THE UNIVERSITY OF GEORGIA
COLLEGE OF AGRICULTURAL & ENVIRONMENTAL SCIENCES

GEORGIA ONION RESEARCH - EXTENSION REPORT

2012

UGA extension

Contents

Vidalia Onion Variety Trial
2010-2011

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Introduction
In an effort to improve onion production and quality, onion varieties were once again evaluated and compared during the 2010-2011 season.

Materials and Methods
There were 46 varieties harvested in the trial. Varieties 1-9 (Table 1) were sown on September 7, 2010, transplanted on November 2, 2010, and harvested on either April 18 or April 25, 2011. Entries 1-9 were considered early varieties representing yellow onions. Varieties 10-39 (Table 1) were seeded on September 20, 2010 and transplanted on November 22, 2010. One entry (#16) was harvested on April 18, 2011, and the remaining entries were harvested April 20 through May 2, 2011. Varieties 10-39 were considered standard varieties representing yellow onions. Varieties 40-45 were red onions and were seeded on September 20, 2010, transplanted on November 22, 2010, and harvested on either May 2 or May 9, 2011. Variety #46 was the sole entry for white onions. It was seeded on September 20, 2010, transplanted on November 22, 2010, and harvested on April 25, 2011. Seeding and transplanting protocols for all varieties were as follows: plant beds were seeded in high-density plantings of 60 seed/linear foot and row spacing for transplants was 12 inches with a 4-inch in-row spacing.

The trials had the following fertility and pest management programs.

Plant Bed Fertility Program Early Planting

Date	Amount	Fertilizer	Formulation
9/1	600 lbs.	5-10-15	30-60-90
9/7	150 lbs.	18-46-0	27-69-0
10/5	200lbs.	CaNO3	31-0-0
10/12	200 lbs.	10-10-10	20-20-20
10/18	200 lbs.	CaNO3	31-0-0
			139-149-110

Plant Bed Fertility Program Standard Planting

Date	Amount	Fertilizer	Formulation
9/15	600 lbs.	5-10-15	30-60-90
9/22	150 lbs.	18-46-0	27-69-0
10/12	200 lbs.	10-10-10	20-20-20
10/18	200 lbs.	CaNO3	31-0-0
11/2	200 lbs	CaNO3	31-0-0
			139-149-110

Field Fertility Program Early Planting

Date	Amount	Fertilizer	Formulation
11/2	150 lbs.	18-46-0	27-69-0
1/7	300 lbs.	5-10-15	15-30-45
1/20	300 lbs.	5-10-15	15-30-45
2/1	200 lbs.	CaNO3	31-0-0
2/17	200 lbs.	CaNO3	31-0-0
			119-129-90

Field Fertility Program Standard Planting

Date	Amount	Fertilizer	Formulation
12/8	150 lbs.	18-46-0	27-69-0
1/7	300 lbs.	5-10-15	15-30-45
1/20	300 lbs.	5-10-15	15-30-45
2/1	200 lbs.	CaNO3	31-0-0
2/17	200 lbs.	CaNO3	31-0-0
			119-129-90

Pesticide Program Early Planting

Date	Amount/A	Material
1/14/11	14 oz.	Pristine
2/24/11	1 1/2 pts.	Rovral
3/3/11	2 lbs.	Mankocide
3/15/11	14 oz.	Pristine

Pesticide Program Standard Planting

Date	Amount /A	Material
1/14/11	14 oz.	Pristine
2/24/11	1 1/2 pts.	Rovral
3/3/11	2 lbs.	Mankocide
3/15/11	14 oz.	Pristine

The experiment was a randomized complete block design with four replications. Each plot was 25 feet long with a 5-foot in-row alley. Onions were pulled, laid on the ground for two to three days prior to clipping to cure by exposure to sunlight, then weighed to determine total green weight. After 24 to 48 hours of additional forced-air curing, onions were graded for size and marketability.

Size and Quality parameters:

Colossal: Over 4 inches in diameter
Jumbo: 3-4 inches in diameter

Medium: 2-3 inches in diameter
Cull: Off shaped, off color, damaged, diseased or onions less than 2 inches in size

Approximately 50 pounds of onions were transported to the Vidalia Onion Research Laboratory in Tifton, Ga., for storage testing. A 10-bulb sample was used to determine pungency, LF and sugar profiles.

Results and Discussion

Cold temperatures in December resulted in little to no growth in the earlier part of the season. Some varieties, such as Sweet Harvest in the early trial, performed poorly in the cold stretch and it was evident in the green weight yield. Once temperatures rebounded in February, onions were growing almost too fast. Considerations were given to reducing fertility rates on CaNO3 applications due to the excessive top growth, but original protocol was maintained. Cull rates are expressed as percent marketable onions and should be noted. Most culls were off-shaped (deeper than they were round or flat on one side due to being a “double”). Very few onions were culled due to pathogens this season.

Dry Weight Yield. Yield is reported as number of 60-pound bags/A for total dry weight yield subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 2, 3, 4, 5). Early planted onions had a range of 1,353 to 1,106 60-pound bags/A (40.6 to 33.2 tons/A). Varieties Sweet Deal and WI-129, DP had the highest yields among the early planted varieties and were not significantly different from one another (Table 2). Later planted yellow onions had a range of 1,186 to 744 60-pound bags/A (35.6 to 22.3 tons/A). Varieties J3003, Sweet Caroline and Nirvana had the highest yields among the later planted varieties and were not significantly different from one another (Table 3). Later planted red onions had a range of 905 to 710 60-pound bags/A (27.2 to 21.3 tons/A). Varieties Mata Hari, J 3004 and EMR 344 had the highest yields among the later planted red varieties and were not significantly different from one another (Table 4). Finally, the only white onion entry, Kristal, yielded 652 60-pound bags/A (19.6 tons/A) (Table 5).

Marketable Yield. Marketable yield is reported as the number of 40-pound bags/A and is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 6, 7, 8, 9). Early planted onions had a range of 1,666 to 1,137 40-pound bags/A (33.3 to 22.7 tons/A). Sweet Deal had the highest marketable yield among the early planted varieties (Table 6). Later planted yellow onions had a range of 1,677 to 628 40-pound bags/A (33.5 to 12.6 tons/A). Varieties J 3003 had the highest marketable yields among the later planted varieties (Table 7). Later planted red onions had a range of 1,174 to 682 40-pound bags/A (23.5 to 13.6 tons/A). Varieties J 3004, Mati Hari, EMR 344 and Pinot Rouge had the highest marketable yields among the later planted red varieties and were not significantly different from one another (Table 8). Finally, the only white onion entry, Kristal, had a marketable yield of 820 40-pound bags/A (16.4 tons/A) (Table 9).

Percent Marketable Yield. Percent marketable yield is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 10, 11, 12, 13). Early planted onions had a range of 87.5 to 67.4 percent marketable yield. Candy Ann had the highest percent marketable yield among the early planted varieties (Table 10). Later planted yellow onions had a range of 97.4 to 55.9 percent marketable yield. EMY Y. Granex and NUN 1006 led 15 varieties that were not significantly different from one another in terms of the highest yield (Table 11). Later planted red onions had a range of 92.9 to 63.9 percent marketable yield. J 3004 had the highest percent marketable yield among the later planted red varieties (Table 12). Finally, the only white onion entry, Kristal, resulted in an 84 percent marketable yield (Table 13).

Colossal Yields. Yield according to size grade Colossal is also subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 14, 15, 16, 17). Early planted onions had a range of 777 to 304 40-pound bags of Colossals/A. Sweet Deal had the highest yield of Colossals/A among the early planted varieties (Table 14). Later planted yellow onions had a range of 219 to 6 40-pound bags of Colossals/A. Varieties XON 403Y (Ringo), J3003 and NUN 1004 had the highest yields for Colossals among the later planted varieties and were not significantly different from one another (Table 15). Later planted red onions had a range of 46 to 7 40-pound bags of Colossals/A. Varieties Mata Hari, J 3004, EMR 344 and Pinot Rouge had the highest yields of Colossals among the later planted red varieties and were not significantly different from one another (Table 16). Finally, the only white onion entry, Kristal, yielded 0 Colossal-sized onions (Table 17).

Jumbo Yields. Yield according to size grade Jumbo is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 18, 19, 20, 21). Early planted onions had a range of 1,015 to 677 40-pound bags of Jumbos/A. Varieties Candy Ann, Honeybee, 10229 and Sweet Deal had the highest yields of Jumbos/A among the early planted varieties and were not significantly different from one another (Table 18). Later planted yellow onions had a range of 1,477 to 522 40-pound bags of Jumbos/A. Varieties J 3003 and J3002 (Alison) had the highest yields for Jumbos among the later planted varieties and were not significantly different from one another (Table 19). Later planted red onions had a range of 977 to 547 40-pound bags of Jumbos/A. All but one of the six varieties topped the list and were not significantly different from one another (Table 20). Finally, the only white onion entry, Kristal, yielded 519 40-pound bags of Jumbos/A (Table 21).

Medium Yield. Yield according to size grade Medium is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 22, 23, 24, 25). Early planted onions had a range of 44 to 5 40-pound bags of Mediums/A. Varieties Sweet Harvest, Candy Ann and Candy May had the highest yields of Mediums/A among the early planted varieties and were not significantly different from one another (Table 22). Later planted yellow onions had a range of 205 to 26 40-pound bags of Mediums/A. Sapelo Sweet, J3006, Sweet Uno and Miss Megan led 13 varieties that were not significantly different from one another in terms of the number of 40-pound bags of Mediums/A (Table 23). Later planted red onions had a range of 217 to 128 40-pound bags of Mediums/A. Although Pinot Rouge had the highest yield of Mediums among the later planted red varieties, none of the six varieties were significantly different from one another (Table 24). Finally, the only white onion entry, Kristal, yielded 301 40-pound bags of Mediums/A (Table 25).

Number of Seed Stems. Number of seed stems/A is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 26, 27, 28, 29). Early planted onions were rated on March 25, 2011 and had a range of 378 to 10,251 seed stems/A. The variety Candy Ann had the fewest number of seed stems/A among the early planted varieties (Table 26). All later planted onions were rated on May 29, 2011. Later planted yellow onions had a range of 0 to 7,405 seed stems/A. With 0 seed stems/A, varieties J3003, Century, NUN 1002 and Nirvana led a group of 26 varieties that were not significantly different for fewest number of seed stems among the later planted varieties (Table 27). Later planted red onions had a range of 0 to 1,103 seed stems/A. The variety Pinot Rouge had the fewest number of seed stems/A among the later planted red varieties, but only one variety had a significantly higher number of seed stems/A (Table 28). Finally, the only white onion entry, Kristal, had 0 seed stems/A (Table 29).

Number of Doubles. Number of doubles/A is subdivided by planting date and by onion type (e.g., yellow, red or white) (Tables 30, 31, 32, 33). Early planted onions were rated on March 25, 2011 and had a range of 523 to 6,331 doubles/A. The variety Candy Ann led a group of nine varieties that were not significantly different for the fewest number of doubles/A among the early planted varieties (Table 30). All later planted onions were rated on May 29, 2011. Later planted yellow onions had a range of 0 to 2,323 doubles/A. Varieties J3007, NUN 1008, Sweet Caroline and J3006 led a group of 27 varieties that were not significantly different for the fewest number of doubles/A among the later planted varieties (Table 31). Later planted red onions had a range of 87 to 668 doubles/A. The varieties J3004 and Lambda had the fewest number of doubles/A among the later planted red varieties, but only one variety had significantly higher doubles/A (Table 32). Finally, the only white onion entry, Kristal, had 290 doubles/A (Table 33).

Pungency and Flavor Characteristics. Pungency and flavor characteristics are presented in Table 34. A few varieties for which there are no yield data are listed in Table 34. Briefly, pungency values (υmol pyruvate/ml) ranged from 1.5 (Sweet Caroline) to 3.5 (10229) and the mean pungency of all 46 varieties was 2.3 υmol pyruvate/ml. Percent BRIX values, essentially a specific gravity measurement of soluble solids, ranged from 8.2 (WI-129 (Amelia)) to 11.05 (NUN1006). The mean percent of BRIX for all varieties was 9.58. Lachrymatory factor (LF) values (υmol/ml) ranged from 0.71 (J3005) to 4.1 (10229) and the mean for all varieties was 2.89 υmol/ml. Finally, total sugars (Σ Glucose + Fructose + Sucrose) as g/100 g fresh weight ranged from 3.76 (EMY Granex 110) to 6.67 (Goldeneye) and had a mean value of 5.43 g/100 g fresh weight.

Postharvest Storage Results. Pre-storage weights, post-storage (CA) weights, 0 day post marketable weights, 14-day post marketable weights, and percent marketable for early, standard, red and white varieties are listed in Table 35.

Table 1. List of Onion Varieties, Entry Number, Company, Onion Type, Seeding Dates and Harvest Dates for the 2010-2011 Vidalia Onion Variety Trial

Entry #	Variety	Company	Onion Type	Seed Sown	Harvest Date
1	WI-129	Wannamaker	Yellow	9/7/2011	4/18/2011
2	Candy Ann	Solar Seeds	Yellow	9/7/2011	4/18/2011
3	Candy Kim	Solar Seeds	Yellow	9/7/2011	4/18/2011
4	Candy May	Solar Seeds	Yellow	9/7/2011	4/18/2011
5	Honeybee	Shamrock Seed	Yellow	9/7/2011	4/18/2011
6	Sweet Deal	Shamrock Seed	Yellow	9/7/2011	4/18/2011
7	DP Sweet 1407	DP Seeds	Yellow	9/7/2011	4/18/2011
8	10229	Hazera	Yellow	9/7/2011	4/25/2011
9	Sweet Harvest	Sakata Seed	Yellow	9/7/2011	4/25/2011
10	Sweet Uno	Enza Zaden	Yellow	9/20/2011	4/27/2011
11	Sweet Jalene	Enza Zaden	Yellow	9/20/2011	4/27/2011
12	Georgia Boy	DP Seeds	Yellow	9/20/2011	4/27/2011
13	Miss Megan	DP Seeds	Yellow	9/20/2011	4/27/2011
14	Mr Buck	DP Seeds	Yellow	9/20/2011	4/27/2011
15	Sapelo Sweet	DP Seeds	Yellow	9/20/2011	4/25/2011
16	NUN 1002	Nunhems	Yellow	9/20/2011	4/18/2011
17	NUN 1003	Nunhems	Yellow	9/20/2011	4/20/2011
18	NUN 1004	Nunhems	Yellow	9/20/2011	4/20/2011
19	NUN 1006	Nunhems	Yellow	9/20/2011	4/25/2011
20	NUN 1008	Nunhems	Yellow	9/20/2011	4/20/2011
21	Sweet Caroline	Nunhems	Yellow	9/20/2011	4/27/2011
22	Caramelo	Nunhems	Yellow	9/20/2011	4/27/2011
23	Sweet Vidalia	Nunhems	Yellow	9/20/2011	4/25/2011
24	Nirvana	Nunhems	Yellow	9/20/2011	4/27/2011
25	Goldeneye	Seminis	Yellow	9/20/2011	4/27/2011
26	Century	Seminis	Yellow	9/20/2011	4/27/2011
27	Granex Yellow Prr	Seminis	Yellow	9/20/2011	5/2/2011
28	Savannah Sweet	Seminis	Yellow	9/20/2011	5/2/2011
29	Sweet Agent (6013)	Seminis	Yellow	9/20/2011	4/20/2011
30	J3002 (Alison)	Bejo	Yellow	9/20/2011	5/2/2011
31	J3003	Bejo	Yellow	9/20/2011	5/2/2011
32	J3006	Bejo	Yellow	9/20/2011	4/20/2011
33	J3007	Bejo	Yellow	9/20/2011	4/25/2011
34	Sweet Jasper	Sakata Seed	Yellow	9/20/2011	5/2/2011
35	XON 403Y (Ringo)	Sakata Seed	Yellow	9/20/2011	5/2/2011
36	HS 18550	Hortag	Yellow	9/20/2011	5/2/2011
37	EMY Y. Granex 110	Emerald	Yellow	9/20/2011	5/2/2011
38	EMY 55350	Emerald	Yellow	9/20/2011	5/2/2011
39	EMY 55375	Emerald	Yellow	9/20/2011	5/2/2011
40	Pinot Rouge	DP Seeds	Red	9/20/2011	5/9/2011
41	J3004	Bejo	Red	9/20/2011	5/2/2011
42	J3005 (Red Hunter)	Bejo	Red	9/20/2011	5/2/2011
43	Mata Hari	Nunhems	Red	9/20/2011	5/9/2011
44	Lambada	Nunhems	Red	9/20/2011	5/9/2011
45	EMR 344	Emerald	Red	9/20/2011	5/9/2011
46	Kristal	Nunhems	White	9/20/2011	4/25/2011

Table 2. Dry Weight of Early Planted Varieties

Harvest Date	Entry #	Variety	60 lb. units/A	*P*=0.05 LSD= 24.86
4/18/2011	6	Sweet Deal	1353	a
4/18/2011	1	WI-129	1265	ab
4/18/2011	7	DP Sweet 1407	1202	bc
4/18/2011	5	Honeybee	1200	bc
4/18/2011	4	Candy May	1197	bc
4/25/2011	8	10229	1187	bc
4/18/2011	3	Candy Kim	1177	bc
4/18/2011	2	Candy Ann	1106	c

Table 3. Dry Weight of Standard Planted Varieties

Harvest Date	Entry #	Variety	60 lb. units/A	*P*=0.05 LSD= 26.02
5/2/2011	31	J3003	1186	a
4/27/2011	21	Sweet Caroline	1076	ab
4/27/2011	24	Nirvana	1065	ab
5/2/2011	28	Savannah Sweet	1052	bc
5/2/2011	30	J3002 (Alison)	1047	bc
4/20/2011	29	Sweet Agent (6013)	1041	bcd
5/2/2011	35	XON 403Y (Ringo)	1024	bcd
4/20/2011	17	NUN 1003	1016	bcd
4/27/2011	25	Goldeneye	998	bcde
4/25/2011	19	NUN 1006	981	bcdef
4/20/2011	18	NUN 1004	977	bcdef
5/2/2011	36	HS 18550	936	cdefg
4/25/2011	33	J3007	919	defg
4/27/2011	26	Century	884	efgh
5/2/2011	27	Granex Yellow Prr	880	efgh
5/2/2011	34	Sweet Jasper	880	efgh
5/2/2011	39	EMY 55375	871	fghi
4/18/2011	16	NUN 1002	861	fghij
4/20/2011	20	NUN 1008	841	ghij
4/27/2011	14	Mr Buck	838	ghij
4/27/2011	22	Caramelo	837	ghij
4/25/2011	15	Sapelo Sweet	836	ghij
4/20/2011	32	J3006	828	ghij
4/27/2011	11	Sweet Jalene	817	ghij
4/25/2011	23	Sweet Vidalia	785	hij
4/27/2011	13	Miss Megan	776	hij
5/2/2011	37	EMY Y. Granex 110	775	hij
4/27/2011	12	Georgia Boy	753	ij
5/2/2011	38	EMY 55350	748	ij
4/27/2011	10	Sweet Uno	744	j

Table 4. Dry Weight of Standard Planted Red Varieties

Harvest Date	Entry #	Variety	60 lb. units/A	*P*=0.05 LSD= 22.74
5/9/2011	43	Mata Hari	905	a
5/2/2011	41	J3004	843	ab
5/9/2011	45	EMR 344	832	ab
5/9/2011	40	Pinot Rouge	788	bc
5/2/2011	42	J3005 (Red Hunter)	769	bc
5/9/2011	44	Lambada	710	c

Table 5. Dry Weight of Standard Planted White Varieties

Harvest Date	Entry #	Variety	60 lb. units/A
4/25/2011	46	Kristal	652

Table 6. Marketable Yield Early Planted Varieties

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 187.90
4/18/2011	6	Sweet Deal	1666	a
4/18/2011	5	Honeybee	1477	b
4/18/2011	2	Candy Ann	1451	bc
4/18/2011	4	Candy May	1395	bcd
4/18/2011	7	DP Sweet 1407	1382	bcd
4/18/2011	3	Candy Kim	1376	bcd
4/18/2011	1	WI-129	1278	cde
4/25/2011	8	10229	1227	de
4/25/2011	9	Sweet Harvest	1137	e

Table 7. Marketable Yield Standard Planted Varieties

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 198.89
5/2/2011	31	J3003	1677	a
4/20/2011	29	Sweet Agent (6013)	1430	b
4/20/2011	17	NUN 1003	1414	bc
4/25/2011	19	NUN 1006	1412	bc
5/2/2011	30	J3002 (Alison)	1407	bc
4/27/2011	21	Sweet Caroline	1391	bcd
4/27/2011	25	Goldeneye	1328	bcde
4/20/2011	18	NUN 1004	1327	bcde
4/25/2011	33	J3007	1269	bcdef
5/2/2011	35	XON 403Y (Ringo)	1248	bcdefg
5/2/2011	28	Savannah Sweet	1230	cdefgh
5/2/2011	34	Sweet Jasper	1207	defghi
4/18/2011	16	NUN 1002	1199	defghij
4/20/2011	20	NUN 1008	1188	efghij
5/2/2011	39	EMY 55375	1159	efghijk
5/2/2011	36	HS 18550	1155	efghijk
4/20/2011	32	J3006	1153	efghijk
4/25/2011	15	Sapelo Sweet	1149	efghijk
4/27/2011	26	Century	1133	efghijk
5/2/2011	37	EMY Y. Granex 110	1130	efghijk
4/27/2011	14	Mr Buck	1108	fghijk
4/27/2011	24	Nirvana	1106	fghijk
4/27/2011	22	Caramelo	1085	fghijk
4/27/2011	23	Sweet Vidalia	1061	ghijk
5/2/2011	27	Granex Yellow Prr	1037	hijk
4/27/2011	12	Georgia Boy	1017	ijk
4/27/2011	10	Sweet Uno	1004	jk
4/27/2011	13	Miss Megan	976	k
4/27/2011	11	Sweet Jalene	972	k
5/2/2011	38	EMY 55350	628	l

Table 8. Marketable Yield Standard Planted Red Varieties

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 149.8
5/2/2011	41	J3004	1174	a
5/9/2011	43	Mata Hari	1121	ab
5/9/2011	45	EMR 344	1102	ab
5/9/2011	40	Pinot Rouge	1029	ab
5/2/2011	42	J3005 (Red Hunter)	1023	b
5/9/2011	44	Lambada	682	c

Table 9. Marketable Yield Weight of Standard Planted White Varieties

Harvest Date	Entry #	Variety	40 lb. units/A
4/25/2011	46	Kristal	820

Table 10. Percent Marketable Yield Early Planted Varieties

Harvest Date	Entry #	Variety	% Mkt/A	*P*=0.05 LSD= 5.15
4/18/2011	2	Candy Ann	87.5	a
4/18/2011	5	Honeybee	82.1	b
4/18/2011	6	Sweet Deal	82	b
4/25/2011	9	Sweet Harvest	81	bc
4/18/2011	3	Candy Kim	77.9	bc
4/18/2011	4	Candy May	77.5	bc
4/18/2011	7	DP Sweet 1407	76.5	c
4/25/2011	8	10229	68.8	d
4/18/2011	1	WI-129	67.4	d

Table 11. Percent Marketable Yield Standard Planted Varieties

Harvest Date	Entry #	Variety	% Mkt/A	*P*=0.05 LSD= 8.45
5/2/2011	37	EMY Y. Granex 110	97.4	a
4/25/2011	19	NUN 1006	96	ab
5/2/2011	31	J3003	94.3	abc
4/20/2011	20	NUN 1008	94.2	abc
4/18/2011	16	NUN 1002	92.8	abcd
4/20/2011	17	NUN 1003	92.8	abcd
4/20/2011	32	J3006	92.7	abcd
4/25/2011	33	J3007	92.1	abcd
4/25/2011	15	Sapelo Sweet	91.7	abcde
4/20/2011	29	Sweet Agent (6013)	91.6	abcde
5/2/2011	34	Sweet Jasper	91.2	abcde
4/20/2011	18	NUN 1004	90.5	abcdef
4/25/2011	23	Sweet Vidalia	90.2	abcdef
4/27/2011	10	Sweet Uno	89.9	abcdef
5/2/2011	30	J3002 (Alison)	89.6	abcdefg
5/2/2011	39	EMY 55375	88.6	bcdefg
4/27/2011	25	Goldeneye	88.6	bcdefg
4/27/2011	14	Mr Buck	88.1	bcdefgh
4/27/2011	12	Georgia Boy	87	cdefgh
4/27/2011	22	Caramelo	86.5	cdefghi
4/27/2011	21	Sweet Caroline	86.2	cdefghij
4/27/2011	26	Century	85.2	defghij
4/27/2011	13	Miss Megan	83.4	efghij
5/2/2011	36	HS 18550	82.3	fghij
5/2/2011	35	XON 403Y (Ringo)	81.2	ghij
4/27/2011	11	Sweet Jalene	80	hij
5/2/2011	27	Granex Yellow Prr	78.4	ij
5/2/2011	28	Savannah Sweet	77.9	j
4/27/2011	24	Nirvana	68.7	k
5/2/2011	38	EMY 55350	55.9	l

Table 12. Percent Marketable Yield Standard Planted Red Varieties

Harvest Date	Entry #	Variety	% Mkt/A	*P*=0.05 LSD= 3.88
5/2/2011	41	J3004	92.9	a
5/2/2011	42	J3005 (Red Hunter)	88.6	b
5/9/2011	45	EMR 344	88.3	b
5/9/2011	40	Pinot Rouge	87.1	b
5/9/2011	43	Mata Hari	82.6	c
5/9/2011	44	Lambada	63.9	d

Table 13. Percent Marketable Yield Standard Planted White Varieties

Harvest Date	Entry #	Variety	% Mkt/A
4/25/2011	46	Kristal	84

Table 14. Yield of Early Planted Varieties by Size Colossal

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 180.33
4/18/2011	6	Sweet Deal	777	a
4/18/2011	1	WI-129	596	b
4/18/2011	4	Candy May	595	b
4/18/2011	3	Candy Kim	590	b
4/18/2011	7	DP Sweet 1407	581	b
4/18/2011	5	Honeybee	474	bc
4/18/2011	2	Candy Ann	395	c
4/25/2011	8	10229	333	c
4/25/2011	9	Sweet Harvest	304	c

Table 15. Yield of Standard Planted Varieties by Size Colossal

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 10.45
5/2/2011	35	XON 403Y (Ringo)	219	a
5/2/2011	31	J3003	163	ab
4/20/2011	18	NUN 1004	143	abc
4/27/2011	21	Sweet Caroline	138	bc
4/27/2011	24	Nirvana	129	bcd
4/20/2011	29	Sweet Agent (6013)	121	bcde
5/2/2011	39	EMY 55375	106	bcdef
4/20/2011	17	NUN 1003	98	bcdefg
4/27/2011	25	Goldeneye	96	bcdefg
5/2/2011	28	Savannah Sweet	95	bcdefg
5/2/2011	30	J3002 (Alison)	78	cdefgh
4/25/2011	19	NUN 1006	77	cdefgh
4/20/2011	32	J3006	68	cdefgh
4/27/2011	26	Century	61	defgh
4/25/2011	33	J3007	57	defgh
5/2/2011	27	Granex Yellow Prr	53	efgh
5/2/2011	36	HS 18550	51	efgh
5/2/2011	34	Sweet Jasper	45	efgh
4/18/2011	16	NUN 1002	44	fgh
4/25/2011	23	Sweet Vidalia	43	fgh
5/2/2011	37	EMY Y. Granex 110	42	fgh
4/27/2011	13	Miss Megan	39	fgh
5/2/2011	38	EMY 55350	34	fgh
4/27/2011	12	Georgia Boy	33	fgh
4/27/2011	11	Sweet Jalene	27	gh
4/20/2011	20	NUN 1008	25	gh
4/27/2011	14	Mr Buck	18	h
4/27/2011	22	Caramelo	18	h
4/25/2011	15	Sapelo Sweet	16	h
4/27/2011	10	Sweet Uno	6	h

Table 16. Yield of Standard Planted Red Varieties by Size Colossal

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 34.49
5/9/2011	43	Mata Hari	46.00	a
5/2/2011	41	J3004	41.00	ab
5/9/2011	45	EMR 344	18.00	ab
5/9/2011	40	Pinot Rouge	17.00	ab
5/2/2011	42	J3005 (Red Hunter)	11.00	b
5/9/2011	44	Lambada	7.00	b

Table 17. Yield of Standard Planted White Varieties by Size Colossal

Harvest Date	Entry #	Variety	40 lb units/A
4/25/2011	46	Kristal	0

Table 18. Yield of Early Harvested Varieties by Size Jumbo

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 158.44
4/18/2011	2	Candy Ann	1015	a
4/18/2011	5	Honeybee	985	a
4/25/2011	8	10229	878	ab
4/18/2011	6	Sweet Deal	866	ab
4/25/2011	9	Sweet Harvest	789	bc
4/18/2011	7	DP Sweet 1407	782	bc
4/18/2011	4	Candy May	777	bc
4/18/2011	3	Candy Kim	766	bc
4/18/2011	1	WI-129	677	c

Table 19. Yield of Standard Harvested Varieties by Size Jumbo

Harvest Date	Entry #	Variety	40 lb. units/A	P=0.05 LSD= 205.58
5/2/2011	31	J3003	1477	a
5/2/2011	30	J3002 (Alison)	1274	ab
4/20/2011	29	Sweet Agent (6013)	1234	b
4/20/2011	17	NUN 1003	1224	b
4/25/2011	19	NUN 1006	1219	b
4/27/2011	21	Sweet Caroline	1198	bc
4/27/2011	25	Goldeneye	1175	bcd
4/20/2011	18	NUN 1004	1103	bcde
4/25/2011	33	J3007	1103	bcde
5/2/2011	28	Savannah Sweet	1094	bcde
5/2/2011	34	Sweet Jasper	1013	cdef
4/20/2011	20	NUN 1008	1009	cdefg
5/2/2011	36	HS 18550	979	defgh
4/18/2011	16	NUN 1002	975	defgh
4/27/2011	26	Century	960	efgh
4/27/2011	24	Nirvana	951	efgh
4/27/2011	14	Mr Buck	936	efghi
5/2/2011	35	XON 403Y (Ringo)	934	efghi
5/2/2011	39	EMY 55375	930	efghi
4/25/2011	15	Sapelo Sweet	929	efghi
5/2/2011	37	EMY Y. Granex 110	911	efghi
4/27/2011	22	Caramelo	908	efghi
5/2/2011	27	Granex Yellow Prr	902	efghi
4/20/2011	32	J3006	884	fghi
4/27/2011	12	Georgia Boy	844	fghi
4/25/2011	23	Sweet Vidalia	831	fghi
4/27/2011	10	Sweet Uno	803	ghi
4/27/2011	11	Sweet Jalene	796	hi
4/27/2011	13	Miss Megan	743	i
5/2/2011	38	EMY 55350	522	j

Table 20. Yield of Standard Harvested Red Varieties by Size Jumbo

Harvest Date	Entry #	Variety	40 lb units/A	P=0.05 LSD= 201.85
5/2/2011	41	J3004	977	a
5/9/2011	43	Mata Hari	933	a
5/9/2011	45	EMR 344	932	a
5/2/2011	42	J3005 (Red Hunter)	804	a
5/9/2011	40	Pinot Rouge	796	a
5/9/2011	44	Lambada	547	b

Table 21. Yield of Standard Planted White Varieties by Size Jumbo

Harvest Date	Entry #	Variety	40 lb units/A
4/25/2011	46	Kristal	519

Table 22. Yield of Early Harvested Varieties by Size Medium

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 21.18
4/25/2011	9	Sweet Harvest	44	a
4/18/2011	2	Candy Ann	41	ab
4/18/2011	4	Candy May	23	abc
4/18/2011	6	Sweet Deal	21	bc
4/18/2011	3	Candy Kim	20	c
4/18/2011	7	DP Sweet 1407	20	c
4/18/2011	5	Honeybee	18	c
4/25/2011	8	10229	16	c
4/18/2011	1	WI-129	5	c

Table 23. Yield of Standard Harvested Varieties by Size Medium

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 64.8
4/25/2011	15	Sapelo Sweet	205	a
4/20/2011	32	J3006	201	a
4/27/2011	10	Sweet Uno	194	a
4/27/2011	13	Miss Megan	193	a
4/25/2011	23	Sweet Vidalia	187	ab
4/18/2011	16	NUN 1002	181	abc
5/2/2011	37	EMY Y. Granex 110	178	abc
4/27/2011	22	Caramelo	160	abcd
4/20/2011	20	NUN 1008	154	abcde
4/27/2011	14	Mr Buck	154	abcde
4/27/2011	11	Sweet Jalene	149	abcde
5/2/2011	34	Sweet Jasper	149	abcde
4/27/2011	12	Georgia Boy	140	abcdef
5/2/2011	36	HS 18550	125	bcdefg
5/2/2011	39	EMY 55375	124	cdefg
4/25/2011	19	NUN 1006	116	cdefgh
4/27/2011	26	Century	111	defgh
4/25/2011	33	J3007	110	defgh
5/2/2011	35	XON 403Y (Ringo)	95	efghi
4/20/2011	17	NUN 1003	92	efghi
5/2/2011	27	Granex Yellow Prr	82	fghij
4/20/2011	18	NUN 1004	81	fghij
4/20/2011	29	Sweet Agent (6013)	76	fghij
5/2/2011	38	EMY 55350	73	ghij
4/27/2011	25	Goldeneye	57	hij
5/2/2011	30	J3002 (Alison)	56	hij
4/27/2011	21	Sweet Caroline	54	hij
5/2/2011	28	Savannah Sweet	42	ij
5/2/2011	31	J3003	37	ij
4/27/2011	24	Nirvana	26	j

Table 24. Yield of Standard Harvested Red Varieties by Size Medium

Harvest Date	Entry #	Variety	40 lb. units/A	*P*=0.05 LSD= 91.11
5/9/2011	40	Pinot Rouge	217	a
5/2/2011	42	J3005 (Red Hunter)	208	a
5/2/2011	41	J3004	156	a
5/9/2011	45	EMR 344	152	a
5/9/2011	43	Mata Hari	143	a
5/9/2011	44	Lambada	128	a

Table 25. Yield of Standard Planted White Varieties by Size Medium

Harvest Date	Entry #	Variety	40 lb. units/A
4/25/2011	46	Kristal	301

Table 26. # Seed Stems of Early Harvested Varieties

Harvest Date	Entry #	Variety	#SS/A	*P*=0.05	Recorded
4/18/2011	2	Candy Ann	377.52	a	3/25/2011
4/25/2011	8	10229	1887.6	ab	3/25/2011
4/18/2011	7	DP Sweet 1407	2700.72	ab	3/25/2011
4/18/2011	6	Sweet Deal	3339.6	abc	3/25/2011
4/18/2011	3	Candy Kim	3920.4	bc	3/25/2011
4/18/2011	5	Honeybee	5808	cd	3/25/2011
4/25/2011	9	Sweet Harvest	8218.32	de	3/25/2011
4/18/2011	1	WI-129	9583.2	e	3/25/2011
4/18/2011	4	Candy May	10251.12	e	3/25/2011

Table 27 # Seed Stems of Standard Harvested Varieties

Harvest Date	Entry #	Variety	#SS/A	*P*=0.05	Recorded
5/2/2011	31	J3003	0	a	5/29/2011
4/27/2011	26	Century	0	a	5/29/2011
4/18/2011	16	NUN 1002	0	a	5/29/2011
4/27/2011	24	Nirvana	0	a	5/29/2011
4/27/2011	21	Sweet Caroline	87.12	a	5/29/2011
4/25/2011	33	J3007	87.12	a	5/29/2011
4/27/2011	22	Caramelo	87.12	a	5/29/2011
4/20/2011	20	NUN 1008	87.12	a	5/29/2011
5/2/2011	28	Savannah Sweet	87.12	a	5/29/2011
4/25/2011	19	NUN 1006	145.2	a	5/29/2011
5/2/2011	30	J3002 (Alison)	145.2	a	5/29/2011
5/2/2011	27	Granex Yellow Prr	232.32	a	5/29/2011
4/27/2011	13	Miss Megan	290.4	a	5/29/2011
4/20/2011	17	NUN 1003	290.4	a	5/29/2011
5/2/2011	38	EMY 55350	377.52	a	5/29/2011
4/27/2011	12	Georgia Boy	435.6	a	5/29/2011
5/2/2011	37	EMY Y. Granex 110	522.72	a	5/29/2011
5/2/2011	34	Sweet Jasper	726	a	5/29/2011
5/2/2011	36	HS 18550	726	a	5/29/2011
5/2/2011	35	XON 403Y (Ringo)	813.12	ab	5/29/2011
4/20/2011	18	NUN 1004	813.12	ab	5/29/2011
4/25/2011	15	Sapelo Sweet	1016.4	ab	5/29/2011
4/27/2011	25	Goldeneye	1016.4	ab	5/29/2011
4/20/2011	29	Sweet Agent (6013)	1016.4	ab	5/29/2011
4/20/2011	32	J3006	1103.52	ab	5/29/2011
4/27/2011	14	Mr Buck	1248.72	ab	5/29/2011
4/25/2011	23	Sweet Vidalia	2410.32	bc	5/29/2011
5/2/2011	39	EMY 55375	3136.32	cd	5/29/2011
4/27/2011	10	Sweet Uno	4646.4	d	5/29/2011
4/27/2011	11	Sweet Jalene	7405.2	e	5/29/2011

Table 28. # Seed Stems of Standard Harvested Red Varieties

Harvest Date	Entry #	Variety	#SS/A	*P*=0.05	Recorded
5/9/2011	40	Pinot Rouge	0	a	5/29/2011
5/9/2011	44	Lambada	145.2	a	5/29/2011
5/2/2011	41	J3004	232.32	a	5/29/2011
5/2/2011	42	J3005 (Red Hunter)	232.32	a	5/29/2011
5/9/2011	45	EMR 344	290.4	a	5/29/2011
5/9/2011	43	Mata Hari	1103.52	b	5/29/2011

Table 29. # Seed Stems of Standard Harvested White Varieties

Harvest Date	Entry #	Variety	#SS/A	Recorded
4/25/2011	46	Kristal	0	5/29/2011

Table 30. # Doubles of Early Harvested Varieties

Harvest Date	Entry #	Variety	#Doubles/A	*P*=0.05	Recorded
4/18/2011	2	Candy Ann	522.72	a	3/25/2011
4/18/2011	1	WI-129	1161.6	a	3/25/2011
4/18/2011	5	Honeybee	1161.6	a	3/25/2011
4/18/2011	6	Sweet Deal	1161.6	a	3/25/2011
4/18/2011	4	Candy May	1306.8	a	3/25/2011
4/25/2011	9	Sweet Harvest	1597.2	ab	3/25/2011
4/18/2011	7	DP Sweet 1407	1684.32	ab	3/25/2011
4/18/2011	3	Candy Kim	2555.52	b	3/25/2011
4/25/2011	8	10229	6330.72	c	3/25/2011

Table 31 # Doubles of Standard Harvested Varieties

Harvest Date	Entry #	Variety	#Doubles/A	*P*=0.05	Recorded
4/25/2011	33	J3007	0	a	5/29/2011
4/20/2011	20	NUN 1008	87.12	a	5/29/2011
4/27/2011	21	Sweet Caroline	87.12	a	5/29/2011
4/20/2011	32	J3006	87.12	a	5/29/2011
5/2/2011	37	EMY Y. Granex 110	145.2	a	5/29/2011
5/2/2011	38	EMY 55350	145.2	a	5/29/2011
4/20/2011	17	NUN 1003	145.2	a	5/29/2011
5/2/2011	28	Savannah Sweet	145.2	a	5/29/2011
4/18/2011	16	NUN 1002	145.2	a	5/29/2011
4/25/2011	19	NUN 1006	232.32	ab	5/29/2011
4/27/2011	11	Sweet Jalene	232.32	ab	5/29/2011
5/2/2011	34	Sweet Jasper	232.32	ab	5/29/2011
4/27/2011	25	Goldeneye	232.32	ab	5/29/2011
4/27/2011	26	Century	232.32	ab	5/29/2011
5/2/2011	31	J3003	290.4	ab	5/29/2011
4/27/2011	22	Caramelo	290.4	ab	5/29/2011
4/27/2011	24	Nirvana	290.4	ab	5/29/2011
5/2/2011	30	J3002 (Alison)	377.52	ab	5/29/2011
4/20/2011	18	NUN 1004	377.52	ab	5/29/2011
4/27/2011	14	Mr Buck	377.52	ab	5/29/2011
4/27/2011	10	Sweet Uno	377.52	ab	5/29/2011
4/27/2011	13	Miss Megan	522.72	abc	5/29/2011
4/27/2011	12	Georgia Boy	580.8	abc	5/29/2011
5/2/2011	35	XON 403Y (Ringo)	726	abc	5/29/2011
4/20/2011	29	Sweet Agent (6013)	726	abc	5/29/2011
5/2/2011	36	HS 18550	813.12	abc	5/29/2011
4/25/2011	23	Sweet Vidalia	871.2	abc	5/29/2011
5/2/2011	39	EMY 55375	1103.52	bc	5/29/2011
5/2/2011	27	Granex Yellow Prr	1393.92	c	5/29/2011
4/25/2011	15	Sapelo Sweet	2323.2	d	5/29/2011

Table 32. # Doubles of Standard Harvested Red Varieties

Harvest Date	Entry #	Variety	#Doubles/A	*P*=0.05	Recorded
5/2/2011	41	J3004	87.12	a	5/29/2011
5/9/2011	44	Lambada	87.12	a	5/29/2011
5/9/2011	45	EMR 344	145.2	ab	5/29/2011
5/9/2011	40	Pinot Rouge	145.2	ab	5/29/2011
5/2/2011	42	J3005 (Red Hunter)	290.4	ab	5/29/2011
5/9/2011	43	Mata Hari	667.92	b	5/29/2011

Table 33. # Doubles of Standard Harvested White Varieties

Harvest Date	Entry #	Variety	#Doubles/A	Recorded
4/25/2011	46	Kristal	290	5/29/2011

Table 34. Pungency, LF, % BRIX and total soluble sugars 2010-2011 Vidalia Onion Variety Trial *

Variety	Pungency	LF	BRIX	Total SS
10229	3.50	4.10	10.15	5.79
Mata Hari	2.97	2.80	9.40	4.57
WI-129 (Amelia)	2.87	2.86	8.20	5.82
Sapelo Sweet	2.81	3.29	10.75	5.86
EMY 55375	2.69	2.91	10.05	4.24
EMY 55350	2.67	2.75	9.45	4.02
Sweet Vidalia	2.63	3.44	10.15	6.27
Sweet Harvest	2.61	3.13	9.75	6.44
Mr Buck	2.59	3.85	9.65	6.43
Honeybee	2.57	3.57	8.95	5.44
Candy May	2.55	3.65	8.35	5.63
J 3003	2.54	3.45	9.65	4.18
Candy Ann (2005)	2.53	2.77	8.45	5.67
Goldeneye	2.53	3.26	10.10	6.67
HS 18550	2.49	3.68	9.45	4.72
Candy Kim	2.46	2.53	8.40	5.97
Granex Yellow PRR	2.45	3.80	10.05	5.77
Savannah Sweet	2.43	3.24	9.25	3.97
Pinot Rouge	2.41	2.25	10.55	5.49
EMY Granex 110	2.37	3.77	9.75	3.76
J 3007	2.36	2.60	8.95	6.42
J 3004	2.35	2.26	9.70	3.97
6013 (Sweet Agent)	2.34	2.70	9.55	5.00
Sweet Deal	2.33	3.69	8.55	5.79
J 3002 (Alison)	2.33	2.76	9.85	5.44
EMR 344	2.33	3.24	8.75	4.97
Sweet Jasper	2.28	2.78	10.60	4.11
Miss Megan	2.25	3.56	9.75	4.09
NUN 1006	2.21	2.72	11.05	6.39
DP Sweet 1407	2.20	2.93	8.75	5.50
Sweet Jalene	2.13	2.70	9.60	5.46
NUN 1003	2.09	2.71	8.50	5.92
Georgia Boy	2.07	2.39	10.25	5.43
NUN 1008	2.07	3.66	9.95	5.10
Century	2.06	2.73	9.90	5.70
XON 403 Y (Ringo)	1.97	2.46	9.55	5.43
Lambada	1.95	1.72	10.35	3.98
Kristal	1.92	2.57	10.10	6.11
Sweet Uno	1.86	2.70	9.80	*5.77*

Variety	Pungency	LF	BRIX	Total SS
J 3006	1.84	2.72	9.35	6.11
Caramelo	1.81	2.98	10.05	5.13
J 3005 (Red Hunter)	1.79	0.71	9.75	6.46
Nirvana	1.74	2.38	9.35	6.62
NUN 1004	1.59	2.40	9.40	5.81
NUN 1002	1.57	1.62	9.25	6.47
Sweet Caroline	1.55	1.98	9.35	6.30

*** Data provided by National Onion Labs, Inc. Collins, Ga.**

Table 35. Postharvest Storage Data for Early Yellow, Standard Yellow, Red and White Onions in the 2010-2011 Vidalia Onion Variety Trial

Variety	Type	Pre Harvest Wt. (lbs)	Post Hrvst Wt. Day 0	Post Hrvst Wt. Day 14	% Mkt Day 14
WI-129	Early Yellow	56.0	30.1	21.3	38.0
Candy Ann	Early Yellow	62.8	44.4	32.4	51.5
Candy Kim	Early Yellow	64.3	48.7	32.1	50.0
Candy May	Early Yellow	62.5	45.2	30.0	48.0
Honeybee	Early Yellow	68.7	45.6	33.8	49.1
Sweet Deal	Early Yellow	63.8	48.4	35.2	55.1
DP Sweet 1407	Early Yellow	58.4	35.5	23.8	40.8
10229	Early Yellow	61.0	53.0	44.7	73.3
Sweet Harvest	Early Yellow	56.5	37.9	26.1	46.2
Sweet Uno	Std. Yellow	61.8	55.2	49.4	79.9
Sweet Jalene	Std. Yellow	63.7	56.3	47.6	74.7
Georgia Boy	Std. Yellow	68.6	62.5	54.8	79.8
Miss Megan	Std. Yellow	58.3	52.5	47.8	82.0
Mr Buck	Std. Yellow	62.4	58.8	53.8	86.2
Sapelo Sweet	Std. Yellow	61.3	47.7	39.4	64.3
NUN 1002	Std. Yellow	64.6	46.8	35.1	54.3
NUN 1003	Std. Yellow	72.6	51.3	31.3	43.1
NUN 1004	Std. Yellow	63.5	23.9	15.1	23.8
NUN 1006	Std. Yellow	71.0	62.7	54.0	76.0
NUN 1008	Std. Yellow	61.1	42.4	27.8	45.4
Sweet Caroline	Std. Yellow	67.8	60.1	49.0	72.3
Caramelo	Std. Yellow	60.8	55.0	49.2	81.0
Sweet Vidalia	Std. Yellow	53.3	45.4	37.8	70.9
Nirvana	Std. Yellow	67.3	59.2	46.5	69.1
Goldeneye	Std. Yellow	68.4	55.3	48.0	70.2
Century	Std. Yellow	64.1	55.8	48.5	75.6
Granex Yellow Prr	Std. Yellow	60.1	52.5	44.7	74.4
Savannah Sweet	Std. Yellow	62.8	55.6	47.7	76.0
Sweet Agent (6013)	Std. Yellow	69.0	48.0	31.8	46.1
J3002 (Alison)	Std. Yellow	67.7	59.4	47.6	70.3
J3003	Std. Yellow	63.1	52.2	45.9	72.7
J3006	Std. Yellow	57.7	44.1	31.7	54.9
J3007	Std. Yellow	61.0	52.5	38.5	63.0
Sweet Jasper	Std. Yellow	66.8	58.2	49.2	73.6
XON 403Y (Ringo)	Std. Yellow	63.5	52.7	43.6	68.7
HS 18550	Std. Yellow	62.8	48.5	38.2	60.8
EMY Y. Granex 110	Std. Yellow	66.5	59.3	48.5	72.9
EMY 55375	Std. Yellow	59.3	51.2	42.7	72.0

Table 35. Postharvest Storage Data for Early Yellow, Standard Yellow, Red and White Onions in the 2010-2011 Vidalia Onion Variety Trial (continued)

Variety	Type	Pre Harvest Wt. (lbs)	Post Hrvst Wt Day 0	Post Hrvst Wt Day 14	% Mkt Day 14
Pinot Rouge	Red	60.4	56.7	47.7	78.9
J3004	Red	54.9	44.7	35.6	64.8
J3005)	Red	57.6	45.2	36.0	62.5
Mata Hari	Red	62.1	52.2	41.0	66.0
Lambada	Red	47.2	38.2	30.2	64.0
EMR 344	Red	61.8	44.7	28.8	46.6
Kristal	White	46.7	28.9	21.3	45.6

Vidalia Onion Variety Trial
2011-2012

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Introduction
In an effort to improve onion production and quality, onion varieties were once again evaluated and compared during the 2011-2012 season.

Materials and Methods
There were 46 varieties in the trial. Varieties 1-9 (Table 1) were sown on September 6, 2011, were transplanted on October 31, 2011, and were considered early varieties representing yellow onions. Varieties 10-46 (Table 1) were sown on September 19, 2011 and transplanted on November 22, 2011. Varieties 10-37 were considered standard varieties representing yellow onions, varieties 38-45 were red onions and variety 46 was a white onion. Plant beds were sown in high-density plantings of 60 seeds per linear foot. Row spacing was 12 inches with a 4-inch in-row spacing.

The trials had the following fertility and pest management programs:

Fertility Program Early Planting

Date	Amount	Fertilizer	Formulation
10/31/11	150 lbs.	18-46-0	27-69-0
1/7/12	300 lbs.	5-10-15	15-30-45
1/17/12	300 lbs.	5-10-15	15-30-45
2/7/12	150 lbs.	CaNO3	22-0-0
2/23/12	150 lbs.	CaNO3	22-0-0
			101-129-90

Fertility Program Standard Planting

Date	Amount	Fertilizer	Formulation
12/6/11	150 lbs.	18-46-0	27-69-0
1/7/12	300 lbs.	5-10-15	15-30-45
1/17/12	300 lbs.	5-10-15	15-30-45
2/7/12	150 lbs.	CaNO3	22-0-0
2/23/12	150 lbs.	CaNO3	22-0-0
			101 -129-90

Pesticide Program Early Planting

Date	Amount/A	Material
1/14/12	15 oz./A	Pristine
1/30/12	1.5 pts./A	Rovral
2/2/12	15 oz./A	Pristine

2/9/12	3 pts.	Lannate
2/10/12	2.5 lbs.	ManKocide
2/21/12	15 oz.	Pristine
2/28/12	1.5 pts.	Rovral
3/7/12	15 oz.	Pristine
3/7/12	2 pts.	Lannate
3/20/12	4 oz. Presidio + 3 lbs. Manzate + 2 pts. Lannate	
3/27/12	6 oz. Forum + 3 lbs. Manzate + 15 oz. Pristine	

Pesticide Program Standard Planting

Date	Amount /A	Material
1/14/12	15 oz./A	Pristine
1/30/12	1.5 pts./A	Rovral
2/2/12	15 oz./A	Pristine
2/9/12	3 pts.	Lannate
2/10/12	2.5 lbs.	ManKocide
2/21/12	15 oz.	Pristine
2/28/12	1.5 pts.	Rovral
3/7/12	15 oz.	Pristine
3/7/12	2 pts.	Lannate
3/20/12	4 oz. Presidio + 3 lbs. Manzate + 2 pts. Lannate	
3/27/12	6 oz. Forum + 3 lbs. Manzate + 15 oz. Pristine	

The experiment was a randomized complete block design with four replications. Each plot was 25 feet long with a 5-foot in-row alley. Onions were pulled, laid on the ground for two to three days prior to clipping to cure by exposure to sunlight, then weighed to determine total green weight. After 24 to 48 hours of additional forced-air curing, onions were graded for size and marketability.

Size and quality parameters:

Colossal: Over 4 inches in diameter
Jumbo: 3-4 inches in diameter
Medium: 2-3 inches in diameter
Cull: Off shaped, off color, damaged, diseased or onions less than 2 inches in size.

Approximately 50 pounds of onions were transported to the Vidalia Onion Research Laboratory in Tifton, Ga., for storage testing. A 10-bulb sample was used to determine pungency, LF and sugar profiles.

Results and Discussion

A downy mildew outbreak in February that lasted until harvest resulted in a lower than expected percent of marketable onions, although total yields were near normal.

Dry Weight Yield. Yield is reported as the number of 60-pound bags/A for total dry weight yield subdivided by planting date and by yellow, red or white onions (Tables 2, 3, 4 and 5). Early planted onions had a range of 1,030 to 379 60-pound bags/A (30.9 to 11.4 tons/A). Varieties Sweet Deal and Candy Kim had the highest yields among the early planted varieties and were not significantly different from one another (Table 2). Later planted yellow onions had a range of 1,321 - 437 60-pound bags/A (39.6 to 13.1 tons/A). Varieties NUN 1002, NUN 1003 and J3003 had the highest yields among the later planted yellow varieties and were not significantly different from one another (Table 3). Later planted red onions had a range of 1,164 to 761 60-pound bags/A (34.9 to 22.8 tons/A). Varieties 3010 and J3004 had the highest yields among the later planted red varieties and were not significantly different from one another (Table 4). Kristal yielded 951 60-pound bags/A for total dry weight (Table 5).

Marketable Yield. Marketable yield is reported as the number of 40-pound bags/A and is subdivided by planting date and by yellow, red or white onions (Tables 6, 7, 8 and 9). Early planted onions had a range of 1,091 to 428 of 40-pound bags/A. Varieties Sweet Deal and Candy Kim had the highest marketable yields among the early planted varieties and were not significantly different from one another (Table 6). Later planted yellow onions had a range of 1,662 to 88 40-pound bags/A. The variety NUN 1002 had the highest marketable yields among the later planted varieties and was significantly different from all other varieties in the late planted, yellow onion category (Table 7). Later planted red onions had a range of 1,105 to 704 40-pound bags/A. The variety J 3004 had the highest marketable yield among the later planted red varieties and was significantly different from all other varieties in the late planted, red onion category (Table 8). The white onion variety Kristal yielded 920 graded 40-pound bags/A (Table 9).

Percent Marketable Yield. Percent marketable yield is subdivided by planting date and by yellow, red or white onions (Tables 10, 11, 12 and 13). Early planted onions had a range of 76 to 51 percent marketable yield. Varieties Candy Ann, Sweet Harvest, Candy Kim, Sweet Deal, Candy May, Amelia and Honeybee had the highest percent marketable yields among the early planted varieties and were not significantly different from one another (Table 10). Later planted yellow onions had a range of 89 to 13 percent marketable yield. Varieties NUN 1008, Goldeneye, NUN 1002, Sapelo Sweet, Nirvana, Georgia Boy, J 3006, NUN 1003, Sweet Agent and Sweet Vidalia had the highest percent marketable yields among the later planted varieties and were not significantly different from one another (Table 11). Later planted red onions had a range of 69 to 49 percent marketable yield. Varieties J3004, Pinot Rouge, Lambada, Mata Hari and Red Coach had the highest percent marketable yields among the later planted red varieties and were not significantly different from one another (Table 12). The white onion variety Kristal had 65 percent marketable yield (Table 13).

Colossal Yields. Yield according to size grade Colossal is also subdivided by planting date and by yellow, red or white onions (Tables 14, 15, 16 and 17). Early planted onions had a range of 367 to 84 40-pound bags of Colossals/A. Varieties Sweet Deal and Candy Kim had the highest yields of Colossals/A among the early planted varieties and were not significantly different from one another (Table 14). Later planted yellow onions had a range of 657 to 12 40-pound bags of Colossals/A. The variety NUN 1002 had the highest yield for Colossals among the later planted varieties and was significantly different from all other late planted, yellow varieties (Table 15). Later planted red onions had a range of 138 to 3 40-pound bags of Colossals/A. Varieties J3004, Mata Hari, 3010, Red Hunter and Red Coach had the highest yields of Colossals among the later planted red varieties and were not significantly different from one another (Table 16). The white onion Kristal yielded 83 40-pound bags of Colossals/A (Table 17).

Jumbo Yields. Yield according to size grade Jumbo is subdivided by planting date and by yellow, red or white onions (Tables 18, 19, 20 and 21). Early planted onions had a range of 719 to 319 40-pound bags of Jumbos/A. Varieties Candy Kim, Sweet Deal and Candy Ann had the highest yields of Jumbos/A among the early planted varieties and were not significantly different from one another (Table 18). Later planted yellow onions had a range of 1,049 to 35 40-pound bags of Jumbos/A. Varieties J 3003, NUN 1003, Nirvna, Goldeneye, J3006, NUN 1002, NUN

1008 and NUN 006 had the highest yields for Jumbos among the later planted varieties and were not significantly different from one another (Table 19). Later planted red onions had a range of 909 to 596 40-pound bags of Jumbos/A. Varieties J3004 and Mata Hari had the highest yields of Jumbos among the later planted red varieties and were not significantly different from one another (Table 20). The white onion Kristal yielded 802 40-pound bags of Jumbos/A (Table 21).

Medium Yield. Yield according to size grade Medium is subdivided by planting date and by yellow, red or white onions (Tables 22, 23, 24 and 25). Early planted onions had a range of 39 to 25 40-pound bags of Mediums/A. There were no significant differences among any of the nine varieties in the early planted, yellow onions (Table 22). Later planted yellow onions had a range of 143 to 11 40-pound bags of Mediums/A. Varieties Sapelo Sweet, Miss Megan, Sweet Vidalia and Goldeneye had the highest yields for Mediums among the later planted varieties and were not significantly different from one another (Table 23). Later planted red onions had a range of 124 to 10 40-pound bags of Mediums/A. Varieties Pinot Rouge and Red Coach had the highest yields of Mediums among the later planted red varieties and were not significantly different from one another (Table 24). The white onion Kristal yielded 35 40-pound bags of Mediums/A (Table 25).

Number of Seed Stems. Number of seed stems/A is subdivided by planting date and by yellow, red or white onions (Tables 26, 27, 28 and 29). There were very few onions that bolted during the 2011–2012 season. Early planted onions had a range of 36 to 14 seed stems/A. The variety Sweet Harvest had the highest number of seed stems/A among the early planted varieties (Table 26). Later planted yellow onions had a range of 1.2 - 0 seed stems/A. (Table 27). Later planted red onions had 0 seed stems/A (Table 28). The white onion Kristal had 0 seed stems/A (Table 29).

Number of Doubles. Number of Doubles/A is subdivided by planting date and by yellow, red or white onions (Tables 30, 31, 32 and 33). Early planted yellow onions had a range of 5 to 1 doubles/A. The varieties Candy Ann and Isabella had the highest number of doubles/A among the early planted varieties (Table 30). Later planted yellow onions had a range of 9.3 to 0.1 doubles/A. The variety Sapelo Sweet had the highest number of doubles/A (Table 31). Later planted red onions had a range of 2.2 to 0.2 doubles/A. The variety Red Hunter had the highest number of doubles/A among late planted, red varieties (Table 32). The white onion Kristal had 2.2 doubles/A (Table 33).

Pungency and Flavor Characteristics. Pungency and flavor characteristics are presented in Table 34.

Postharvest Storage Results. Pre-storage weights, post-storage (CA) weights, 0 day post-marketable weights, 14 day post-marketable weights, and percent marketable for early, standard, red and white varieties are listed in Table 35.

Table 1. Varieties in the 2011 – 2012 Vidalia Onion Variety Trial

Variety	Entry #	Planting Date	Category
WI-129	1	Early	Yellow
Isabella	2	Early	Yellow
Candy Ann	3	Early	Yellow
Candy Kim	4	Early	Yellow
Candy May	5	Early	Yellow
Honeybee	6	Early	Yellow
Sweet Deal	7	Early	Yellow
SSC 2893	8	Early	Yellow
Sweet Harvest	9	Early	Yellow
Sweet Uno	10	Late	Yellow
Sweet Jalene	11	Late	Yellow
Georgia Boy	12	Late	Yellow
Miss Megan	13	Late	Yellow
Mr. Buck	14	Late	Yellow
Sapelo Sweet	15	Late	Yellow
NUN1002	16	Late	Yellow
NUN1003	17	Late	Yellow
NUN1006	18	Late	Yellow
NUN1008	19	Late	Yellow
Sweet Caroline	20	Late	Yellow
Caramelo	21	Late	Yellow
Sweet Vidalia	22	Late	Yellow
Nirvana	23	Late	Yellow
Goldeneye	24	Late	Yellow
Century	25	Late	Yellow
Granex Yellow PRR	26	Late	Yellow
Savannah Sweet	27	Late	Yellow
Sweet Agent (6013)	28	Late	Yellow
J3002 (Alison)	29	Late	Yellow
J3003	30	Late	Yellow
J3006	31	Late	Yellow
J3007	32	Late	Yellow
Sweet Jasper	33	Late	Yellow
XON 403Y (Ringo)	34	Late	Yellow
HSX (61304)	35	Late	Yellow
EMY Y. Granex 110	36	Late	Yellow
EMY 55375	37	Late	Yellow
Pinot Rouge	38	Late	Red
J3004	39	Late	Red
J3005 (Red Hunter)	40	Late	Red
Mata Hari	41	Late	Red
Lambada	42	Late	Red
3010	43	Late	Red
Red Coach	44	Late	Red
EMR 344	45	Late	Red
Kristal	46	Late	White

Table 2. Dry Weight Yield (# 60 lb. bags/A) Early-Planted, Yellow Onion Varieties

Variety	Dry Wt. Yield (# 60 lb. bags/A)
Sweet Deal	1030 a
Candy Kim	979 ab
Honeybee	795 bc
Candy May	789 bc
SSC 2893	774 c
WI-129 (Amelia)	768 c
Candy Ann	765 c
Isabella	674 c
Sweet Harvest	379 d
	LSD= 194.73

Table 3. Dry Weight Yield (# 60 lb. bags/A) Late-Planted, Yellow Onion Varieties

Variety	Dry Wt. Yield (# 60 lb. bags/A)
NUN1002	1321 a
NUN1003	1271 a
J3003	1148 ab
J3006	1093 bc
NUN1006	1085 bcd
Sweet Jasper	1072 bcde
Caramelo	1071 bcde
J3002	1068 bcde
XON403Y (Ringo)	1050 bcdef
Sweet Caroline	1043 bcdef
Sweet Agent (6013)	1040 bcdefg
J3007	1036 bcdefg
Mr. Buck	1007 bcdefgh
Granex Yellow PRR	998 bcdefgh
Nirvana	986 bcdefgh
Century	965 cdefghi
EMY 55375	946 cdefghi
Sweet Uno	933 cdefghi
Miss Megan	924 cdefghi
Goldeneye	911 defghi
Savannah Sweet	905 efghi
NUN 1008	892 fghi
Sweet Jalene	883 fghi
Sweet Vidalia	866 ghi
Georgia Boy	854 hi
Sapelo Sweet	846 hi
EMY Y. Granex 110	805 i
HSX 61304	437 j
	LSD = 176.4

Table 4. Dry Weight Yield (# 60 lb. bags/A) Late-Planted, Red Onion Varieties

Variety	Dry Wt. Yield (# 60 lb. bags/A)	
3010	1164	a
J3004	1064	ab
J3005 (Red Hunter)	965	bc
Mata Hari	943	bcd
Red Coach	879	cde
EMR 344	804	cde
Lambada	766	de
Pinot Rouge	761	e

Table 5. Dry Weight Yield (# 60 lb. bags/A) Late-Planted, White Onion Varieties

Variety	Dry Wt. Yield (# 60 lb. bags/A)
Kristal	951

Table 6. Marketable Yield (# 40 lb. bags/A) Early-Planted, Yellow Onion Varieties

Variety	Marketable Yield (# 40 lb. bags/A)	
Sweet Deal	1091	a
Candy Kim	1070	a
Candy Ann	873	b
Candy May	827	b
Honeybee	797	b
WI-129 (Amelia)	754	bc
Isabella	618	c
SSC 2893	586	cd
Sweet Harvest	428	d
	lsd=169.9	

Table 7. Marketable Yield (# 40 lb. bags/A) Late-Planted, Yellow Onion Varieties

Variety	Marketable Yield (# 40 lb. bags/A)	
NUN 1002	1662	a
NUN1003	1442	b
J3006	1276	bc
J3003	1276	bc
Nirvana	1204	cd
NUN 1008	1190	cd
Goldeneye	1190	cd
Sweet Agent (6013)	1173	cd
NUN1006	1169	cde
Sapelo Sweet	1030	def
Savannah Sweet	1006	def
Sweet Vidalia	965	efg
Sweet Jasper	938	fgh
J3007	938	fgh
Georgia Boy	919	fgh
Sweet Caroline	909	fgh
Century	867	fgh
XON 403Y (Ringo)	856	fgh
Mr Buck	852	fgh
J3002 (Alison)	845	fghi
Sweet Uno	836	fghi
Granex Yellow PRR	770	ghij
Caramelo	744	hijk
Miss Megan	743	hijk
Sweet Jalene	644	ijk
EMY 55375	594	jk
EMY Y. Granex 110	549	k
HSX 61304	88	l
	lsd =206.7	

Table 8. Marketable Yield (# 40 lb. bags/A) Late-Planted, Red Onion Varieties

Variety	Marketable Yield (# 40 lb. bags/A)	
J3004	1105	a
Mata Hari	893	b
3010	856	bc
J3005 (Red Hunter)	856	bc
Red Coach	799	bc
Pinot Rouge	756	bc
EMR 344	720	bc
Lambada	704	c
	lsd =	179.4

Table 9. Marketable Yield (# 40 lb. bags/A) Late-Planted, White Onion Varieties

Variety	Marketable Yield (# 40 lb. bags/A)
Kristal	920

Table 10. % Marketable Early-Planted, Yellow Onion Varieties

Variety	% Marketable	
Candy Ann	76	a
Sweet Harvest	76	a
Candy Kim	73	a
Sweet Deal	71	ab
Candy May	70	ab
WI-129	69	ab
Honeybee	67	ab
Isabella	61	bc
SSC 2893	51	c
	lsd = 11.4	

Table 11. % Marketable Late-Planted, Yellow Onion Varieties

Variety	% Marketable	
NUN1008	89	a
Goldeneye	87	ab
NUN1002	84	abc
Sapelo Sweet	81	abc
Nirvana	81	abc
Georgia Boy	79	abc
J3006	78	abc
NUN1003	76	abc
Sweet Agent (6013)	75	abc
Sweet Vidalia	75	abcd
Savannah Sweet	74	bcde
J3003	74	bcde
NUN1006	72	cdef
Century	61	defg
J3007	60	efg
Sweet Uno	60	fg
Sweet Jasper	58	fg
Sweet Caroline	58	fg
Mr. Buck	57	g
XON 403Y (Ringo)	54	g
Miss Megan	54	g
J3002 (Alison)	53	g
Granex Yellow PRR	51	g
Sweet Jalene	48	g
Caramelo	47	gh
EMY Y. Granex 110	47	gh
EMY 55375	41	h
HSX 61304	13	i
lsd= 14.3		

Table 12. % Marketable Late-Planted, Red Onion Varieties

Variety	% Marketable	
J3004	69	a
Pinot Rouge	66	ab
Lambada	64	ab
Mata Hari	63	ab
Red Coach	61	ab
EMR 344	60	b
J3005 (Red Hunter)	59	b
3010	49	c
lsd =	9.6	

Table 13. % Marketable Late-Planted, White Onion Varieties

Variety	% Marketable
Kristal	65

Table 14. # 40 lb. bags/A Graded Colossal for Early-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Colossal/A	
Sweet Deal	367	a
Candy Kim	319	ab
Candy May	265	b
Honeybee	262	b
Candy Ann	231	bc
WI-129 (Amelia)	163	cd
SSC 2893	134	d
Isabella	131	d
Sweet Harvest	84	d
	lsd = 90.1	

Table 15. # 40 lb. bags/A Graded Colossal for Late-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Colossal/A	
NUN1002	657	a
NUN1003	387	b
Sweet Agent (6013)	342	bc
J3006	228	cd
NUN1006	207	de
J3003	185	def
NUN1008	183	def
Nirvana	157	defg
J3002 (Alis0n)	131	defgh
Sweet Caroline	131	defgh
XON 403Y (Ringo)	127	defghi
Goldeneye	110	efghi
J3007	109	efghi
Caramelo	99	efghi
Sweet Vidalia	87	fghi
Century	83	fghi
Granex Yellow PRR	74	fghi
Sweet Jalene	70	fghi
Sweet Jasper	70	fghi
EMY 55375	66	ghi
Sapelo Sweet	60	ghi
Sweet Uno	55	ghi
Georgia Boy	50	ghi
Mr. Buck	47	ghi
Miss Megan	45	ghi
Savannah Sweet	43	ghi
EMY Y. Granex 110	35	hi
HSX 61304	12	i
lsd=116.2		

Table 16. # 40 lb. bags/A Graded Colossal for Late-Planted, Red Onion Varieties

Variety	# 40 lb. bags Colossal/A	
J3004	138	a
3010	117	ab
J3005 (Red Hunter)	106	ab
Red Coach	70	abc
Lambada	50	bc
Mata Hari	44	bc
Pinot Rouge	19	c
EMR 344	3	c
lsd =	75.9	

Table 17. # 40 lb. bags/A Graded Colossal for Late-Planted, White Onion Varieties

Variety	# 40 lb. bags Colossal/A
Kristal	83

Table 18. # 40 lb. bags/A Graded Jumbo for Early-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Jumbo /A	
Candy Kim	719	a
Sweet Deal	698	a
Candy Ann	615	ab
WI-129 (Amelia)	560	bc
Candy May	531	bcd
Honeybee	506	bcd
Isabella	459	cd
SSC 2893	413	de
Sweet Harvest	319	e
lsd =	129.3	

Table 19. # 40 lb. bags/A Graded Jumbo for Late-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Jumbo/A	
J3003	1049	a
NUN1003	1002	ab
Nirvana	1001	ab
Goldeneye	971	abc
J3006	969	abc
NUN1002	959	abc
NUN1008	943	abcd
NUN1006	901	abcde
Savannah Sweet	881	bcdef
Sweet Jasper	830	cdefg
Sapelo Sweet	827	cdefg
J3007	791	defgh
Georgia Boy	784	defgh
Sweet Vidalia	768	efgh
Sweet Agent (6013)	744	efghi
Sweet Caroline	721	fghij
Mr. Buck	718	fghij
Century	703	ghij
Sweet Uno	695	ghij
XON 403Y (Ringo)	690	ghij
J3002 (Alison)	661	hijk
Granex Yellow PRR	634	hijk
Caramelo	593	ijkl
Miss Megan	577	jkl
Sweet Jalene	524	kl
EMY 55375	463	l
EMY Y.Granex 110	462	l
HSX 61304	66	m
lsd =	164.1	

Table 20. # 40 lb. bags/A Graded Jumbo for Late-Planted, Red Onion Varieties

Variety	# 40 lb. bags Jumbo/A	
J3004	909	a
Mata Hari	791	ab
3010	730	bc
J3005 (Red Hunter)	686	bc
EMR 344	645	bc
Red Coach	636	bc
Pinot Rouge	613	c
Lambada	596	c
lsd =	157.6	

Table 21. # 40 lb. bags/A Graded Jumbo for Late-Planted, White Onion Varieties

Variety	# 40 lb. bags Jumbo /A
Kristal	802

Table 22. # 40 lb. bags/A Graded Medium for Early-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Medium /A	
SSC 2893	39	a
Candy Kim	33	a
WI-129 (Amelia)	31	a
Candy May	30	a
Honeybee	29	a
Isabella	28	a
Candy Ann	27	a
Sweet Deal	26	a
Sweet Harvest	25	a
lsd =	18.02	

Table 23. # 40 lb. bags/A Graded Medium for Late-Planted, Yellow Onion Varieties

Variety	# 40 lb. bags Medium /A	
Sapelo Sweet	143	a
Miss Megan	120	ab
Sweet Vidalia	111	abc
Goldeneye	109	abc
Sweet Agent (6013)	88	bcd
Sweet Uno	86	bcd
Mr. Buck	86	bcd
Georgia Boy	85	bcd
Savannah Sweet	82	cde
Century	81	cde
J3006	79	cdef
EMY 55375	66	defg
NUN1008	64	defg
Granex Yellow PRR	61	defg
NUN1006	61	defg
Sweet Caroline	57	defg
NUN1003	54	defg
J3002 (Alison)	53	defg
Caramelo	53	defg
EMY Y. Granex 110	52	defg
Sweet Jalene	50	defg
Nirvana	46	efgh
NUN1002	46	efgh
J3003	42	fgh
XON 403Y (Ringo)	39	gh
Sweet Jasper	39	gh
J3007	38	gh
HSX 61304	11	h
	lsd = 37.9	

Table 24. # 40 lb. bags/A Graded Medium for Late-Planted, Red Onion Varieties

Variety	# 40 lb. bags Medium/A	
Pinot Rouge	124	a
Red Coach	94	ab
EMR 344	72	b
J3005 (Red Hunter)	64	b
Mata Hari	58	b
Lambada	58	b
J3004	57	b
3010	10	c
	lsd = 36.8	

Table 25. # 40 lb. bags/A Graded Medium for Late-Planted, White Onion Varieties

Variety	# 40 lb. bags Medium /A
Kristal	35

Table 26. # Seed Stems/A for Early-Planted, Yellow Onion Varieties

Variety	# Seed Stems/A
Sweet Harvest	36.2
Candy May	26.2
Isabella	24.2
Honeybee	23.7
Candy Ann	21.6
SSC 2893	18.5
WI-129 (Amelia)	16.7
Sweet Deal	14.4
Candy Kim	14

Table 27. # Seed Stems/A for Late-Planted, Yellow Onion Varieties

Variety	# Seed Stems/A
Sweet Vidalia	1.2
Sweet Jalene	0.3
Sweet Uno	0.2
Mr Buck	0.2
Granex Yellow PRR	0.2
Miss Megan	0.1
Savannah Sweet	0.1
Sweet Jasper	0.1
Georgia Boy	0
Sapelo Sweet	0
NUN 1002	0
NUN1003	0
NUN1006	0
NUN 1008	0
Sweet Caroline	0
Caramelo	0
Nirvana	0
Goldeneye	0
Century	0
Sweet Agent (6013)	0
J3002 (Alison)	0
J3003	0
J3006	0
J3007	0
XON 403Y (Ringo)	0
HSX 61304	0
EMY Y. Granex 110	0
EMY 55375	0

Table 28. # Seed Stems/A for Late-Planted, Red Onion Varieties

Variety	# Seed Stems/A
Pinot Rouge	0
J3004	0
J3005 (Red Hunter)	0
Mata Hari	0
Lambada	0
3010	0
Red Coach	0
EMR 344	0

Table 29. # Seed Stems/A for Late-Planted, White Onion Varieties

Variety	# Seed Stems/A
Kristal	0.1

Table 30. # Doubles/A for Early-Planted, Yellow Onion Varieties

Variety	# Doubles/A
Candy Ann	5.1
Isabella	5
SSC 2893	4.9
Candy May	4.3
Honeybee	4.3
WI-129 (Amelia)	3.2
Candy Kim	3.2
Sweet Deal	1.8
Sweet Harvest	1

Table 31. # Doubles/A for Late-Planted, Yellow Onion Varieties.

Variety	# Doubles/A
Sapelo Sweet	9.3
Sweet Agent (6013)	4.2
Georgia Boy	3.3
Miss Megan	3.2
Mr Buck	3.2
HSX 61304	3.2
Nirvana	2.6
J3006	2.5
Sweet Vidalia	2.3
NUN 1002	2.2
Granex Yellow PRR	2.2
Sweet Jalene	1.6
Century	1.5
Savannah Sweet	1.3
J3003	1.3
XON 403Y (Ringo)	1.3
NUN1003	1.2
J3007	1.2
Sweet Jasper	1.2
EMY Y. Granex 110	1.2
NUN 1008	1.1
J3002 (Alison	1.1
NUN1006	1.0
Sweet Caroline	1.0
Goldeneye	1.0
Sweet Uno	0.8
EMY 55375	0.4
Caramelo	0.1

Table 32. # Doubles/A for Late-Planted, Red Onion Varieties.

Variety	# Doubles/A
J3005 (Red Hunter)	2.2
3010	1.6
Red Coach	1.6
Pinot Rouge	1.2
Lambada	1.2
J3004	1.0
Mata Hari	0.4
EMR 344	0.2

Table 33. # Doubles/A for Late-Planted, White Onion Varieties

Variety	# Doubles/A
Kristal	2.2

Table 34. LF, Pungency and % BRIX for Onion Varieties in the 2011-2012 Variety Trial*

Variety Code	Seed Variety	Skin Color	LF (µmoles/mL)	Pungency (µmoles/mL)	% Brix
1	WI-129	Yellow	4.8	4.3	9.4
2	Isabella	Yellow	4.6	4.3	9.4
3	Candy Ann	Yellow	4.7	4.6	9.1
4	Candy Kim	Yellow	4.2	4.5	8.7
5	Candy May	Yellow	4.4	4.4	8.6
6	Honeybee	Yellow	3.9	4.0	8.9
7	Sweet Deal	Yellow	4.2	4.2	8.7
8	SSC 2893	Yellow	4.0	4.4	8.8
9	Sweet Harvest	Yellow	5.3	4.9	11.1
10	Sweet Uno	Yellow	6.7	4.6	9.5
11	Sweet Jalene	Yellow	7.0	4.6	9.4
12	Georgia Boy	Yellow	6.5	4.7	10.7
13	Miss Megan	Yellow	5.8	4.4	9.8
14	Mr. Buck	Yellow	5.9	4.0	10.4
15	Sapelo Sweet	Yellow	6.7	5.9	11.1
16	NUN 1002	Yellow	3.9	4.1	9.6
17	NUN 1003	Yellow	3.8	3.8	9.1
18	NUN 1006	Yellow	4.3	2.8	10.6
19	NUN 1008	Yellow	5.5	3.9	10.2
20	Sweet Caroline	Yellow	6.1	4.2	8.9
21	Caramelo	Yellow	6.1	4.2	10.1
22	Sweet Vidalia	Yellow	6.7	5.0	10.2
23	Nirvana	Yellow	6.8	5.2	10.1
24	Goldeneye	Yellow	5.6	4.8	10.8
25	Century	Yellow	5.4	3.4	10.0
26	Granex Yellow PRR	Yellow	8.6	5.5	10.1
27	Savannah Sweet	Yellow	6.7	5.2	10.4
28	Sweet Agent (6013)	Yellow	5.3	4.2	10.1
29	J3002 (Alison)	Yellow	4.1	4.4	9.4
30	J3003	Yellow	5.7	4.1	10.3
31	J3006	Yellow	4.0	4.3	10.3
32	J3007	Yellow	4.8	3.2	10.0
33	Sweet Jasper	Yellow	5.4	3.8	10.1
34	XON 403Y (Ringo)	Yellow	5.3	3.9	10.5
36	EMY Y. Granex 110	Yellow	6.8	5.0	9.4
37	EMY 55375	Yellow	7.3	5.3	9.5
38	Pinot Rouge	Red	4.2	4.8	11.1
39	J3004	Red	4.0	4.5	10.2
40	J3005 (Red Hunter)	Red	2.6	3.6	10.3
41	Mata Hari	Red	6.6	5.8	10.2
42	Lambada	Red	6.5	5.6	10.5
43	03010	Red	7.2	5.0	9.3
44	Red Coach	Red	5.7	5.4	10.1
45	EMR 344	Red	6.6	5.2	9.1
46	Kristal	White	5.2	4.4	9.5
Grand Average			**5.5**	**4.5**	**9.8**

*** Data provided by National Onion Labs, Inc. Collins, Ga.**

Table 35. Postharvest Storage Data

Variety	Type	Pre-Storage Wt. (lb.)	Post Storage (after CA) Wt.	0 Day (Post) Marketable Wt.	14 Day (Post) Marketable Wt.	Percent Mktable by Wt.
SSC 2893	Early	32.20	31.80	30.70	25.63	0.83
Candy Ann	Early	59.65	58.90	51.80	46.15	0.79
Honeybee	Early	45.35	44.60	40.75	34.80	0.78
Candy Kim	Early	64.30	63.40	57.20	48.50	0.76
Candy Kim	Early	64.30	63.40	57.20	48.50	0.76
Sweet Deal	Early	70.15	69.25	62.15	51.55	0.75
Isabella	Early	39.85	39.45	35.30	29.23	0.74
Candy May	Early	49.10	48.35	43.80	34.30	0.71
Sweet Harvest	Early	20.85	20.20	15.85	11.33	0.60
Georgia Boy	Standard	65.85	63.30	59.95	55.95	0.88
Savannah Sweet	Standard	63.60	61.85	60.15	51.38	0.83
NUN 1003	Standard	66.25	64.25	58.70	53.29	0.83
Goldeneye	Standard	65.05	63.15	60.45	51.38	0.81
J3006	Standard	62.25	60.75	55.50	48.35	0.80
Granex Ylw. PRR	Standard	59.85	57.45	52.20	45.90	0.80
NUN 1006	Standard	66.35	63.45	59.60	49.85	0.79
Miss Megan	Standard	56.10	53.45	50.00	41.88	0.78
Sweet Vidalia	Standard	62.00	59.80	53.60	46.53	0.78
EMY 55376	Standard	38.20	37.05	35.10	28.45	0.77
Sapelo Sweet	Standard	69.90	67.75	61.65	51.70	0.76
Century	Standard	56.35	54.05	51.30	41.10	0.76
Mr. Buck	Standard	61.45	58.65	53.80	45.15	0.76
J3007	Standard	65.35	62.45	59.45	46.65	0.75
NUN 1008	Standard	68.05	65.80	61.10	48.18	0.74
EMY Granex 111	Standard	41.85	40.05	36.70	29.13	0.73
J3002 (Alison)	Standard	68.47	65.67	58.93	47.73	0.73
XON 403Y	Standard	64.50	62.05	56.85	45.38	0.73
Nirvana	Standard	69.95	67.55	58.80	48.78	0.72
NUN 1002	Standard	66.50	64.15	54.45	45.50	0.71
Caramelo	Standard	66.90	63.95	58.50	45.35	0.71
Sweet Agent	Standard	64.65	62.65	53.55	44.53	0.71
Sweet Jalene	Standard	50.75	48.05	44.05	32.38	0.68
Sweet Caroline	Standard	65.30	62.40	53.55	42.78	0.68
J3003	Standard	65.90	63.15	56.70	42.05	0.66
Sweet Jasper	Standard	66.90	64.50	55.05	38.50	0.60
Sweet Uno	Standard	67.20	63.75	53.95	38.38	0.60
HSX 61305	Standard	0.00	0.00	0.00	0.00	0.00

Table 35 (continued)

Variety	Type	Pre-Storage Mktble Wt. (lb.)	Post Storage (after CA) Wt.	0 Day (Post) Mktble Wt.	(14 Day (Post) Mktble Wt.	Percent Mktble
Mata Hari	Red	63.05	60.45	58.6	51.95	0.86
Red Coach	Red	62.15	59.4	56.2	50.68	0.85
Pinot Rouge	Red	61.4	59.4	58.05	50.35	0.85
J3004	Red	67.75	65.7	62.2	55.1	0.84
J3005	Red	62.75	60.45	57.1	50.28	0.83
3010	Red	62.25	60.08	57.85	49.05	0.82
EMR 344	Red	65.9	62.6	58.75	49.53	0.78
Lambada	Red	59.25	56.5	52.4	42.93	0.74
Kristal	White	68.4	64.65	43.43	25.8	0.4

Annual Report of the Vidalia Onion Research Laboratory
University of Georgia - Tifton Campus

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Introduction

The Vidalia Onion Research Laboratory continues to be an integral part of many post-harvest projects and activities. While mostly used for cold storage and controlled atmosphere vegetable and fruit research, the Onion Lab also has other facilities and equipment. This report lists the users and their usage of this facility for the 2011-2012 season.

Table 1. Experiments Requiring CA

Researcher(s)	Crop(s)	Experiment	Number of Rooms	Storage Specifications	Duration (Months)
Gitaitis, MacLean, Torrance	Onion	Variety Trial	4	34°F+70% RH 3% O_2+5% CO_2+92% N_2	4
Diaz, MacLean	Onion	Storage	4	34°F+70% RH 3% O_2+5% CO_2+92% N_2 Ozone @ 1.0 ppm/hr 21% O_2 (Air) SO2 (1hr trt @ 5000 ppm)	2 & 4
MacLean, Sidhu, Diaz	Pomegranate	Storage	2	41°F+90% RH 3% O_2+5% CO_2+92% N_2 21% O_2 (Air)	2

Table 2. Cold Storage Users and Usage

Researcher(s)	Crop(s)	Temperature (°F)	% RH	Duration (Months)
MacLean, Diaz	Onion	70	70	2
	Pomegranate	42	85	<1
	Tomato	55	75	1
Langston, Sanders	Onion	70	70	1
		34	≥80	2
		34	≥80	4
		36	≥80	1
Li	Onion	36	70	2, 4, 5
Riley	Onion	34	≥80	5
	Cowpeas	34	≥80	<1
	Squash	34	≥80	<1
Diaz	Various Seed	46	50	12
Riner	Onion	34	70	4
		34	70	5
MacLean, Sidhu, Diaz	Pomegranate	34, 42, 40	85, 85, 80	<1, <1, 1
	Pomegranate Cuttings	34	70	8
Sidhu, Diaz	Kale	41, 64	90, 90	2, 3
Ruter	Camellia Seed	46	50	8
Conner	Muscadine	34, 39, 44	90	<1
	Seed	36	70	10
	Pecan	40, 34	50, 70	<1, 4
Nesmith	Bahia Grass Seed	46	50	12
MacLean, Abney	Blueberry	34	85	1
Gitaitis	Onion	34	70	1

Table 3. Facilities and Equipment Users

Facility or Equipment	Researcher(s)	Crop(s)
Warehouse	MacLean	Onion, Pomegranate, Tomato
	Diaz	Kale, Bell Pepper, Tomato, Hot Pepper, Onion, Corn Pigweed
	Sosnoskie	Onion
	Langston	Onion
	Gitaitis	Onion
	Riner	Pecan
	Conner	Onion
	Riley	Sweet Potato
	Sparks	Onion
	Sanders	Camellia
	Ruter	Kale, Pomegranate
	Sidhu	
Lab	MacLean	Blueberry, Muscadine, Pomegranate
	Diaz	Tomato, Pomegranate
	Conner	Muscadine
	Bansal	Onion
	Abney	Blueberry
	Sidhu	Pomegranate, Kale
Grader and Sizer	Diaz	Onion
	Sanders	Onion
	Gitaitis	Onion
Dryers	Diaz	Pomegranate, Tomato, Kale, Soil Samples, Hot Pepper, Corn
	Conner	Pecan
	Ruter	Gardenia
Growth Chamber	MacLean	Tomato
	Sidhu	Kale
	Diaz	Hot Pepper
	Gitaitis	Onion

Evaluation of Fungicides for Control of Downy Mildew of Onion Spring 2012

David B. Langston, Jr. – Principal Investigator
Cliff Riner – Co-Principal Investigator
F.H. Sanders, Jr. – Co-Principal Investigator

Introduction

Downy mildew caused by the pathogen *Peronospora destructor* is a destructive disease of onion worldwide. However, it had only been an occasional problem for growers of Vidalia onions. That changed in the spring of 2012 as many growers realized significant yield loss to this disease over most of the Vidalia onion growing area. Since the disease has only been a sporadic problem in Georgia, little is known about how it was able to initiate the 2012 epidemic or about which fungicides work the best to control it. A trial was initiated in a grower field to evaluate current fungicides that have potential to control downy mildew of onion.

Materials and Methods

Fungicide efficacy against downy mildew of onion was evaluated in an onion field near Glenville, Ga. The onion variety 'Mr. Buck' had been planted to this field. Plots were one 20-foot-long panel each and used a 5-foot planted buffer between plot ends. Rows on each side of the plots served as non-treated buffers/inoculum reservoirs. Fungicides that are specific to downy mildew were applied using a CO_2 backpack sprayer calibrated to deliver 40 GPA using TX-26 hollow cone nozzles. Fungicide treatments were applied on March 22 and 29. Plots were evaluated for downy mildew severity on April 5.

Results

Three fungicides significantly reduced downy mildew severity compared to the non-sprayed plots: Reason, Zampro and Omega 550. Reason significantly outperformed Zampro, which significantly outperformed Omega 500. Fortunately, these fungicides have different modes of action and can be rotated with one another to reduce development of resistance in the downy mildew pathogen. Omega 500 is the only fungicide in this group that will also control Botrytis leaf blight, purple blotch and Stemphylium blight. Zampro and Reason will need to be tank-mixed with a broad-spectrum protectant fungicide like chlorothalonil to provide protection against foliar diseases besides downy mildew.

Treatment, application rate and (timing)[z]	Downy Mildew Severity[y] April 5, 2012
Reason 4.13SC, 8.2 fl. oz./A…………………………………………	37.5 f[x]
Zampro 250SC, 14 fl. oz./A Organosilicone adjuvant, 0.125% v/v………………………………	50.0 e
Omega500 4SC, 1 pt/A………………………………………………	62.5 d
Forum 4.18SC, 6 fl. oz./A……………………………………………	72.5 bc
Ranman 3.3 SC, 2.75 fl. oz./A Organosilicone adjuvant, 0.125% v/v………………………………	75.0 ab
Presidio 4SC, 4 fl. oz./A……………………………………………..	77.5 a
Tanos 50% DF, 10 oz./A……………………………………………	77.5 ab
Manzate 75% DF, 2 lb./A……………………………………………	77.5 ab
Previcur Flex 6SC, 19.2 fl. oz./A……………………………………	82.5 a
Untreated……………………………………………………………	77.5 ab

[z]Application dates were March 22 and 29, 2012
[y]Downy mildew severity was rated on a 0-100 scale where 0 = no disease, 50 = 50% of the leaf area affected and 100 = 100% of the leaf area affected.
[x]Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P≤ 0.05.

Black Mold Post-Harvest Fungicide Trial 2012

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Introduction

Black mold caused by the fungus *Aspergillus niger* has become a major concern for some Vidalia onion producers in recent years. This may be partly due to the relatively new drying facilities used by some producers that dry large volumes of onions in rooms heated by forced air for two to three days. *A. niger* grows readily at the temperatures used to dry onions in this manner, with optimum growth for the fungus between 82 and 93 °F. The purpose of this investigation is to determine post-harvest applications of fungicides that can reduce the amount of black mold in stored Vidalia onions.

Materials and methods

Savannah sweet onions were transplanted on December 5, 2012 at the Vidalia Onion and Vegetable Research and Educational Center in Lyons, Ga. Other than fungicide applications, onions were grown according to production guidelines published by the University of Georgia Cooperative Extension. The only pre-harvest fungicides that were used were Bravo (1.5 pt/A) tank mixed with Reason (8.2 fl. oz./A) applied on March 28 and April 4, 2012, for downy mildew suppression. Onions were field cured for 72 hours and harvested on May 4, 2012. After harvest, onions were taken to the Vidalia Onion Lab in Tifton, Ga., and run through a grading line where the visibly rotten onions and onions with physical wounding were culled. The remaining onions were placed into 20-pound bags (20 onions per bag). Bags were separated into groups of 12, with two bags representing one plot. The test design was a randomized complete block with six replications and two rating dates. The treatments consisted of the fungicides Scholar (fludioxonil) and Quadris (azoxystrobin) applied as drenches, Scholar applied as a spray, and an untreated control (see Table 1). After the fungicides were applied, one onion inoculated with *A. niger* was placed in each onion bag. Onions were allowed to dry for two hours and were placed into cold storage at 34 °F on May 11, 2012. Onions were taken out of storage at two different times (July 18 and September 4, 2012) and placed at room temperature for 14 days before rating. Black mold was evaluated by examining onions for the presence of *A. niger* on the surface of the onions as well as under the dried outer scales. Incidence and severity was recorded for each plot.

Results and Discussion

All fungicide-treated onions had significantly less black mold than the untreated controls and there was no difference between treatments (Table 1). The fungicide Scholar was just as effective at suppressing black mold as Quadris in this trial. Also, there was no difference in the application method used to apply Scholar to onion bulbs; both methods (drenching and spraying) were equally effective (Table 1).

Summary and Conclusions

This is the first time we have tested post-harvest-applied fungicides for the control of black mold in onions. The initial results look promising with the fungicide Scholar, which is already labeled on stone fruit, kiwi, sweet potatoes and pomegranates for control of post-harvest diseases. It may get a label for onions in the future. Although Quadris suppressed black mold in this trial, it is not expected to be labeled for post-harvest applications. Quadris was used as a positive control because it is known to control *A. niger* in peanuts.

Table 1. Black Mold Post-Harvest Fungicide Trial

Treatment, application rate and (timing)[z]	Black Mold % Incidence[y] Aug. 1, 2012	Black Mold Severity[x] Aug. 1, 2012	Black Mold % Incidence Sept. 18, 2012	Black Mold Severity Sept. 18, 2012
Scholar 1.92SC, 16 fl. oz./100 gal (drench)………..	34.2 c[w]	0.6 c	41.7 b	1.1 b
Scholar 1.92SC, 16 fl. oz./100 gal (spray)…………	20.0 c	0.5 c	40.8 b	1.1 b
Quadris 2.08SC, 15.4 fl. oz./100 gal (drench)……...	37.5 c	0.8 c	50.8 b	1.2 b
Untreated ………………………………………	93.0 a	5.7 a	72.5 a	2.7 a

[z] Fungicdes were applied on May 11, 2012.
[y] Black Mold % incidence was rated by counting the number of onion bulbs in each plot that that had visible *Aspergillus niger* sporulation and dividing that number by the total number of onion bulbs in each plot (n=20).
[x] Black mold severity was rated on a 0-10 scale where 0 = no *A. niger* present, 5 = 50% of the onion surface covered with *A. niger*, and 10 = 100% of the onion surface covered with *A. niger*. Each onion was rated and the severity was averaged for each plot (n=20).
[w] Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at $P \leq 0.05$.

Investigation of the Epidemiology of Yellow Bud, a New Disease of Vidalia Onions

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Introduction

Yellow bud is an emerging onion disease that has the potential to severely affect Vidalia onion production. This disease was first observed in Georgia in 2007 and has since been spreading throughout the Vidalia onion growing region. Yellow bud has the potential to become widespread as it has been observed in onion transplant beds. Symptoms of yellow bud include intense chlorosis in emerging leaves and severe blight in the older leaves leading to stand loss, reduced bulb size and avenues of entry for secondary, soft rot organisms. The causal agent has been identified as a Gram-negative, non-fluorescent, rod- shaped, aerobic bacterium that possesses all the phenotypic characteristics of Pseudomonas syringae van Hall LOPAT group Ia of Lelliott et al. (1). It produces levan, is negative for oxidase, potato rot and arginine dihydrolase, and produces a hypersensitive reaction in tobacco. Like some other species sharing these traits, yellow bud strains have the ability to produce the toxin coronatine.

Currently, we lack basic information on the possible sources of inoculum, survival and spread of the pathogen and biology of bacterial infection. The identification of inoculum sources for the disease could result in the development of management practices that reduce disease severity and minimize economic losses. In this research, we identified two weed species as a potential local source of inoculum and assessed if the bacterium could survive on these weeds within and around the Vidalia onion zone (VOZ) in Georgia between onion harvest in the spring and the seeding of next year's crop in the fall. In addition, we demonstrated that the yellow bud bacterium could be transmitted through experimentally-infested onion seeds.

Materials and Methods

In the spring of 2012, weed samples (n = 20 species (10 monocots and 10 dicots/location)) were collected from the edge of fields in three different counties (one fallow field where yellow bud was first observed in 2007 (Tattnall County) and two commercial fields where onions were expressing yellow bud symptoms (Toombs and Candler counties). Samples were placed in 25 ml of phosphate-buffered saline and processed to recover bacteria from leaf surfaces. Total genomic DNA was taken using commercial extraction kits and subjected to SYBR green-real-time PCR using primers that amplify the coronafacate ligase (cfl) gene (2). A portion of the preparation was spread-plated on nutrient agar (NA) supplemented with 0.5 percent yeast extract (NA+). To test pathogenicity of bacteria isolated from weed surfaces, 15-day-old onion seedlings, cv. Century, were inoculated with a suspension of test bacteria and plants were maintained under greenhouse conditions of 20°C and 60 to 65 percent R.H. Yellow bud incidence was scored at 14 days post inoculation. The identity and percentage of weed species harboring pathogenic strains of Pseudomonas sp. were recorded. Additionally, the bacterium was re-isolated and confirmed as Pseudomonas sp. using LOPAT (levan, oxidase, potato rot, arginine dihydrolase, and hypersensitivity on tobacco), sequencing of 16S rRNA and coronofactate ligase genes from bacterial isolates using universal primers. Amplified products were sequenced and BLAST searched in GenBank.

In a separate study, bacterial survival on the two most important identified weed species (from the above experiments) during onion growing and non-growing seasons within and around the boundaries of the VOZ was conducted. Sample sites included western (Dodge County), southwestern (Coffee County), northern (Burke County) and southern (Pierce County) boundaries of the VOZ. An additional sample site was chosen within the VOZ that had a previous history of yellow bud disease (Tattnall County). Sampling of two weed species (Curly Dock and Italian Ryegrass) were conducted during late June and late August of 2012. Samples (n = 10/species/site) were collected and processed as described above. Recovery and identity of Pseudomonas sp. was confirmed using tests as described above. Later, the percentage of weed species positive for Pseudomonas sp. from each sampling site at different sampling periods was recorded.

To test potential seedborne infestation by Pseudomonas sp. in onion seeds, seed-to-seedling transmission from artificially inoculated onion seedlots (cv. Century) was conducted. Ten seedlots (n = 100 seeds per lot) were placed in a transparent germination boxes lined with two layers of sterile, blotter paper saturated with sterile, deionized water. The germination boxes were closed and incubated at 20°C under fluorescent lights for 14 days. Onion seeds (n =100) vacuum-infiltrated with sterile buffer served as a negative control. The percentage of seed germination and yellow bud seedling transmission from each seedlot was recorded.

Results

Among the different weed species tested, the PCR assay detected the bacterium on Italian ryegrass (*Lolium multiflorum* L.) from all three locations and on curly dock (*Rumex crispus* L.) from only the fallow field (Tattnall County) (Table 1). Bacterial colonies isolated on NA+ had characteristics similar to previously reported yellow bud strains (2). When 15-day-old onion seedlings were inoculated with a bacterial suspension, 100 percent of the seedlings developed yellow bud symptoms 14 days after planting under greenhouse conditions. Ten control plants inoculated with sterile water remained asymptomatic. Bacterial colonies re-isolated from symptomatic seedlings had similar characteristics to those described above. Sequencing of 16S rRNA and coronofactate ligase genes revealed that sequences of the weed strains matched yellow bud strain Pseudomonas sp. 7Y-1 (GenBank Accession JF939842.1) and P. syringae pv.

Atropurpureau(GenBank Accession AB001440.1) (98 to 99 percent similarity with 16s rRNA and 94 to 99 percent by coronofactate ligase gene), respectively. Additional samples of Italian ryegrass and curly dock were collected from plants flagged during the earlier visit. Bacterial colonies were isolated from the weed washes and again identified as non-fluorescent stains in LOPAT group Ia.

Table 1. Frequency of detection of *Pseudomonas* sp. from the leaf washings of weed species collected at three sample sites in three Georgia counties by real-time PCR assay of coronafacate ligase gene followed by physiological and pathogenicity tests.

Location	Common name	Latin Binomial	PCR assay[a]	Physiological[b] assay	Pathogenicity on onion
Site 1 (Candler County)	Italian Ryegrass	*Lolium multiflorum*	40.0	30.0	30.0
	Curly dock	*Rumex crispus*	40.0	20.0	20.0
Site 2 (Tattnall County)	Italian Ryegrass	*Lolium multiflorum*	60.0	50.0	50.0
	Curly dock	*Rumex crispus*	40.0	30.0	30.0
Site 3 (Toombs County)	Italian Ryegrass	*Lolium multiflorum*	30.0	20.0	20.0

[a] Real-time PCR assay with coronafacate ligase (cfl) gene-based primers.
[b] Indole test, Ice-nucleation test, fluorescence on King's medium B and LOPAT test where L, O, P , A and T stand for levan production, oxidase test, potato rot, arginine dihydrolase and hypersensitivity on tobacco.

The yellow bud bacterium was recovered from Italian ryegrass from all sampling sites in June 2012. The percentages of Italian ryegrass samples harboring epiphytic population of *Pseudomonas* sp. from north, west, southwest, south and within the VOZ sampling sites were 20, 10, 20, 50 and 60 percent, respectively (Table 2). In contrast, during the same sampling period, bacterial isolates were not recovered from curly dock at the north, west and southwest sampling sites; however, in samples from the south site and within the VOZ sampling sites, 40 and 50 percent of curly dock harbored the bacterium. In August, Italian ryegrass samples were absent at the west and southwest sampling sites, whereas samples were present in the other three locations. The percentage of Italian ryegrass samples that harbored *Pseudomonas* sp. from the north, south and within the VOZ sampling sites were 30, 20 and 30 percent, respectively (Table 2). During the same sampling period, curly dock samples were present only at the south and within the VOZ sampling sites and the percentages of samples positive for *Pseudomonas* sp. were 10 and 20 percent, respectively.

Seeds inoculated with PBS (negative control) did not develop yellow symptoms after 14 days of incubation at 20°C under fluorescent lights. One hundred percent of the seedlots that were artificially inoculated with *Pseudomonas* sp. displayed yellow bud symptoms; however, seed-to-seedling transmission percentages in individual lots varied (13.8 to 40.2 percent) (Table 3).

Table 2. Number of samples of Italian ryegrass and curly dock that tested positive (real-time PCR assay followed by physiological and pathogenicity tests) for *Pseudomonas* sp. by months and by collection site during 2012 survey.

Zone	Month of Survey	Italian Ryegrass	Curly Dock
North (Burke County)	June	20.0[a]	0
West (Dodge County)	June	10.0	0
South west (Coffee County)	June	20.0	0
South (Pierce County)	June	50.0	40.0
Site within VOZ (Tattnall County)	June	60.0	50.0
North (Burke County)	August	30.0	0
West (Dodge County)	August	nd[b]	nd
South west (Coffee County)	August	nd	nd
South (Pierce County)	August	20.0	10.0
Site within the VOZ (Tattnall County)	August	30.0	20.0

[a] Percentage of weed samples positive for *Pseudomonas* sp. from each sampling site.
[b] Weed species were not found in that particular geographical location.

Table 3. Seed-to-seedling transmission of yellow bud in artificially infested onion seeds.

Seedlot Designation	Percent Seed Germination[a]	Percent Yellow Bud Transmission[b]
SL-1	67.0	22.4
SL-2	75.0	24.0
SL-3	87.0	24.2
SL-4	65.0	13.8
SL-5	72.0	26.3
SL-6	83.0	18.1
SL-7	72.0	40.2
SL-8	82.0	30.4
SL-9	89.0	18.0
SL-10	92.0	25.0
Mean	78.4	24.3

[a] Mean percentages of seed germination for 10 artificially inoculated onion seedlots (n = 100 seeds). Seeds were planted in transparent, closed, plastic boxes on saturated blotter paper and incubated for 14 days at 22°C and 80% R.H.

[b] Mean percentages of yellow bud seedling transmission for 10 artificially inoculated onion seedlots (n = 100 seeds). Seeds were planted in transparent, closed, plastic boxes on saturated blotter paper and incubated for 14 days at 22°C and 80% R.H. Yellow seedling transmission was determined as the number of seedlings showing typical BFB symptoms divided by the total number of seeds germinated × 100.

Conclusions

We identified two important weed species (Italian Ryegrass and curly dock) that can harbor epiphytic populations of *Pseudomonas* sp., a causal agent of yellow bud disease of onions. These weed species were prevalent during the onion growing as well as the non-growing seasons within and around the VOZ. Our survey during two non-onion growing periods (June and August) around and within the VOZ suggests that the bacterium can survive on Italian ryegrass as an epiphyte, whereas in curly dock, *Pseudomonas* sp. survived at only two locations surveyed (southern and within the VOZ sampling sites). These data demonstrate that the yellow bud bacterium can survive as a local source of inoculum on certain weeds that serve as a green bridge between onion crops. In addition, we also observed that the bacterium can potentially be transmitted through infested onion seeds. Further research is required to study the importance of both seedborne inoculum and the role of these weed species on the spread of yellow bud disease in the seed beds and production fields.

References

(1) R. A. Lelliott et al. J. Appl. Bact. 29:470, 1966.

(2) R. Gitaitis et al. Plant Dis. 96:285, 2012.

(3) I. Y. Besancon et al. Biotechnol. Appl. Biochem. 1994; 20:131–140.

Thrips Control in Onion Demonstrations 2012

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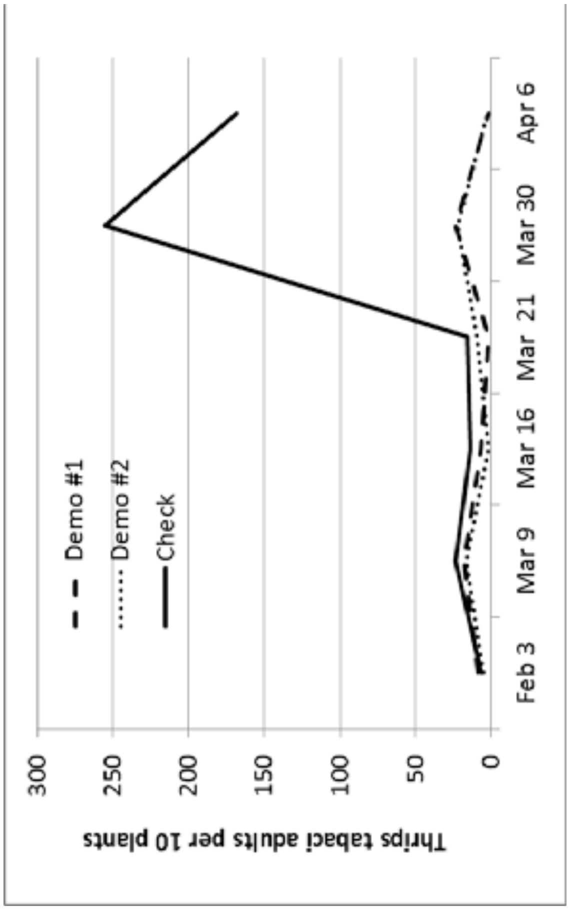
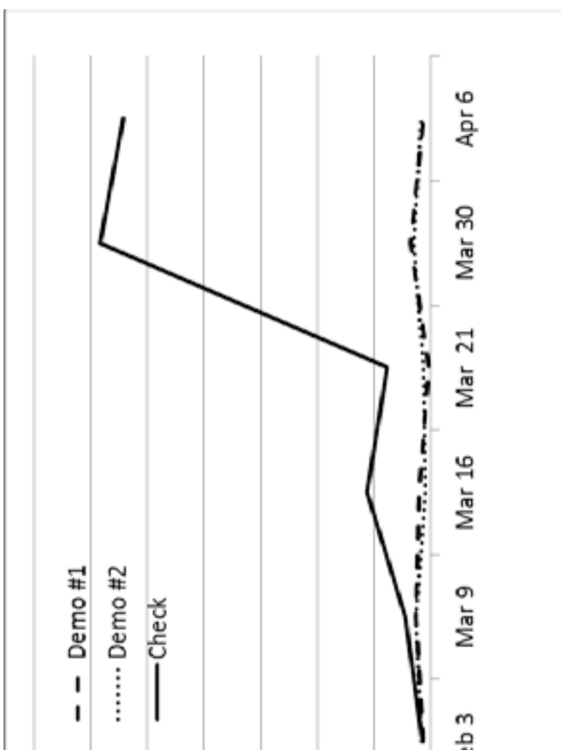
Onion: *Allium cepa* L. hyb. "Savannah Sweet"
Tobacco thrips; *Frankliniella fusca* (Hinds)
Onion thrips; *Thrips tabaci* Lindeman

In 2011-2012, an insecticide efficacy demonstration trial was conducted to evaluate various chemicals for the control of thrips in onions in 420-foot-long plots at the VORC, Tattnall County, Ga. Onions, hyb. Savannah Sweet, were transplanted on November 30, 2011 into four rows per bed at approximately 2 to 3 inches between plants and maintained with standard cultural practices. A total of 600 pounds of 10-10-10 was applied to clay loam field plots. Irrigation was applied at about one half inch weekly with an overhead sprinkler system if there was no rainfall. Total numbers of thrips per plant were counted on 10 plants per plot on February 2, 17 and 24, March 9, 16, 21 and 30, and April 6, 2012, collected from onion tops during the test to determine species of thrips. Most of the thrips were collected from the plant at the time of bulb formation during March/April. Five applications of insecticide were applied on February 21 and March 2, 13, 21 and 30. Insecticide treatments were applied with a tractor-mounted sprayer delivering 54 GPA with six TX18 hollow cone tips per row. An unsprayed check was included. Treatment plots were one bed of four rows by 420 feet plus a 6-foot break between each treatment bed. Fungicide applications began over all plots with two applications of Rovral 1.5 pt./A + Pristine 14.5 oz./A in January/February but switched to the Dupont Fungicide Program of application 1 (Tanos 8.0 oz. product + Mankocide 2.5 lb. product/A), 2 (Bravo 2 pts. + Mankocide 2.5 lb. product/A), 3 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 4 (Mankocide 2.5 lb. product/A), 5 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 6 (Bravo 2 pts. + Mankocide 2.5 lb. product/A) beginning mid-February. Since this was a demonstration trial, there were no true replicates, but dates and subplots were used as pseudo replicates for thrips and onion yield analysis, respectively.

Based on the onion top subsample, onion thrips, *Thrips tabaci* Lindeman, and tobacco thrips, *Frankliniella fusca* (Hinds), were the dominant species in this test. Western flower thrips, *Frankliniella occidentalis* (Pergande), were also present in low numbers (less than 1 percent of adult numbers). Total thrips exceeded threshold levels of one thrips per plant initially and five thrips per plant subsequently on all but one sample date. Thus, reduced bulb size was expected and evident in the Colossal size Vidalia onions (Table 1). Overall yield was also reduced by 15 percent compared to the Demo 2 rotation, but not significantly different using the pseudo replication. Benevia alone provided superior thrips control, but the rotations worked as well (i.e., not significantly different and superior to the check in all but *F. fusca* control). Thus, the rotations would be preferred for pesticide resistance management over the long term. Using rotations, this relatively high level of efficacy against thrips (83 percent control over all) should be maintained without significant loss in onion yield. For Vidalia onion growing conditions, this was the highest level of thrips seen in 10 years, so the thrips pest pressure is not likely to exceed this in most years.


Thrips tabaci adults per 10 plants
Demo #1
Demo #2
Check
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6


Thrips per 10 plant sample
Demo #1
Demo #2
Check
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6

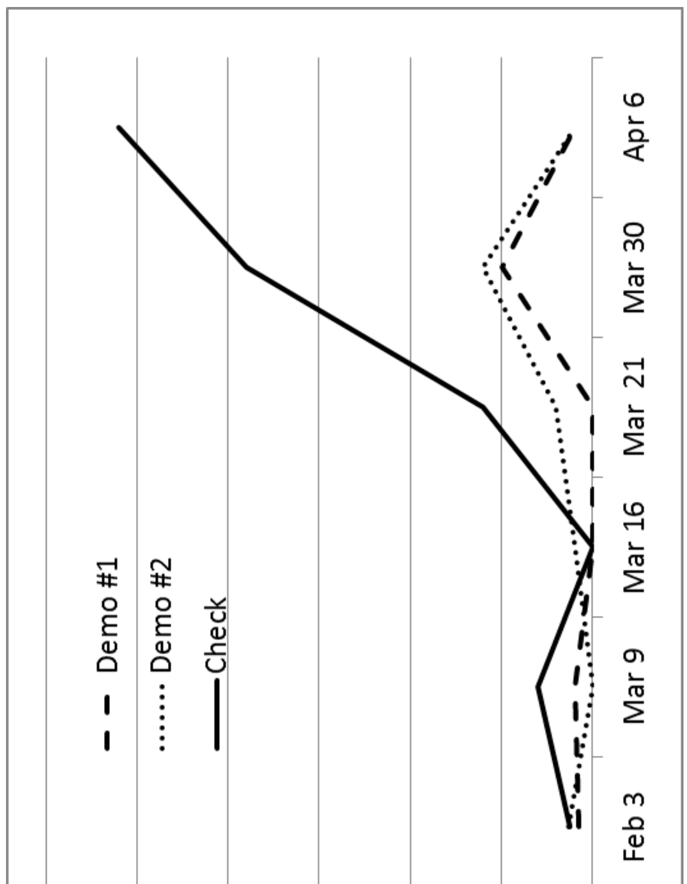
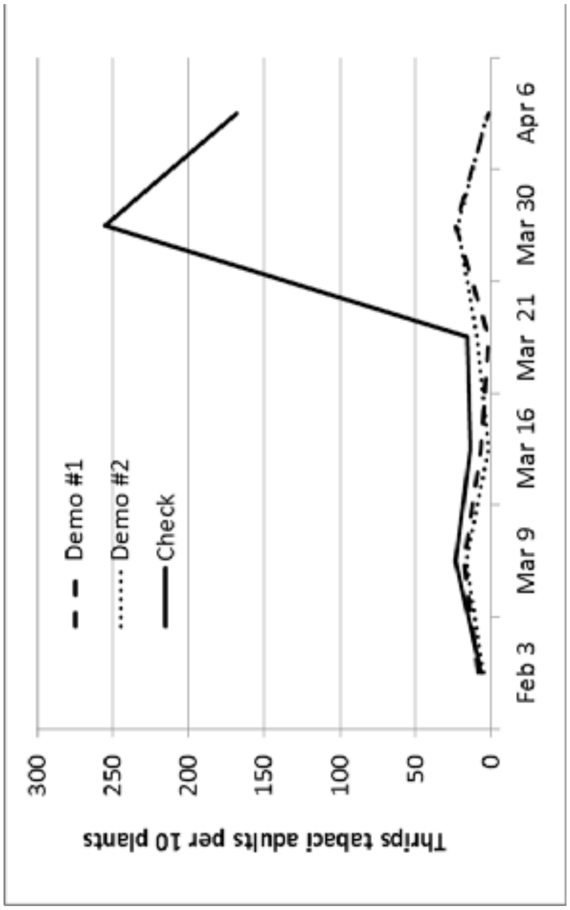

F. fusca per 10 plants
Demo #1
Demo #2
Check
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6

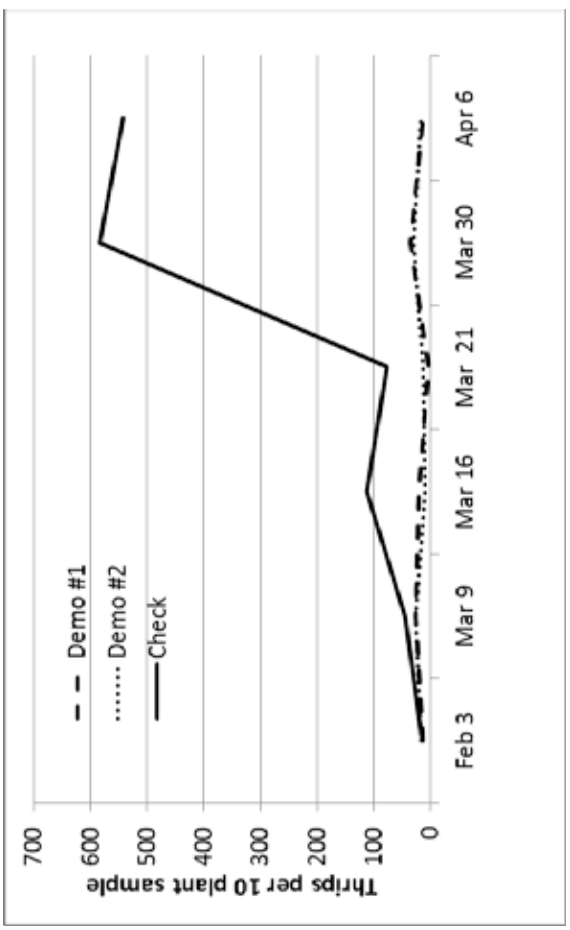
Table 1. Average Thrips on the Plant and Onion Yield

Treatment**	Amount product/acre	Overall thrips average from all scout dates	*Frankliniella fusca* in onion top sampe	*Thrips tabaci* adults in onion top sample	Thrips immatures in top sample	Marketable wt. Colossal size onions/30-ft. row
1 Benevia 10OD	0.088 lb. ai/A	15.6 b	0.9 b	9.3 b	5.1 b	124 a
1 **Dupont Fungicide Program**						
2 AA. Radiant	8 fl. oz./A	16.7 b	1.5 ab	7.2 b	7.4 b	122 a
2 BB. Benevia 0OD	0.088 lb. ai/A					
2 CC. Lannate LV	3 pt./A					
2 **Dupont Fungicide Program**						
3 untreated check		90.2 a	4.1 a	33.1 a	52.7 a	86 b

* Means within columns followed by the same letter are not significantly (LSD, P<0.05) using pseudo replication (i.e., dates for thrips and subplots for onion yield). Only Colossal size onion yield is reported because it was significantly different between treatments.

** AA= $1^{st} + 2^{nd}$ spray date, BB=$3^{rd} + 4^{th}$ spray date, CC=$5^{th} + 6^{th}$ spray date then start over, also all spray treatments with adjuvant MSO at 0.5% v/v. The **Dupont Fungicide Program** was Application 1 (Tanos 8.0 oz. product + Mankocide 2.5 lb. product/A), 2 (Bravo 2 pts. + Mankocide 2.5 lb. product/A), 3 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 4 (Mankocide 2.5 lb. product/A), 5 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 6 (Bravo 2 pts. + Mankocide 2.5 lb. product/A), then repeat if necessary.


Thrips tabaci adults per 10 plants
300
250
200
150
100
50
0
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6
Demo #1
Demo #2
Check


Thrips per 10 plant sample
700
600
500
400
300
200
100
0
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6
Demo #1
Demo #2
Check

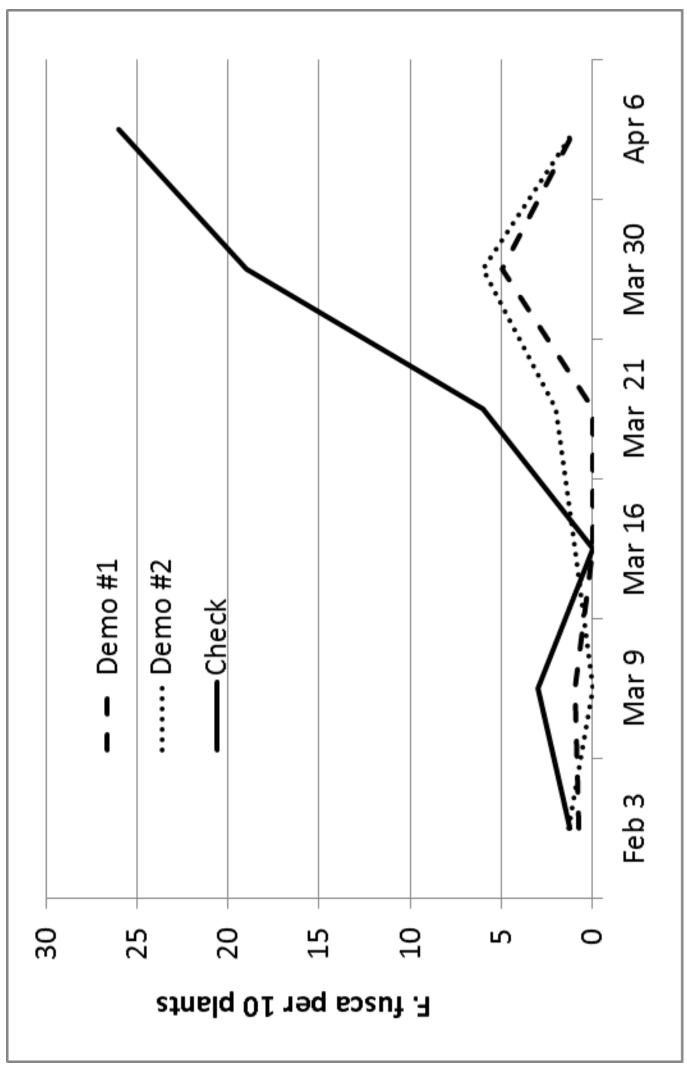

F. fusca per 10 plants
30
25
20
15
10
5
0
Feb 3
Mar 9
Mar 16
Mar 21
Mar 30
Apr 6
Demo #1
Demo #2
Check

Table 1. Average Thrips on the Plant and Onion Yield

Treatment**	Amount product/acre	Overall thrips average from all scout dates	*Frankliniella fusca* in onion top sampe	*Thrips tabaci* adults in onion top sample	Thrips immatures in top sample	Marketable wt. Colossal size onions/30-ft. row
1 Benevia 10OD	0.088 lb. ai/A	15.6 b	0.9 b	9.3 b	5.1 b	124 a
1 **Dupont Fungicide Program**						
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3 untreated check		90.2 a	4.1 a	33.1 a	52.7 a	86 b

* Means within columns followed by the same letter are not significantly (LSD, $P<0.05$) using pseudo replication (i.e., dates for thrips and subplots for onion yield). Only Colossal size onion yield is reported because it was significantly different between treatments.

** AA= $1^{st} + 2^{nd}$ spray date, BB=$3^{rd} + 4^{th}$ spray date, CC=$5^{th} + 6^{th}$ spray date then start over, also all spray treatments with adjuvant MSO at 0.5% v/v. The **Dupont Fungicide Program** was Application 1 (Tanos 8.0 oz. product + Mankocide 2.5 lb. product/A), 2 (Bravo 2 pts. + Mankocide 2.5 lb. product/A), 3 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 4 (Mankocide 2.5 lb. product/A), 5 (Fontelis 16 fl. oz. + Mankocide 2.5 lb. product/A), 6 (Bravo 2 pts. + Mankocide 2.5 lb. product/A), then repeat if necessary.

Investigation of the *Frankliniella Fusca* (Tobacco Thrips) - *Pantoea Ananatis* Relationship on the Epidemiology of Center Rot of Onions

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Introduction

Since its first report on Vidalia sweet onion in Georgia (1997), center rot of onion has been a constant threat to onion producers in Georgia and other onion-producing states. The causal agent is a gram-negative bacterium, *Pantoea ananatis*, which is endemic to Georgia, as more than 20 weed species have been reported as possible inoculum reservoir hosts on which it was detected as an epiphyte. On onion, center rot symptoms include necrotic and bleached streaks on young leaves. As the disease develops, severely infected plants may wilt. The bacteria may continue colonizing leaf tissues until they move downward into the bulb. The bacterium is not a "strong rotter" but discoloration of bulb tissues often occur and it can predispose onions to other bulb rots in storage. Under favorable conditions, this disease has the potential to cause yield losses of up to 100 percent.

In Georgia, *P. anantis* is primarily transmitted by thrips (*Frankliniella fusca* (Hinds)), and may be a component of the insect's gut microflora since it belongs to the family *Enterobacteraceae*. This bacterial family includes the more well-known "gut" bacteria *Salmonella* and *Escherichia coli* (*E.coli*). Understanding the interaction of the insect-bacteria relationship is essential for the knowledge of disease epidemiology leading to the effective management of center rot. Currently, we lack information on how or when thrips acquire the bacteria, how long it can retain the bacteria, and how it transmits the bacteria to healthy onion plants. Specific knowledge of the efficiency of bacterial acquisition, persistence and transmission by thrips to healthy onion seedlings is critical for disease management based on vector control. Hence, the goal of this research was to determine the efficiency of bacterial acquisition, retention and mechanism of transmission by thrips in onion seedlings. Specific objectives were as follows:

Objective 1. Determine the efficiency of *P. ananatis* (bacteria) acquisition and persistence by adult *F. fusca* (thrips).

Objective 2. Determine the mechanism of *P. ananatis* (bacteria) transmission by adult *F. fusca* (thrips) to healthy onion seedlings.

Objective 3. Determine the localization of *P. ananatis* (bacteria) within the adult *F. fusca* (thrips) body.

Materials and Methods

Determine the efficiency of *P. ananatis* (bacteria) acquisition and persistence by adult *F. fusca* (thrips). Adult thrips were collected from an onion field in Reidsville, Ga. (2012) and reared at the University of Georgia-Coastal Plain Experiment Station (UGA-CPES), Department of Entomology. Thrips populations were maintained continuously in an isolated rearing room on *P. ananatis*-free peanut plants. In order to determine if laboratory-reared thrips harbored *P. ananatis* in their gut, three replicates of 10 surface-sterilized thrips were macerated individually in 1.5 ml microcentrifuge tubes with 1 ml of phosphate saline buffer (PBS) and 0.1 ml aliquants were spread plated on both PA-20 and TSBA agar plates. Upon incubation at 28°C for 48 hours, plates were assessed for *P. ananatis* bacterial colonies.

Surface sterilized and air-dried peanut leaves were placed in a micro-centrifuge tube containing 1 ml of 1×106 CFU/ml of *P. ananatis*. Leaf segments were incubated for 5 minutes. To assess the efficiency of thrips acquiring bacteria, a time course study was conducted. Surface sterilized peanut leaves harboring epiphytic bacterial populations of 1 × 106 (*P. ananatis*) were allowed to feed by negative adult *F. fusca* colony for 48 hours. At each exposure time interval or acquisition access period (0, 1, 6, 12, 24 and 48 hours post-exposure (hpe)), four individual adult thrips were sampled from inoculated leaves and placed into separate microcentrifuge tubes. Then individual thrips were assayed separately for the presence of bacteria by the dilution-plating method using a semi-selective medium. Thrips fed on buffer-inoculated leaves served as a negative control. The percentage of thrips positive for *P. ananatis* at each exposure time was recorded. A regression analysis was used to determine the relationship between the acquisition access period and percent of thrips acquiring *P. ananatis*.

In a persistence study, trials were conducted to determine how long thrips can retain bacterial populations after being fed on inoculated peanut leaves. After an acquisition access period of 72 hours on bacteria-inoculated peanut leaves, thips were surface-sterilized and transferred to surface-sterilized peanut leaves. At each time interval (0, 6, 24, 48, 96, 120 and 168 hpe), four thrips sampled from clean peanut leaves were placed into separate vials and the presence of bacteria from individual thrips was determined using the dilution-plating method and a semiselective medium. A regression analysis was used to determine the relationship between the persistence period and percentage of *P. ananatis*-positive thrips.

Determine the mechanism of *P. ananatis* (bacteria) transmission by adult *F. fusca* (thrips) to healthy onion seedlings. Subsets (n = 15/subset) of thrips were allowed to feed on inoculated peanut leaves for 72 hours, after which they were transferred to clean micro-centrifuge tubes covered with paraffin film. A drop (100µl) of 10 percent sucrose solution was placed at the top of the paraffin film and thrips were allowed to feed through the film for five days. After the five-day period, thrips were removed and micro-centrifuge tubes were rinsed with 1 ml buffer to collect thrips feces. Adult thrips fed on PBS-inoculated peanut leaves and processed likewise for feces collection served as **a** negative control. Later, 0.1 ml of the rinsed buffer was placed at the cut end of an onion leaf.

Onion seedlings were scored for the presence of center rot symptoms three to five days after inoculation. Onion leaves were inoculated directly with 1 × 108 CFU/ml of *P. ananatis* as described above to serve as a positive control. The percentage of onion seedlings with center rot symptoms was recorded.

Determine the localization of *P. ananatis* (bacteria) within the adult *F. fusca* (thrips) body. Adult *F. fusca* (n = 15) were allowed to feed on *P. ananatis*-inoculated peanut leaves for 48 hours and samples of three thrips were collected and fixed, dehydrated and sectioned as described in Dutta et al. (1). Thrips fed on PBS-inoculated peanut leaves served as a negative control. For immunolabeling, sections were blocked with 3 percent (wt/vol) non-fat dry milk in 0.01 M potassium phosphate, pH 7.1, containing 0.5 M NaCl (KPBS) for one hour and washed with 10 mM KPBS three times for five minutes each. The primary antibody, polyclonal rabbit anti-PNA (2), was diluted 1:10 in 3 percent BSA in 10 mM KPBS and 10 µl was applied to the seed sections and incubated for 60 to 90 minutes. Sections were then washed with BSA-KPBS three times for two minutes each, and 10 µl of a 1:100 dilution of anti-rabbit immunoglobulin G (IgG) conjugated to Alexa-fluor 488 (Life Technologies Corp., Grand Island, NY) in BSA-KPBS was applied and incubated for 60 minites.

Finally, sections were washed with BSA-KPBS and then with distilled water for five minutes each. Before placing the coverslip on the sections, 10 µl of Citifluor antifade mounting medium AF1 (Electron Microscopy Sciences, Hatfield, PA) was applied. Separate thrips sections were stained with 0.05 percent toluidine blue to visualize the basic cellular arrangement of thrips tissues. The immunolabeled sections were observed with an Eclipse 80i microscope (Nikon Instruments Inc., Melville, NY) and pattern of bacterial colonization of bacteria inside thrips was recorded.

Results

Determine the efficiency of *P. ananatis* (bacteria) acquisition and persistence by adult *F. fusca* (thrips). After surface sterilization, *Pantoea ananatis* was neither detected from the rinsates or from the macerates of adult thrips that fed on non-inoculated peanut leaves. In addition, *P. ananatis* was never detected in the laboratory-maintained thrips population, which was never exposed to the bacterium. However, after acquisition access periods of 1, 6 and 12 hours, the mean percentage of thrips with *P. ananatis* was 0, 4.2 and 25.0 percent, respectively in thrips that fed on inoculated leaves. The mean percentage of thrips acquiring *P. ananatis* after acquisition access periods of 24 and 48 hours was 45.9 and 70.8 percent, respectively. A positive exponential relationship between acquisition access period and mean percentage of *P. ananatis*-positive thrips was observed (P= 0.019, $R2$ = 0.98). Bacterial colonies were not recovered from thrips that fed on PBS-inoculated peanut leaves.

After being exposed for 72 hours to epiphytic populations of *P. ananatis*, the bacterium persisted in 70.8, 50.0, 33.3 and 33.3 percent of thrips after 0, 6, 24, 48 and 96 hpe to healthy peanut leaves, respectively. Even after 120 and 168 hpe to healthy peanut leaves, *P. ananatis* persisted in 16.7 and 4.2 percent of thrips. The relationship between persistence period and percentage of *P. ananatis* positive thrips was better represented by an exponential decay regression model (P= 0.02, $R2$ = 0.94). *P. ananatis* populations were not recovered from negative control thrips assayed similarly.

Determine mechanism of *P. ananatis* (bacteria) transmission by adult *F. fusca* (thrips) to healthy onion seedlings. One hundred percent of the seedlings that were inoculated with *P. ananatis* displayed typical center rot symptoms after five days post-inoculation. Seedlings inoculated with sucrose solution remained asymptomatic. Sixty four percent of onion seedlings that were inoculated with thrips feces developed center rot symptoms. A subset of seedlings associated with each treatment that led to putative center rot symptoms was confirmed to be infected with *P. ananatis* by pathogen isolation followed by real-time PCR assay.

Determine the localization of *P. ananatis* (bacteria) within the adult *F. fusca* (thrips) body. Immunolabeled micrographs of *F. fusca* showed bacterial localization in the head, thorax, hind gut and hemolymph after 48 hours of acquisition access period. *Pantoea ananatis* cells were not observed in the sections of negative control thrips.

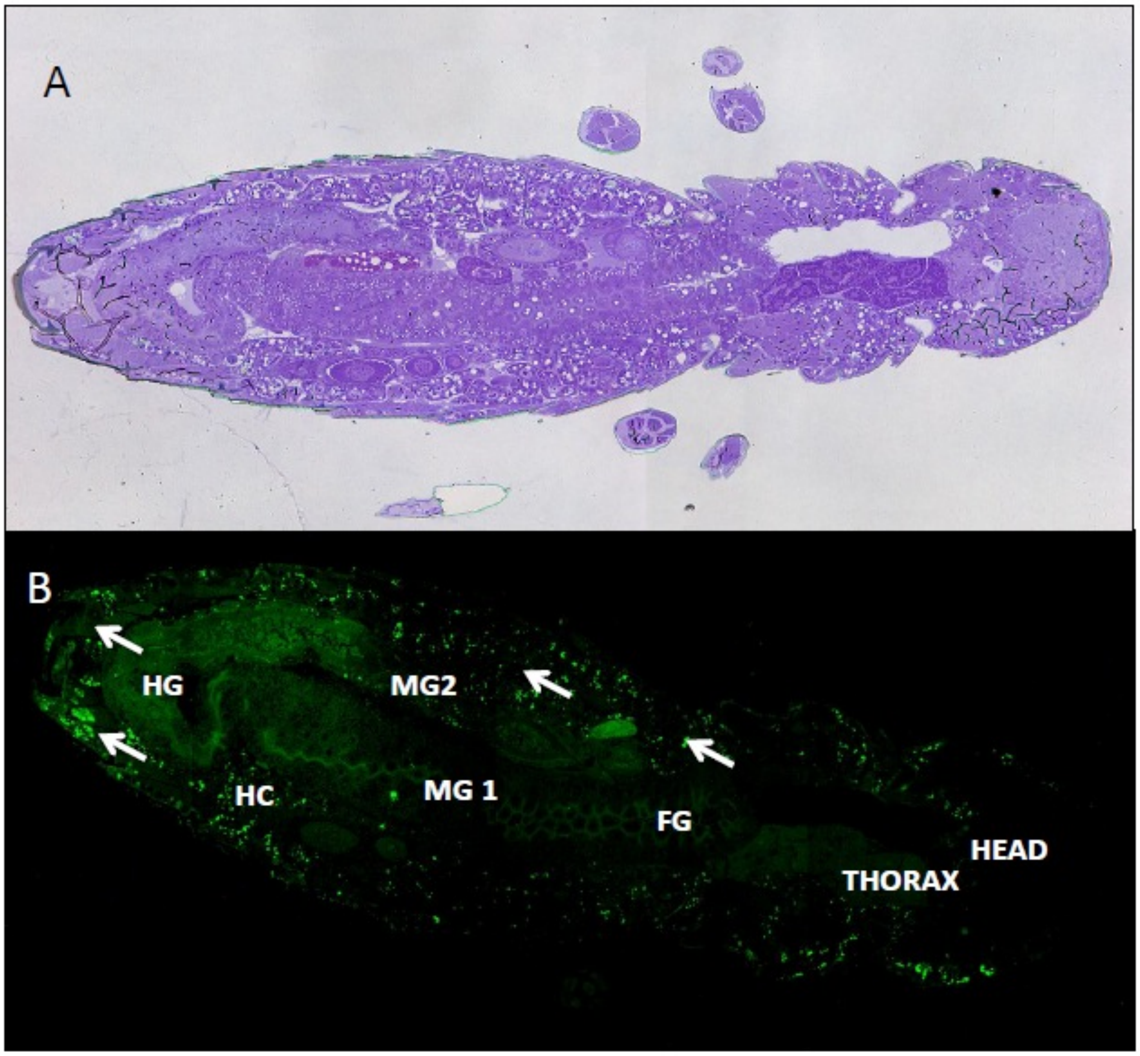

Figure 1. Immunolocalization of *P. ananatis* in adult tobacco thrip (*F. fusca*). A: Immunolabeled micrograph of *F. fusca* fed on epiphytic populations of *P. ananatis*, B: *F. fusca* micrograph stained with toluidine blue dye. FG: Foregut; MG1: Midgut 1; Midgut 2; HG: Hindgut; HC: Hoemocoel.

Conclusions

Tobacco thrips (*F. fusca*) can efficiently acquire *P. ananatis* from a contaminated source and an acquisition access period of 48 hours is required for ≥70 percent of thrips to acquire the bacterium.

Bacterial localization in the hind gut and hemolymph of the thrips was observed after an acquisition access period of 48 hours. Our study also demonstrated the potential mechanism of bacterial transmission is through thrips feces. More than 63 percent of the onion seedlings showed center rot symptoms when inoculated with feces of thrips that fed on epiphytic populations of *P. ananatis.* These results suggest that *P. ananatis* transmission to healthy onion plants is a passive process (i.e., bacterial transmission occurs through contaminated feces rather than by active feeding.

Furthermore, this study also demonstrated that after an acquisition access period of 72 hours*, P. ananatis* can persist in *F. fusca* for 168 hpe to healthy peanut leaves, which is the food of choice in the assay used. This suggests that *P. ananatis* do not colonize the gut of *F. fusca* and after prolonged feeding on healthy tissues. Based on these data, it appears that thrips can cleanse their digestive system by feeding on a non-contaminated food supply for at least 196 hours.

References

1. Dutta et al., 2012. Phytopathology 102:461-468.

2. Walcott et al., 2003. Plant Dis. 86:06-111.

Thrips on Onions – Foliar Efficacy Trials
2012

Alton N. Sparks, Jr.
Extension Entomologist
University of Georgia, Tifton Campus

Locations: (two locations)
Vidalia Onion and Vegetable Research Center (VOVRC)
Commercial growers field south of Santa Claus (near intersection of Highways 4 and 15/29)

Experimental Design:
RCBD with four replications

Plot Size:
Commercial field: one bed (four rows; 6 feet) by 20 feet with a non-treated bed between plots
VOVRC: one bed (four rows; 6 feet) by 14 feet (all plots were end-to-end on a single bed)

Application Method:
CO_2 pressurized backpack sprayer, 60 PSI, 40 GPA, four hollow-cone nozzles, broadcast application

Treatments and application dates:

Commercial field:

Radiant at 6 oz./A
Karate (2.08 lb. AI/gal) at 1.92 oz./A
Agri-Mek SC (0.7 lb. AI/gal) at 3.5 oz./A
HGW86 (10SE) at 27 oz./A (+ buffer at 1 ml/3000 ml)
Torac at 21 oz./A
HGW86 (as above) + Lannate at 3 pts./A
Torac (as above) + Lannate at 3 pts./A
Non-treated check

ALL insecticide treatments + Dyne-Amic at 0.5%
Single application on 12 March 2012

VOVRC:

Dropped the HGW86+Lannate treatment
Added Movento at 5 oz./A
ALL plus Dyne-Amic
Applications on 14 and 22 March 2012

Thrips Sampling:
Middle two rows of each plot were visually searched for three minutes and the number of adult and immature thrips found were counted and recorded.

Thrips species: Thrips samples collected prior to both tests (8 March 2012) showed 91 percent and 100 percent onion thrips at VOVRC and the commercial field, respectively.

Statistical Analyses: PROC ANOVA of PC-SAS (P<0.05); LSD (P=0.05).

Results:
Results for each test are presented in tabular form below.
As always, nothing provides great control of thrips, particularly in a small plot test.

In the commercial field, at one day after application, the two treatments containing Lannate provided the greatest numerical suppression followed closely by Radiant and HGW86 and Torac without Lannate. These same five treatments provided suppression of thrips adults throughout the test. Agri-Mek showed suppression of adults at seven and 10 days after treatment (DAT), but not at the earlier counts. Immature counts showed similar trends, with both HGW86, both Torac, and Radiant treatments showing suppression of immatures from four through 10 DAT. Agri-Mek showed suppression at four and 10 DAT, but not at seven DAT.

At the VOVRC, adult thrips showed statistical separation of treatments only at one day after the first application (1 DAT-1) and at four DAT-2 (adult counts at the VOVRC were more variable). Radiant, HGW86, Agri-Mek and both Torac treatments showed reductions on both dates. The most consistent reduction in adults appeared to occur with the Torac and HGW86 treatments. Immature thrips counts showed statistical differences among treatments on all sample dates. The most consistent suppression of immature thrips appeared to occur with HGW 86, Radiant, and both Torac treatments. Movento and HGW86 showed the greatest suppression on the last sample date, suggesting possible longer residual activity against immature thrips with these products.

Evaluating Efforts to Delay Onion Maturity in Georgia

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Overview

In spite of many legal varieties available, all onions typically mature within about three weeks of one another. While the onion harvest in Georgia may last from early April to June, peak maturity across all cultivars is generally in the last three weeks of April. In 2012, harvest of the official UGA Onion Variety Trial began on April 12 and concluded on April 26 after an early season due to exceptionally warm spring temperatures. In 2011, harvest of the trial ranged from April 18 to May 2, and in 2010 the harvest ranged from April 19 to May 24. Later harvest is possible when temperatures in April and May are cooler than normal; however, when temperatures get in the 90s consistently, onions have a short timeline regardless of varietal maturity classification.

Purpose

This study was designed to see if the modification of multiple factors could extend the window of maturity of fresh season onions in Georgia. Once an onion reaches peak maturity, only bad things can happen as it sits in the field waiting to be harvested. Growers could greatly benefit from practices that could extend the time of peak maturity with currently existing cultivars.

Methodology

Three cultivars were selected that had been later maturing in both the 2010 and 2011 UGA trial (EMY 110, EMY 55375 and Sweet Jasper). These cultivars were sown on the plant beds in mid-October as opposed to normal seeding dates in September. As a result, they were transplanted in January (most onions are planted in November and December) behind fumigated plant beds, where metam sodium fumigation use should have greatly diminished the presence of Pink Root Rot. Pink Root Rot can shorten the life of onion by collapsing and deteriorating the root system as temperatures warm in the spring.

Another tool in an attempt to delay maturity was plant population. A standard population of 87,120 plants per acre was used in the study with an observational plot of each variety with a population of 152,460 plants per acre.

Late nitrogen use was also evaluated in an effort to delay maturity. There were eight standard plots of each variety. Four replications received additional nitrogen, and four replications did not receive the last application.

Plant Bed Fertility (Sown 10/17) 4 pts. Dacthal

9/1	600 lbs. 5-10-15	30-60-90
10/17	150 lbs.18-46-0	27-69-0
11/16	150 lbs CaNO3	31-0-0
12/2	150 lbs CaNO3	31-0-0
		Total = 119-129-90

Field Fertility (Planted 1/5/12)

1/6	Goal + Prowl
	150 lbs. DAP
	300 lbs 5-10-15
1/17	300 lbs 5-10-15
2/7	150 lbs. CaNO3
2/23	150 lbs. CaNO3
3/8	150 lbs. CaNO3
3/22	150 lbs. CaNO3 **(#2 plots only)**

Total Plot 1 = 127-129-90

Total Plot 2 = 150-129-90

<u>Results</u>

There was no visible difference in maturity between the two nitrogen fertility regimes. Likewise, no differences in maturity were observed between the standard plant populations and the high density plots of each cultivar. These cultivars did mature at the same time, as there was little difference in the percentage of tops down across the entire study.

Plots were harvested on May 7. In comparing each cultivar in this study to its counterpart in the UGA Onion Variety Trial, we were able to extend peak maturity by a modest 10 days.

While maturity was not greatly impacted by plant population and nitrogen use, yield differences were apparent.

In looking at total fresh weights:

EMY 110 - Low N plots yielded 887 60-pound field bags per acre and high N plots produced 807 field bags per acre, about a 10 percent difference. The high density plot produced 1,087 field bags, a 22 percent increase in total yield.

EMY 55375 – Low N plots yielded 847 bags per acre and high N plots made 848 bags. The high density plot produced 1,004 field bags, about an 18 percent increase in total yield.

Sweet Jasper – Low N plots averaged 819 field bags per acre and high N plots produced 801 bags per acre, a modest 2 percent difference. The high density plot made 1,055 field bags, a 29 percent increase.

After grading and sizing onions:

	40 lb. boxes/A	% Colossal	% Jumbo	% Medium
EMY 110 – Low N	784	3	79	18
High N	775	3	82	15
High Density	951	2	66	32
EMY 55375 – Low N	935	2	81	17
High N	836	0	82	18
High Density	930	2	58	40
Sweet Jasper – Low N	677	2	73	25
High N	639	1	75	24
High Density	976	0	39	61

It must be noted that the high density plot of each cultivar was a single plot not replicated four times as were the high and low nitrogen plots. However, it is worth noting that larger marketable yields are possible as is a much larger percentage of Mediums (desirable in some markets).

The additional 23 units of nitrogen applied on March 22 did not increase yield, but it did reduce marketable yield in each variety. EMY 110 was down 1 percent, EMY 55375 reduced 12 percent and Sweet Jasper was down 6 percent.

Summary

2012 brought a warm spring, with average daily temperatures during the length of this study (January 5 – May 7) of 74.5 °F. Comparatively, during this same time period over the previous several years the daily average temperature was in the 68-69 °F range. Temperatures were above

90 °F for about 10 days, from the last few days of April through the first week of May. Attempts to delay maturity through later planting, higher fertility or higher plant populations had little impact across three selected cultivars this season. A delay of 10 days is modest; however, to a grower, a 10-day gap could be helpful at harvest time.

Using Onion Waste as a Co-Digestant with Dairy Waste to Produce a Renewable Energy

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Introduction

Onion waste originating from the culling process in Georgia alone can be in the hundreds of thousands of pounds per year during Vidalia onion season and approximately six times less during the non-Vidalia season. This waste material has to be disposed of in some form or fashion. As the United States continues to look for alternative forms of energy, one potential source for packinghouses is onion waste. These onions can be converted into methane gas through the process of anaerobic digestion. The data presented here is based on research conducted at the lab of Dr. Gary L. Hawkins in Tifton, Ga., using culled onions collected from a Vidalia onion packing plant over multiple years.

Materials and Methods

Preparation of culled onions and sample analysis: Culled onions were collected directly off of the culling line from a packing plant in Glenville, Ga., and transported back to the lab on the UGA campus in Tifton, Ga. The culled onions were processed by separating the juice from the pulp with a Vincent Screwpress (NOTE: the mention of trade names in this report does not indicate endorsement by the University of Georgia). The juice was stored in 250-gallon tanks and the pulp was added to a compost pile at the lab. To determine press efficiency, the juice and pulp was analyzed for moisture content, total solids and volatile solids. Additionally, the juice was analyzed for chemical oxygen demand (COD), Brix and pH. The onion juice was stored until a time needed to produce a feedstock for the anaerobic digesters. At that time, a 50 percent onion and 50 percent dairy waste mixture was made to feed the anaerobic digesters. Testing of the onion/dairy mixture consisted of COD, alkalinity and pH. Once processed through anaerobic digesters, the effluent (liquid out of digesters) was also tested for COD, alkalinity and pH. Gas production was monitored during the anaerobic digestion process to determine operation stability.

Dairy waste was collected from the UGA dairy wastewater separation trenches as the wastewater moved into the anaerobic lagoon. This liquid was stored in 250-gallon tanks until needed to mix with the onion juice to produce a 50/50 mixture for feeding to anaerobic digesters.

Anaerobic Digesters: Three identical pilot scale anaerobic digesters were used for the experiments (Figure 1). Three digesters were used as replicates along with time. The type of digester used for these experiments was a downflow anaerobic filter. The open volume of the digesters was 90 liters with a packing material of lava rock, which occupied 50 percent of that volume. The digesters were constructed of PVC pipe with ports for feeding the digesters, collecting samples and removing the effluent. Samples ports placed at a midway point down the digester were used to collect samples for analysis. The temperature of each digester was maintained at 35 °C ± 1 °C throughout all experiments as measured by a thermocouple placed in the center of the anaerobic digester and maintained with a blanket of circulating water from a hot water heater. Temperature of the digesters, feed rate and gas monitoring were controlled and data was stored using a Campbell Scientific CR3000 Data Logger.

Figure 1. Anaerobic filters used in the experiments to determine amount of bio-gas that could be produced from onion culls.

Feed rates to the digesters was set at 3 liters per day in a split application. Based on the collection of samples at a point halfway down the digesters, the calculated hydraulic retention time of the digesters was effectively 10 days. The COD of the wastewater changed daily as the mix tank underwent degradation and therefore the effective organic loading changed daily as monitored by twice-weekly analysis of the feedstock to the digesters.

Gas production was monitored hourly through the use of a water-based tipping bucket. Each side of the tipping bucket was calibrated to contain 25 mL of air before tipping. When the bucket tipped, a magnet-based switch would register a pulse that was accumulated in the memory of the data logger and stored in final memory hourly.

Results and Discussion

Onion juice was mixed with dairy waste in a 50/50 mixture. Previous tests showed that onion juice stored by itself or with other fruit or vegetable juices reached an equilibrium pH of approximately 3.5 after four days. This low pH stops all degradation of the onion juice and converts some of the sugars into acid in the first stage of anaerobic digestion. The 50/50 wastewater mixture was found to provide the best combination to feed the anaerobic digesters for the production of bio-gas. A 75 percent onion / 25 percent dairy mixture was used, but the anaerobic conversion rate of sugars to acid in the digester was too fast for further conversion to methane gas and the digesters failed due to a low pH.

Initial experiments had calcium bicarbonate added to the onion / dairy (50/50) mixture to provide a consistent alkalinity to the digesters (alkalinity is the ability of a system to resist pH change).

After a couple batches, the microbial population within the digesters was able to produce ample alkalinity to maintain a consistent pH (this data is not presented in this report).

Bio-gas production (70-75 percent methane) can be seen in Figure 2. The areas where the bio-gas production is zero or near zero are periods when the digesters were not fed in an attempt to determine recovery rates after a short or lengthy rest period. These periods were designed to see the effect on the bio-gas production when there was no onion juice available. Between May and July 2012, no wastewater mix was added to the digesters to determine the recovery rate after an extended hibernation period. In all cases after a down period, the anaerobic digesters rebounded and started producing bio-gas within days of the feedstock being reintroduced to the digesters (Figure 2). One potential reason for this could be that the temperature of the digester was maintained at 35 °C even when no feedstock was added.

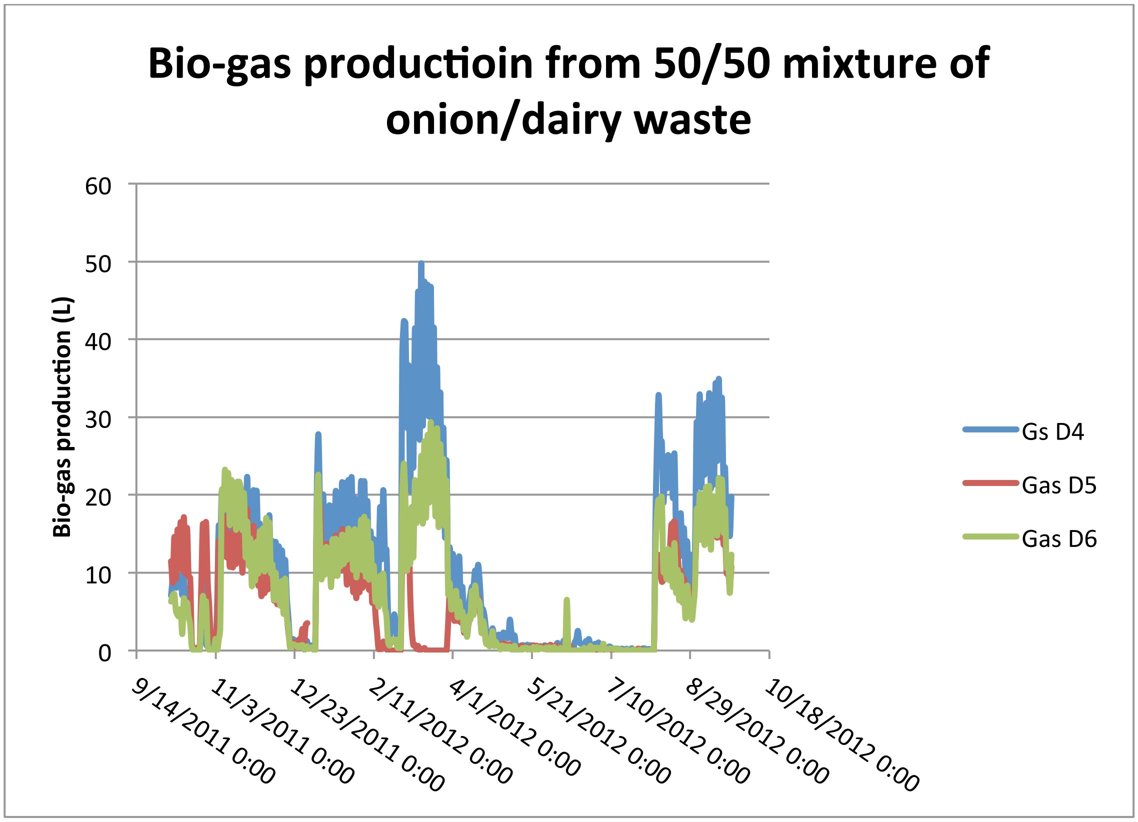

Figure 2. Bio-gas production from 3 liters of onion/dairy waste mix added in split applications daily.

As can be seen in Figure 2, there was a trend during each period of the experiment for the gas production to decrease over time. Even though the gas production decreased over time, the COD removal from the wastewater averaged 88 percent over the period shown in Figure 2. The gas production followed the COD of the influent as would be expected from chemistry.

Conclusions

According to this research, when juice from culled onions is used in conjunction with 50 percent dairy waste, there is an average production of 14 liters of bio-gas (70-75 percent methane) for every 1.5 liters of onion juice added to the reactors. Therefore, it would be feasible to use the culled Vidalia onions as a source of feedstock to convert waste to energy.

Other questions

The research presented here was based on the hypothesis that culled Vidalia onions could be a feedstock to produce ample bio-gas for use as an alternative energy source. This research suggests that Vidalia onions would provide a viable source of energy for use in the onion packing plant or elsewhere. However, there are a few questions that also arise from this research: 1) Can the effluent from the anaerobic digester be used in place of dairy waste as the second component in the feedstock mixture? 2) What can the effluent water be used for after running through the anaerobic digester? and 3) Can the onion culls be handled in a manner that does not require additional energy input to get the onion liquid separated from onion pulp if an anaerobic filter is used? These questions and others need to be answered prior to beginning any large scale production of waste to energy.

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