**125**	**75**	**115**	**30**
6	Preplant w/Avail (75 lbs P)	18-46-0	163	12/3/07	29	75	0	0
		13.75-0-46	250	1/15/08	34	0	115	0
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
	Total				**125**	**75**	**115**	**0**
7	wo/Avail (75 lbs P)	10-34-0	221	1/15/08	22	75	0	0
	3 weeks after transplanting	13.75-0-46	250	1/15/08	34	0	115	0
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**118**	**75**	**115**	**0**
8	w/Avail (75 lbs P)	10-34-0	221	1/15/08	22	75	0	0
	3 weeks after transplanting	13.75-0-46	250	1/15/08	34	0	115	0
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**118**	**75**	**115**	**0**
9	wo/Avail (50 lbs P) at transpl.	10-34-0	147	12/3/08	15	50	0	0
		13.75-0-46	250	1/15/08	26	0	88	0
		15.5-0-0	200	2/8/08	31	0	0	0
		15.5-0-0	200	2/26/08	31	0	0	0
	Total				**103**	**50**	**88**	**0**

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

	No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
	10	w/Avail (50 lbs P) at transpl.	10-34-0	147	12/3/08	15	50	0	0
			13.75-0-46	250	1/15/08	26	0	88	0
			15.5-0-0	200	2/8/08	31	0	0	0
			15.5-0-0	200	2/26/08	31	0	0	0
		Total				**103**	**50**	**88**	**0**
	11	0 Phosphorus	15.5-0-0	150	12/3/07	23	0	0	0
			0-0-22-22S	115	12/3/07	0	0	25	25
			13.75-0-46	250	1/15/08	26	0	88	0
			15.5-0-0	200	2/8/08	31	0	0	0
			15.5-0-0	200	2/26/08	31	0	0	0
Foliar Appl. Dates		**Total**				**111**	**0**	**113**	**25**
1/16/08	12	Nitamin 30L, 1 gal wkly, 150 N	10-10-10-12S	250	12/3/07	25	25	25	30
1/29/08			18-46-0	140	12/20/07	25	64	0	0
2/7/08			15.5-0-0	242	1/15/08	38	0	0	0
2/13/08			0-0-60	100	1/15/08	0	0	60	0
2/20/08			0-0-0-13S	150	1/15/08	0	0	0	20

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

	No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
2/28/08			15.5-0-0	242	2/8/08	38	0	0	0
3/6/08		7 foliar applications	30-0-0 (Nitamin 30L)	10.3	Jan	25	0	0	0
		Total				**151**	**89**	**85**	**50**
1/16/08	13	Nitamin 30L, 2 gal wkly, 150 N	10-10-10-12S	250	12/3/07	25	25	25	30
1/29/08			18-46-0	140	12/20/07	25	64	0	0
2/7/08			15.5-0-0	144	1/15/08	22	0	0	0
2/13/08			0-0-60	100	1/15/08	0	0	60	0
2/20/08			0-0-0-13S	150	1/15/08	0	0	0	20
2/28/08			15.5-0-0	144	2/8/08	22	0	0	0
3/6/08		7 foliar applications	30-0-0 (Nitamin 30L)	21	Jan	50	0	0	0
		Total				**144**	**89**	**85**	**50**
	14	Nitamin 30L, 3 gal biwkly, 150 N	10-10-10-12S	250	12/3/07	25	25	25	30
			18-46-0	140	12/20/07	25	64	0	0
1/16/08			15.5-0-0	174	1/15/08	27	0	0	0
1/29/08			0-0-60	100	1/15/08	0	0	60	0

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

	No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
2/13/08			0-0-0-13S	150	1/15/08	0	0	0	20
2/28/08			15.5-0-0	174	2/8/08	27	0	0	0
3/6/08		5 foliar applications	30-0-0 (Nitamin 30L)	39	Jan	50	0	0	0
		Total				**154**	**89**	**85**	**50**
	15	Nitamin 30L, 3 gal biwkly, 120 N	10-10-10-12S	250	12/3/07	25	25	25	30
1/16/08			18-46-0	140	12/20/07	25	64	0	0
1/29/08			15.5-0-0	152	1/15/08	27	0	0	0
2/13/08			0-0-60	100	1/15/08	0	0	60	0
2/28/08			0-0-0-13S	150	1/15/08	0	0	0	20
3/6/08		5 foliar applications	30-0-0 (Nitamin 30L)	39	Jan	50	0	0	0
		Total				**127**	**89**	**85**	**50**
	16	GP-G54, 150 N	10-10-10-12S	250	12/3/07	25	25	25	30
			18-46-0	140	12/20/07	25	64	0	0
			11-0-0 (GP-G54)	460	1/15/08	50	0	0	0
			0-0-60	100	1/15/08	0	0	60	0

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
		0-0-0-13S	150	1/15/08	0	0	0	20
		11-0-0 (GP-G54)	460	2/8/08	50	0	0	0
	Total				**150**	**89**	**85**	**50**
17	GP-G54, 120 N	10-10-10-12S	250	12/3/07	25	25	25	30
		18-46-0	140	12/20/07	25	64	0	0
		11-0-0 (GP-G54)	319	1/15/08	35	0	0	0
		0-0-60	100	1/15/08	0	0	60	0
		0-0-0-13S	150	1/15/08	0	0	0	20
		11-0-0 (GP-G54)	319	2/8/08	35	0	0	0
	Total				**120**	**89**	**85**	**50**
18	Helena Foliar Enhancement	10-10-10-12S	250	12/3/07	25	25	25	30
		Phos-K-Mag	2 qts.	1/7/07				
		18-46-0	43	1/7/07	8	20	0	0
		47-0-0	41	1/7/07	19	0	0	0
		Phos-Cal-Zinc	2 qts.	1/15/08				

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
		Copflow	8 oz	-				
		15.5-0-0	335	1/15/08	52	0	0	0
		0-0-60	42	1/15/08	0	0	25	0
		0-0-22-22S	68	1/15/08	0	0	15	15
		Phos-Cal	2 qts.	2/8/08				
		Phos-Cal-Zinc	2 qts.	2/8/08				
		15.5-0-0	328	2/8/08	51	0	0	0
		Phos Cal	2 qts.	March				
	Total				**155**	**45**	**65**	**45**
19	Helena HM0744	10-10-10-12S	250	12/3/07	25	25	25	30
		HM0744	1 qt.	1/7/07				
		18-46-0	43	1/7/07	8	20	0	0
		47-0-0	41	1/7/07	19	0	0	0
		15.5-0-0	335	1/15/08	52	0	0	0
		0-0-60	42	1/15/08	0	0	25	0
		0-0-22-22S	68	1/15/08	0	0	15	15
		HM0744	3 pts.	2/8/08				
		15.5-0-0	328	2/8/08	51			

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
		HM0744	3 pts.	3/18/08				
	Total				**155**	**45**	**65**	**45**
20	Helena Foliar + HM0744	10-10-10-12S	250	12/3/07	25	25	25	30
		Phos-K-Mag	2 qts.	1/7/07				
		HM0744	1 qt.	1/7/07				
		18-46-0	43	1/7/07	8	20	0	0
		47-0-0	41	1/7/07	19	0	0	0
		Phos-Cal-Zinc	2 qts.	1/15/08				
		Copflow	8 oz	-				
		15.5-0-0	335	1/15/08	52	0	0	0
		0-0-60	42	1/15/08	0	0	25	0
		0-0-22-22S	68	1/15/08	0	0	15	15
		Phos-Cal	2 qts.	2/8/08				
		Phos-Cal-Zinc	2 qts.	2/8/08				
		HM0744	3 pts.	2/8/08				
		15.5-0-0	328	2/8/08	51			
		HM0744	3 pts.	3/18/08				

Table 1. Treatment list with materials, rate, date of application, and amount of N, P, K, and S applied.

No.	Treatment	Material	(lbs/acre)	Date	N	P	K	S
	Total				**155**	**45**	**65**	**45**
21	High Standard	10-10-10-12S	500	12/3/07	50	50	50	60
		13.75-0-46	150	1/15/08	20	0	66	0
		15.5-0-0	250	2/8/08	39	0	0	0
		15.5-0-0	250	2/26/08	39	0	0	0
	Total				**148**	**50**	**116**	**60**

Table 2. Total yield, graded yield, total marketable yield, and percent marketable for onion fertility study, 2007-08.

No	Treatment	Total yield	Colossals (>4")	Jumbos (3-4")	Mediums (2-3")	Total marketable yield	Marketable
		(50-lb bags/acre)					(%)
1	Standard	1,024	403	211	11	626	51%
2	Standard (preplant)	1,117	467	343	21	832	74%
3	Old Standard	1,120	409	241	9	659	57%
4	Old Standard (preplant)	1,043	270	152	9	430	41%
5	Preplant wo/Avail (75 lbs P)	791	142	177	32	350	41%
6	Preplant w/Avail (75 lbs P)	759	144	203	24	371	41%
7	wo/Avail (75 lbs P) 3 wks after transpl.	734	121	256	24	401	49%
8	w/Avail (75 lbs P) 3 wks after transpl.	805	66	249	34	349	44%
9	wo/Avail (50 lbs P) at transpl.	647	51	83	13	148	19%
10	w/Avail (50 lbs P) at transpl.	875	91	194	22	308	35%
11	0 Phosphorus	810	222	258	28	507	58%
12	Nitamin 30L, 1 gal wkly, 150 N	1,003	302	198	13	513	51%
13	Nitamin 30L, 2 gal wkly, 150 N	955	277	230	26	532	52%
14	Nitamin 30L, 3 gal biwkly, 150 N	1,042	400	260	15	675	66%
15	Nitamin 30L, 3 gal biwkly, 120 N	879	202	240	24	466	53%
16	GP-G54, 150 N	1,184	395	225	14	635	53%
17	GP-G54, 120 N	761	119	229	21	369	46%
18	Helena Foliar Enhancement	861	416	238	22	676	77%
19	Helena HM0744	881	227	197	13	437	48%
20	Helena Foliar + HM0744	913	287	315	28	630	69%
21	High Standard	821	137	213	28	377	47%
	Coefficient of variation	19%	54%	39%	69%	40%	37%
	Fisher's Protected LSD (0.05) w/Bonferroni adj for 5 comparisons	296	224	148	24	327	30%

Table 3. Leaf tissue analyses for selected elements in the onion fertility study, 2007-08.

No	Treatment	Nitrogen	Phosphorus	Potassium	Calcium	Sulfur	Magnesium	Zinc
		(%)						(ppm)
1	Standard	3.07	0.50	2.90	0.56	0.57	0.19	17.4
2	Standard (preplant)	3.49	0.45	3.03	0.47	0.65	0.16	19.6
3	Old Standard	3.42	0.55	3.42	0.54	0.73	0.17	20.9
4	Old Standard (preplant)	3.42	0.57	3.17	0.52	0.72	0.15	23.1
5	Preplant wo/Avail (75 lbs P)	3.47	0.60	3.40	0.62	0.33	0.20	18.9
6	Preplant w/Avail (75 lbs P)	3.16	0.43	3.65	0.80	0.32	0.24	15.0
7	wo/Avail (75 lbs P) 3 wks after transpl.	3.31	0.55	3.02	0.45	0.31	0.16	18.8
8	w/Avail (75 lbs P) 3 wks after transpl.	3.85	0.50	3.18	0.53	0.34	0.18	18.5
9	wo/Avail (50 lbs P) at transpl.	3.34	0.61	3.71	0.87	0.24	0.28	16.7
10	w/Avail (50 lbs P) at transpl.	3.07	0.40	4.76	1.41	0.25	0.35	13.5
11	0 Phosphorus	3.35	0.43	3.04	0.52	0.36	0.18	17.1
12	Nitamin 30L, 1 gal wkly, 150 N	3.10	0.39	4.08	1.06	0.57	0.27	15.6
13	Nitamin 30L, 2 gal wkly, 150 N	3.41	0.53	3.26	0.57	0.47	0.20	17.7
14	Nitamin 30L, 3 gal biwkly, 150 N	3.26	0.59	3.07	0.55	0.49	0.18	17.9
15	Nitamin 30L, 3 gal biwkly, 120 N	2.84	0.45	3.17	0.78	0.56	0.21	14.7
16	GP-G54, 150 N	3.12	0.61	3.36	0.58	0.43	0.16	20.5
17	GP-G54, 120 N	3.27	0.51	3.26	0.58	0.50	0.18	19.0
18	Helena Foliar Enhancement	3.29	0.42	3.42	0.80	0.65	0.17	16.4
19	Helena HM0744	3.19	0.32	3.64	1.07	0.62	0.19	15.4
20	Helena Foliar + HM0744	3.10	0.48	2.89	0.57	0.57	0.14	14.7
21	High Standard	3.34	0.38	3.63	0.78	0.34	0.21	17.1
	Coefficient of variation	7%	24%	22%	54%	19%	33%	17%
	Fisher's Protected LSD (0.05) w/Bonferroni adj for 5 comparisons	0.37	0.20	NS	NS	0.15	0.11	4.9

PRELIMINARY EVALUATION OF STORAGE CONDITIONS AND VARIETIES' EFFECT ON VIDALIA ONION MARKETABILITY AND WEIGHT LOSS

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Introduction

The growth of the Vidalia onion industry over the past 20 years has been dramatic and in part can be attributed to the use of controlled atmosphere (CA) storage. This type of storage involves placing onions in a high CO_2 (5%), low O_2 (3%), refrigerated (34°F) environment where respiration is dramatically slowed and onion rotting pathogens can be held in check.

We routinely place all of the entries in the variety trial in CA storage for approximately four months, at which time we evaluate them. It is, however, a common practice in the industry to store some onions in refrigerated storage as well as in CA storage for shorter periods of time. This study was undertaken to evaluate onion storage for shorter periods of time.

Materials and Methods

Onions transplanted to their final spacing in December 2007 were grown according to University of Georgia Cooperative Extension Service recommendations (Boyhan and Kelley, 2007). There were three varieties in this experiment, 'WI-129', 'Caramelo', and 'Ohoopee Sweet'. 'WI-129' was harvested on 29 April 2008, while 'Ohoopee Sweet' and 'Caramelo' were harvested on 5 and 20 May 2008, respectively. In addition, there were four storage treatments with onions stored in cold storage (34°F, 70% RH) for two or four weeks as well as onions stored in CA for eight and 12 weeks. Each variety/storage combination was replicated four times.

Upon harvest, they were graded into marketable and unmarketable onions and the marketable onions were placed in the storage treatments. Onions were removed from storage after the allotted time and the percent

marketable and weight loss were calculated. The weight loss percent was transformed with ($x^{0.25}$) to normalize the distribution for analysis.

Results and Discussion

There were significant variety, storage, and interaction effects for percent marketable onions. The interaction effect indicated that the primary reduction in percent marketable onions was with 'WI-129', which went from 89% marketable onions after two weeks in cold storage to 54% marketable onions after three months in CA storage. Neither 'Caramelo' nor 'Ohoopee Sweet' saw an appreciable change in percent marketable onions based on time in storage.

Both storage and interaction effects were significant for percent weight loss in storage. Evaluating weight loss for each variety indicating significant differences within each variety for time in storage. 'WI-129' had the greatest weight loss after 12 weeks of CA storage with 15.3%. In addition, both the four weeks in cold storage and the 8 weeks in CA resulted in significant weight loss compared to two weeks in cold storage.

The greatest weight loss for 'Caramelo' was with four weeks in cold storage, which was greater then any of the other storage regimens for this variety. Finally 'Ohoopee Sweet' also showed significant differences in weight loss, but the differences were much smaller compared to the other varieties.

The relatively low percent marketable onions for 'WI-129' particularly after 12 weeks of CA storage is not unprecedented (Boyhan et al., 2007). Early maturing varieties like 'WI-129' have not done well in postharvest storage. In conclusion, some varieties such as 'Caramelo' and 'Ohoopee Sweet' appear to do quite well in postharvest storage whether in cold or CA storage.

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Table 1. Variety and storage affect on marketability and weight loss in Vidalia onions.

	Marketable	Weight loss
Variety	(%)	
WI-129	70%	6.9%
Caramelo	86%	4.0%
Ohoopee Sweet	91%	1.6%
Storage		
2 weeks cold storage	91%	0.5%
4 weeks cold storage	82%	7.2%
8 weeks CA storage	79%	3.1%
12 weeks CA storage	76%	5.8%
Probabilities		
Variety	0.000	0.069
Storage	0.008	0.000
Variety x Storage	0.024	0.000
Interaction effects		
Variety		
WI-129		
2 weeks cold storage	89%	0.2%
4 weeks cold storage	73%	7.3%
8 weeks CA storage	62%	4.9%
12 weeks CA storage	54%	15.3%
Caramelo		
2 weeks cold storage	94%	0.9%
4 weeks cold storage	80%	12.4%
8 weeks CA storage	88%	2.6%
12 weeks CA storage	82%	0.0%
Ohoopee Sweet		
2 weeks cold storage	90%	0.4%
4 weeks cold storage	92%	2.1%
8 weeks CA storage	87%	1.8%
12 weeks CA storage	93%	2.2%
Probabilities		
Storage		
WI-129	0.008	0.016
Caramelo	0.559	0.000
Ohoopee Sweet	0.136	0.004

EVALUATION OF ORGANIC FERTILIZERS AND PREPLANT TIMING APPLICATION ON VIDALIA ONION PRODUCTION

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Introduction

Organic Vidalia onion production has become an important niche market for onion growers. It has been estimated that 400 acres of organic Vidalia onions were produced in the 2007-08 season, which is up 150 acres from the previous season.

Growers have used a variety of materials to fertilize these onions including poultry litter and commercial organic fertilizers. These materials do not perform as commercial inorganic fertilizers because they must undergo a mineralization process before the nutrients are available to the plant. Because of this, some growers have been frustrated by the performance of organic fertilizers. This experiment was undertaken to evaluate two organic fertilizers and the effect of preplant application timing on yield.

Materials and Methods

Four weeks prior to transplanting land was prepared according to University of Georgia Cooperative Extension Service recommendations (Boyhan, 2007) (Boyhan and Kelley, 2007). Treatments consisted of applications of 75 lbs/acre nitrogen from organic 4-2-3 or 8-5-5 fertilizers (Perdue Agrirecycle, Seaford, DE and Nature Safe, Cold Spring, KY, respectively) applied at four or two weeks prior to transplanting or at transplanting. The application dates were 30 Oct. 2007, 13 Nov. 2007, and 27 Nov. 2007, which was also the date of transplanting.

The experimental design was a randomized complete block design with four replications. Experimental units or plots consisted of beds prepared on 6-ft centers with four rows of onions planted per bed with a 12 inch between-row and 5.5 inch in-row spacing. Each experimental unit was 25 ft of planted bed.

Organically produced transplants of 'Savannah Sweet' and 'Candy Ann' were used with 'Savannah Sweet' transplanted into replications 1 and 3 and 'Candy Ann' transplanted into replications 2 and 4.

Onions were grown organically with all treatments receiving additional organic fertilizer of 37.5 lbs/acre nitrogen from 13-0-0 (Nature Safe) applied on 28 Jan. 2008 and 37.5 lbs/acre nitrogen from 8-5-5 applied on 26 Feb. 2008.

Onions were harvested when judged mature, which was 23 April 2008 for 'Candy Ann' and 8 May 2008 for 'Savannah Sweet'. Onions were field cured prior to having their tops and roots removed and were immediately weighed to determine total yield. Onions were then graded into colossal (≥4 inches), jumbo (≥3 and <4 inches), and medium (≥2 and <3 inches) size classes.

Results and Discussion

There were no differences in total or graded yield between the treatments (Table 1). In addition, there was no difference in the percent marketable onions.

Many growers have complained about the lack of performance with organic fertilizers. This, it was thought, could be alleviated with applications 2-4 weeks prior to transplanting to allow the fertilizers to undergo some mineralization so that nutrients would be available at transplanting. The average total yield in this study was 728 50-lb bags/acre, which is slightly less than the average for 'Savannah Sweet' and 'Candy Ann' in the variety trial (see elsewhere in this publication) at 765 50-lb bags/acre. This suggests that perhaps an even earlier application date might have been beneficial. The downside to fertilizer application well in advance of transplanting is the potential for nutrient loss to leaching due to rain or overhead irrigation.

The soil at the Vidalia Farm is somewhat heavier then many soils found in the onion belt so that our results may not reflect the potential for preplant organic fertilizer application that may be possible on lighter soils. In conclusion, this study indicated that preplant organic fertilizer application had no benefit.

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Boyhan, G.E. & W.T. Kelley (eds.). 2007. Onion production guide. Univ. of Ga. Coop. Ext. Serv. Bul. 1198.

Table 1. Yield and graded yield of organic fertilizer timing treatments, 2008.

Treatment	Total yield	Colossal yield	Jumbo yield	Medium yield	Marketable
	(50-lb bags/acre)				(%)
4 wks before transplt. w/4-2-3	654	39	282	69	64%
2 wks before transplt. w/4-2-3	740	41	406	65	68%
0 wks before transplt. w/4-2-3	827	96	449	37	70%
4 wks before transplt. w/8-5-5	672	56	330	80	68%
2 wks before transplt. w/8-5-5	745	80	394	52	69%
0 wks before transplt. w/8-5-5	729	67	372	55	67%
Coefficient of variation	16%	78%	33%	54%	22%
Fisher's Protected LSD (p=0.05)	NS	NS	NS	NS	NS

ONION VARIETY AND SPACING EVALUATION IN NORTH ALABAMA, 2007-2008

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Introduction

Onions can be a profitable crop for small growers that produce a wide range of vegetables for roadside and pick-your-own markets. Many regions, particularly those close to urban areas, have large numbers of small growers that cater to local markets. The growth in organic production and 'buy local' campaigns have helped these small growers survive and in many cases prosper.

Mild sweet onions can have a fit in many of these operations as an overwintering crop that can be produced along with other overwintering crops such as strawberries, many brassicas (collards, broccoli, cauliflower, etc.), and carrots to name a few.

For large commercial onion growers such as in the Vidalia region of southeastern Georgia, this may be a revenue source as well. Large onion growers may find it profitable to produce transplants that can be shipped to other regions in the Southeast for these local markets. In addition, there is evidence that later planted (mid-October) intermediate-day onion transplants can be produced in the Vidalia region for shipment to other regions in the Southeast as well as into the mid-Atlantic states. There may be a particularly lucrative source of income for growers willing to produce organic transplants for these other regions.

The objective of this study was to evaluate onion production in North Alabama where many small growers are located. The transplants for the evaluation were produced in the Vidalia region.

Materials and Methods

Onion transplants were produced at the Vidalia Onion and Vegetable Research Center according to University of Georgia Cooperative

Extension Service recommendations (Boyhan and Kelley, 2007). These transplants were transported to the North Alabama Substation in Cullman, AL for transplanting. In 2007, 45 lbs/acre of nitrogen was applied preplant as a complete fertilizer. This was followed by weekly applications through the drip system of 13 lbs/acre N. This resulted in a total of 150 lbs/acre N. Each plot was 5 feet long with onions spaced either with 4 inches in-row and 5 inches between-row spacing, which was on black plastic mulch or a 12 inch between-row and 6 inch in-row spacing, which was on bareground.

Onions were arranged in a randomized complete block of four replications. Onion transplants were set on 28 Nov. 2006 as described above. Onions were harvested when a variety was judged mature on 13, 27 Apr., and 9, 25 May 2007. WI-131 on plastic was harvested on 13 Apr. 2007 and on bareground on 27 Apr. 2007. All other varieties on plastic mulch were harvested on 9 May 2007 and on bareground on 25 May 2007.

Onions were graded into medium (≥2 and <3 inches) and jumbo (≥3 inches) size classes. In addition, a random bulb sample was measured for length and width in the jumbo size class to calculate the height/width bulb ratio. Culls were recorded as bulbs below two inches in size as well as damaged and diseased bulbs.

In the 2007-08 season, onion transplants were set on 11 Dec. 2007. Cultural practices were the same as for the 2006-07 season. Plot size was 20 ft of planted bed with all onions planted on black plastic mulch. There were three rows of onion with a 12 inch between-row and 6 inch in-row spacing. Onions were harvested when judged mature for the variety with WI-129 harvested on 29 Apr. 2008 and the remainder in the trial on 20 May 2008.

Onions were graded into sizes classes of mediums, jumbos, and colossals (≥4 inches). In addition, a random bulb sample was measured for length and width in the jumbo size class to calculate the height/width bulb ratio. Culls were recorded as bulbs below two inches in size as well as damaged and diseased bulbs. Seedstems (flowering) were recorded on 28 Apr. 2008.

In addition to the varieties grown in the replicated trial, there were seven varieties grown on plastic mulch and eight varieties grown on bareground as single plots for observational purposes. The observational plots on black plastic mulch were harvested on 20 May 2008 and those on bareground were harvested on 2 June 2008.

Intermediate-day onions were evaluated as well. Two varieties were transplanted on 11 Mar. 2008 in a randomized complete block design of three replications as described above. These onions were transplanted and grown as described above. They were harvested on 16 June 2008 and graded into size classes as described previously.

Results and Discussion

Overall yields were good in the 2006-07 trial with Pegasus having the highest jumbo yield, but it was not significantly different from the other entries with the exception of WI-131 (Table 1). Pegasus also had the highest medium yields, but again differed statistically only from WI-131. Pegasus is a late maturing variety in the Vidalia growing region and consequently is susceptible to warm season bacterial diseases such as sour skin. Because of these disease issues, it has been discontinued as a commercial variety in the Vidalia region. It may have done better in the north Alabama region because it was further north and may have escaped these disease problems.

The spacing results were as would be expected with the wider spacing resulting in greater jumbo yield and lower medium yield (Table 1). In addition, there were more cull onions with the closer spacing. Spacing also had a small, but significant effect on the bulb height/width ratio. The more closely spaced onions had a greater height/width ratio, but it was still considered acceptable for a Granex type onion. Granex onions are wider then they are tall, which is considered desirable in the Vidalia growing region. Finally there were no interaction effects between varieties and spacing.

In the 2007-08 season, 'WI-129' had the highest medium yield, while 'Savannah Sweet' had the greatest jumbo yield and 'Caramelo' had the greatest number of colossal onions (Table 2). These yields are very good overall and are comparable to what is produced in the Vidalia region.

Included in this experiment were 'Mata Hari' and 'XON-565W', which are a red and white variety, respectively. These entries, although not the greatest yields, had good yields and may offer a unique marketing opportunity to small growers in the Southeast. Currently both red and white varieties are not allowed by the Vidalia onion marketing order.

Seedstem numbers were generally low for all entries evaluated. In addition, several varieties were evaluated as single plot observational entries (Table 2). The yield of these varieties were lower then in the replicated trial, but not much information can be gleaned from these because they were not replicated. Many of these varieties, however, show promise for North Alabama production.

Finally an early spring trial was conducted with two intermediate varieties, 'FDI 201' and 'FDI 206', which were transplanted in March and harvested in June. These red varieties did very well in this trial and had no statistical differences between them. These intermediate varieties produced as transplants in the Vidalia region may be a new revenue source for Vidalia growers marketing short-day and intermediate-day onion transplants to other regions in the Southeast and mid-Atlantic states.

These varieties were included in the short-day onion variety trial at

the Vidalia Farm (see article elsewhere in this publication) where they did not do very well. Because of late season bacterial diseases, these onions were harvested with the latest maturing short-day varieties, but it was clear they were immature at that time of harvest. For other regions further north these varieties should do very well.

In conclusion, these trials indicate great potential for onion production throughout the Southeast region. Small local growers may have another revenue source. Vidalia onion growers can also benefit by supplying transplants to these growers. There may be particular interest in supplying organically produced transplants from the Vidalia region to other regions.

Literature Cited

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Table 1. Evaluation of short-day onion varieties and spacing at the North Alabama Substation, Auburn University, Cullman, AL 2007.

Variety	Jumbos[z]	Mediums[z] (lbs/acre)	Culls	Bulb ratio (height/width, inches)
Sweet Vidalia	7,182	5,481	2,761	0.68
Pegasus	7,759	6,171	2,274	0.73
Savannah Sweet	5,389	5,971	4,449	0.76
Mr. Buck	6,586	4,234	2,219	0.69
WI-131	4,278	3,127	3,548	0.80
Plant spacing				
4 x 5 inches	4,903	6,499	4,424	0.76
12 x 6 inches	7,601	3,608	1,647	0.71
Probabilities				
Variety	0.042	0.017	0.105	0.124
Spacing	0.002	0.000	0.000	0.010
Variety x spacing	0.059	0.209	0.354	0.628
LSD (varieties, p=0.05)	3,376	2,674	-	-

[z]Jumbos ≥3 inches, Mediums ≥2 & <3 inches.

Table 2. Short-day onion evaluation at the North Alabama Substation, Auburn University in Cullman, Alabama 2008.

Variety	Mediums[z]	Jumbos[z]	Colossals[z]	Culls	Seedstems	Bulb ratio
	(lbs/acre)				(No./plot)[y]	(height/width, inches)
Savannah Sweet	143	12,939	16,116	1,118	3.3	0.93
Mata Hari	1,251	10,960	13,432	648	3.3	0.82
XON-565W	427	6,448	12,704	697	2.5	0.85
WI-129	6,872	7,128	0	1,850	3.5	0.87
Caramelo	895	7,537	20,734	2,563	7.0	0.82
Coefficient of variation	35%	30%	39%	56%	69%	9%
Fisher's LSD (p=0.05)	1,038	4,131	7,591	1,187	NS[x]	NS
Single plot observational evaluations on black plastic						
Sweet Jasper	1,310	6,327	4,469	1,162		0.82
Sweet Vidalia	116	5,009	8,574	969		0.85
Century	109	7,525	6,948	0		0.88
Miss Megan	399	5,129	3,303	113		0.82
13 XGH 08401	512	4,792	4,229	1,888		0.86
Golden Eye	450	4,530	4,229	610		1.09
Sweet Caroline	0	6,080	9,021	185		0.85
Single plot observational evaluations on bareground.						
Sweet Vidalia	2,131	1,147	0	806		0.77
Miss Megan	1,401	1,263	0	889		0.81
Century	1,837	0	0	1,024		-
Ohoopee Sweet	1,539	330	0	621		0.77
Golden Eye	2,323	5,521	0	309		0.73
Sweet Jasper	2,134	7,104	1,383	36		0.75
YGH 108101	2,171	1,241	0	1,009		0.78
Sweet Caroline	1,960	5,764	0	65		0.76

[z]Mediums ≥2 & <3 inches, Jumbos ≥3 & <4 inches, Colossals >4 inches.

[y]Plot size is 20 ft long with 3 rows planted with approximately 12 inches between rows and 6 inches in-row.

[x]NS - not significant.

Table 3. Evaluation of intermediate-day onions at the North Alabama Substation, Auburn U., Cullman, AL, 2008.

Variety	Mediums[z]	Jumbos[z]	Colossals[z]	Culls
	(lbs/acre)			
FDI 201	6,091	12,906	6,851	1,898
FDI 206	6,052	10,128	5,924	2,211
Probabilities	0.982	0.488	0.844	0.657
Coefficient of variation	31%	35%	80%	25%

[z]Mediums ≥2 & <3 inches, Jumbos ≥3 & <4 inches, Colossals >4 inches.

EVALUATION OF SHORT-DAY ONIONS AFTER CONTROLLED ATMOSPHERE STORAGE

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Introduction

As part of the ongoing evaluation of current and new varieties, onions are evaluated for storability under controlled atmosphere (CA) storage. This type of storage involves a low oxygen (3%), high carbon dioxide (5%), refrigerated (34° F) atmosphere.

This type of storage has extended the market window for short-day onions grown in the Vidalia region of southeastern Georgia. Vidalia onions can be available from May into September.

Materials and Methods

Approximately 50 pounds of onions from each experimental unit (plot) from the onion variety trial is transported from the Vidalia Onion and Vegetable Research Center in Lyons, GA to the Vidalia Onion Research Laboratory (VORL) in Tifton, GA. Onions are transported to the VORL in Tifton as they were harvested. Early harvested onions were held under refrigeration (34°F) until all the onions were harvested and transported to the VORL.

Onions were placed in separate chambers based on replication with all entries from a replication in a single chamber. This maintains the randomized complete block design from the field with four replications. Conditions in each chamber were maintained with 3% O_2, 5% CO_2, 70% relative humidity, and 34°F. Each experimental unit (bag of onions) was weighed and then placed in the chambers on 23 May 2008.

Onions were removed from the chambers beginning on 30 Sept. 2008 with the completion of the evaluations on 2 Oct. 2008. Each bag of onions was weighed upon removal from CA to calculate the percent weight loss in storage. Onions were then separated into marketable and unmarketable onions and each group weighed. The percent marketable onions was calculated based upon onion weights prior to placement in CA storage and is reported here.

Marketable onions were saved and stored at ambient (≈70-80° F) conditions at the VORL for 14 days and then reevaluated for both percent marketable and percent weight loss after removal from storage.

Finally, five bulbs from each experimental unit was measured for height from the basal plate to the top where the onion leaves were removed. The onion width was also determined perpendicular to the growth axis at the widest point. The bulb height/width ratio is reported. In addition, each of these bulbs was cut perpendicular to the growth axis to count the number of centers in each bulb.

Results and Discussion

Overall CA storage results were very good for this year's trial with percent marketable onions for all varieties averaging 78%. The varieties ranged from 52-93% marketable (Table 1). Several varieties were not placed in storage because they were lost due to a malfunctioning dryer. The results this year were much better then last year when the average for all varieties was 49%. Even with the early varieties excluded (early maturing varieties usually don't do well in CA storage), the average in 2007 was only 53% marketable onions after removal from storage.

The highest percent marketable onions was for HSX-8044R at 93% marketable after four months in CA storage. This is a red variety, which had a total yield of 709 50-lb bags per acre (see variety trial results elsewhere in this publication).

Among the official Vidalia onion varieties, Ohoopee Sweet had the highest percent marketable onions after removal from storage with 90%. Other varieties on the official list with good storability results include Mr. Buck, Granex 33, Georgia Boy, Sapelo Sweet, Golden Eye, Caramelo, Sweet Vidalia, and Savannah Sweet. All of these varieties had better then 80% marketable onions after removal from storage.

Varieties with the lowest percent marketable onions included very early maturing varieties such as Candy Ann or very late maturing varieties such as Century and Miss Megan.

Moisture loss in storage averaged 4% with a range of 2.8-7.5%. There was a strong negative correlation between percent marketable onions and water loss in storage.

Granex type onions are slightly flattened onions with the bulb

diameter greater then the bulb height. Varieties with a height/width ratio up to 1 are acceptable, but this is usually reserved for processing into onion rings. The shape has generally been considered an important distinguishing characteristic of Vidalia onions. All of the onions in the trial this year had height/width ratios below one. The flattest onion in the trial was YGH-15094 with a height/width ratio of 0.57. Two entries had height/width ratios above 0.9, Lambada and Linda Vista.

After 14 days at ambient conditions the onions averaged 77% marketable onions. This means that on average 23% of the onions were unmarketable after two weeks. Because of this, it is strongly recommended that CA stored onions should be kept refrigerated as much as is practicable after removal from storage. Generally those varieties that did well in storage with a high percent of marketable onions also had a high percent of marketable onions after 14 days.

Single centers are an important characteristic for onions destined for processing. Generally more onion rings are available with a single center. Most of the varieties averaged less than two centers per bulb. Among the official Vidalia varieties with greater than two centers were Ohoopee Sweet and Georgia Boy.

This year there were a significant number of red varieties (16). The average percent marketable after CA storage for the reds was 73% with a range of 60-93%.

In conclusion, the results for all varieties stored in CA this year were very good. CA storage has certainly extended the market window for Vidalia onions, but it has not performed as consistently as expected. In some years the percent marketable onions from CA storage can be quite low with losses primarily due to Botrytis neck rot, however, why this is so is not understood.

Table 1. Evaluation of short-day onion variety trial after 4 months of controlled atmosphere storage.

		14 days post-storage					
		Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
Variety	Company	(%)				Height/width	(No.)
J 3001	Bejo Seed	90%	3.0%	82%	2.4%	0.67	1.6
J 3002	Bejo Seed	81%	3.2%	67%	4.0%	0.66	1.5
J 3003	Bejo Seed	85%	3.8%	79%	2.9%	0.70	1.1
J 3004	Bejo Seed	74%	3.4%	82%	2.7%	0.74	1.0
J 3005	Bejo Seed	92%	2.9%	80%	2.3%	0.71	1.1
Georgia Boy	D. Palmer	85%	3.8%	87%	2.8%	0.66	2.1
Miss Megan	D. Palmer	66%	7.4%	49%	5.5%	0.63	1.8
Mr. Buck	D. Palmer	89%	3.5%	86%	2.8%	0.67	1.8
Ohoopee Sweet	D. Palmer	90%	3.2%	83%	3.5%	0.74	2.7
Pinot Rouge	D. Palmer	92%	2.9%	88%	2.8%	0.72	1.5
Sapelo Sweet	D. Palmer	85%	3.7%	85%	2.0%	0.68	1.8
RGH-705700	Dessert	53%	7.3%	78%	3.5%	0.71	1.2
RGH-707700	Dessert	68%	6.3%	71%	3.6%	0.74	1.4

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		14 days post-storage					
		Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
Variety	Company	(%)				Height/width	(No.)
RGH-707704	Dessert	71%	4.7%	80%	3.1%	0.69	1.1
YGH-105101	Dessert	86%	3.9%	91%	2.7%	0.74	1.5
YGH-108101	Dessert	83%	4.2%	87%	2.8%	0.61	1.4
YGH-114101	Dessert	89%	3.2%	92%	2.4%	0.64	1.3
YGH-15082	Dessert	76%	4.6%	77%	3.0%	0.73	1.4
YGH-15085	Dessert	61%	7.4%	48%	2.5%	0.70	1.0
YGH-15094	Dessert	86%	4.2%	84%	3.0%	0.57	1.4
HSX-8044R	Hortag Seed	93%	2.8%	89%	2.0%	0.74	1.5
Caramelo (1000)	Nunhems	84%	3.5%	87%	2.1%	0.66	1.2
Lambada (3004)	Nunhems	77%	3.4%	81%	2.8%	0.93	1.0
Mata Hari	Nunhems	69%	5.7%	75%	3.6%	0.75	1.5
Nirvana	Nunhems	77%	4.6%	70%	3.1%	0.72	1.1
NUN 1002	Nunhems	.	.	.	.	.	.

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		14 days post-storage					
		Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
Variety	Company	(%)				Height/width	(No.)
NUN 1003	Nunhems	.	.	.	.	.	.
NUN 1004	Nunhems	.	.	.	.	.	.
NUN 1005	Nunhems	78%	3.6%	83%	2.8%	0.62	1.5
NUN 1006	Nunhems	88%	3.7%	77%	3.5%	0.61	2.0
NUN 3001	Nunhems	84%	4.2%	81%	2.9%	0.88	1.1
NUN 3006	Nunhems	75%	5.6%	74%	2.6%	0.82	1.1
Sweet Caroline	Nunhems	78%	4.3%	83%	2.5%	0.65	1.1
Sweet Vidalia	Nunhems	84%	3.8%	87%	2.1%	0.64	1.9
Sweet Harvest	Sakata	69%	4.3%	67%	2.8%	0.68	1.9
Sweet Jasper	Sakata	79%	4.5%	83%	3.2%	0.67	1.7
XON 780R	Sakata	77%	3.9%	77%	2.9%	0.72	1.3
XON-403Y	Sakata	75%	4.2%	83%	2.6%	0.77	1.6
XON-408Y	Sakata	78%	4.0%	73%	2.7%	0.71	2.0

Table 1. Evaluation of short-day onion variety trial after 4 months of controlled atmosphere storage.

		14 days post-storage					
		Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
Variety	Company	(%)				Height/width	(No.)
XON-565W	Sakata	89%	3.5%	72%	3.2%	0.63	1.3
Century	Seminis	57%	6.7%	51%	2.6%	0.72	1.4
Golden Eye	Seminis	84%	3.2%	87%	2.3%	0.66	1.3
Granex 33	Seminis	87%	4.0%	90%	1.9%	0.80	1.5
Granex Yellow PRR	Seminis	.	.	.	.	.	.
Linda Vista	Seminis	52%	6.5%	57%	2.1%	0.94	1.0
Savannah Sweet	Seminis	81%	3.9%	78%	3.0%	0.68	1.6
XP Red (XP 07597000)	Seminis	78%	5.6%	73%	3.8%	0.77	1.1
Honeybee F1	Shamrock	.	.	.	.	.	.
SSC 1535 F1	Shamrock	.	.	.	.	.	.
Sugar Belle F1	Shamrock	79%	4.3%	69%	2.8%	0.67	1.7
Sweet Deal F1 (SSC 2346)	Shamrock	.	.	.	.	.	.

Table 1. Evaluation of short-day onion variety trial after 4 months of controlled atmosphere storage.

		14 days post-storage					
		Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
Variety	Company	(%)				Height/width	(No.)
Candy Ann (SS 2005)	Solar Seed	54%	3.7%	75%	3.2%	0.70	1.9
Candy Kim (SS 2011)	Solar Seed	60%	4.7%	50%	2.9%	0.78	1.8
FDI 201	Tanimura & Antle	62%	5.3%	79%	2.8%	0.78	1.0
FDI 206	Tanimura & Antle	60%	6.0%	80%	6.8%	0.82	1.1
FDS 103	Tanimura & Antle	83%	2.9%	88%	2.1%	0.62	1.2
FDS 108	Tanimura & Antle	69%	5.1%	82%	4.5%	0.75	1.4
WI-129	Wannamaker	.	.	.	.	.	.
WI-131	Wannamaker	.	.	.	.	.	.
XP 07956019	Seminis	.	.	.	.	.	.
XP 07956013	Seminis	.	.	.	.	.	.
XP 07552015	Seminis	66%	4.3%	68%	2.8%	0.66	1.4
XP 07952011	Seminis	75%	4.5%	72%	2.6%	0.67	1.6
DPXLLC 07-1431	DP Seeds	72%	5.9%	75%	4.7%	0.86	1.0

Table 1. Evaluation of short-day onion variety trial after 4 months of controlled atmosphere storage.

				14 days post-storage			
Variety	Company	Marketable	Weight loss	Marketable	Weight loss	Bulb ratio	Centers
		(%)				Height/width	(No.)
DPXLLC 07-3067	DP Seeds	79%	5.6%	73%	4.2%	0.74	1.3
DPXLLC 07-3066	DP Seeds	62%	7.5%	61%	2.9%	0.69	1.3
DPXLLC 07-1429	DP Seeds	90%	3.4%	87%	2.7%	0.65	1.5
DPXLLC 07-1432	DP Seeds	59%	5.7%	73%	9.0%	0.85	1.0
DPXLLC 07-1430	DP Seeds	83%	3.5%	88%	2.7%	0.62	1.7
	Coefficient of variation	13%	20%	14%	86%	12%	20%
	Fisher's Protected LSD (p≤0.05)	19%	2%	20%	NS	0.16	0.5
	w/Bonferroni adj. for 5 comparisons						

EVALUATION OF DISEASE CONTROL AND SHORT-DAY ONION VARIETIES AFTER CONTROLLED ATMOSPHERE STORAGE

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Introduction

Disease resistance can be an important consideration in selecting an appropriate onion variety. Competent disease resistance can reduce or eliminate the need for fungicide application. The objective of this study was to evaluate controlled atmosphere stored onions of several varieties with and without fungicide applications.

Materials and Methods

Onion from the no-spray trial (see article elsewhere in this publication for details) were used in this study. Approximately 50 lbs of onions were placed in controlled atmosphere (CA) storage (3% O2, 5% CO2, 70% relative humidity, 34°F) from each experimental unit (plot) from the no-spray trial. Onions from each plot were weighed and then placed in CA storage on 6 May 2008 and removed on 30 Sept. 2008.

Onions removed from storage were immediately weighed to determine percent water loss in storage. In addition, onions were separated into marketable and unmarketable onions and each were weighed with the percent marketable onions reported.

Results and Discussion

There were no differences between onions with or without fungicide applications (Table 1). There were, however, differences in percent marketable and weight loss based on varieties. The percent marketable onions ranged from 32% for WI-129 to 92% for Pinot Rouge. Weight loss in storage ranged from 2.6-4.9%.

In the previous year's study, there were no direct comparisons between sprayed and unsprayed onions held in CA storage, however, onions from the variety trial that were sprayed regularly showed much lower disease incidence compared to the no-spray onions. This year's study was to include regularly sprayed onions, onions sprayed only at the end of the season, and unsprayed onions, however, due to a miscommunication the regular spray was not included.

The results of this year's no-spray storage study more closely mirrors the results from the variety trial with relatively high levels of marketable onions post-CA storage for most varieties tested. In 2007, onions were sprayed almost weekly with fungicides whereas the amount of fungicides used in 2008 included only four sprays, 2 of Rovral and 2 of Pristine.

In conclusion, no conclusive results can be drawn concerning the interaction of fungicide applications' affect on CA stored onions. Further study is needed.

Table 1. Evaluation of variety and fungicide spray treatment on controlled atmosphere storage of short-day onions

	Marketable	Weight loss
Variety	(%)	
Pinot Rouge	92%	2.6%
Georgia Boy	87%	2.9%
Ohoopee Sweet	87%	3.0%
Sweet Vidalia	84%	3.9%
WI-129	32%	4.9%
Sugar Belle	72%	3.9%
Golden Eye	83%	3.5%
Century	58%	3.1%
Savannah Sweet	89%	3.0%
Fungicides		
Yes	75%	3.5%
No	77%	3.3%
Probabilities		
Variety	0.000	0.000
Fungicides	0.450	0.243
Variety x fungicide	0.760	0.915
Fisher's Protected LSD (p=0.05) for varieties	12%	1.3%