2020 Vidalia Onion

Extension and Research Report

UNIVERSITY OF GEORGIA
EXTENSION

2020 University of Georgia Vidalia Onion Extension and Research Report

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Weather summary for the 2019-20 Vidalia onion season

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Introduction

Every onion season is unique in its weather patterns and events, and this past one was no different. I will review and discuss the weather patterns and events that were notable for the 2019–20 Vidalia Onion season, and the potential implications they had for the crop

Onion seedbed period (September-October 2019)

This time during the onion season was notable for its extremely high temperatures and absence of rainfall events. Most of September and the first week of October had many days exceeding 90 °F. In fact, there were 23 days during September and October when temperatures exceeded 90 °F, and 12 days in which the temperature exceeded 95 °F. The high temperatures occurred at the time when growers were planting onion seed and trying to grow young seedlings. Consequently, irrigation events were more frequent than in past years. It was unknown at the time the effect that these extreme temperatures would have on the onions, but as growers began pulling and transplanting, many noted that the seedbeds were not providing the number of transplants they expected. It is possible that the extreme heat resulted in reduced/poor germination and/or stand loss to seedbeds.

Transplanting and early season (November-December 2019)

As we transitioned into transplanting and early season, the temperatures cooled off and became more favorable for onions. After transplanting, weather conditions favored the onion establishment, with mild temperature and few rainfall events. Later, rain events were more common, while there were no extreme hot or cold temperatures recorded during this time. There were only 3 days with a minimum temperature below freezing. Overall, growers were able to successfully transplant and get onions off to a good start.

Mid-season (January-February 2020)

Similar to the early season, the onion mid-season was very favorable for onion growth. Warm temperatures than usual and frequent rainfall allowed young onion plants to grow rapidly, which allowed considerable leaf growth, and many growers remarked that their crop was "ahead of schedule" since the onions had larger tops with more leaf surface, as well as more leaves than is typical for this time. Several rainfall events brought us 1 inch or more of water, which created some delays in making field applications of fertilizer or fungicides.

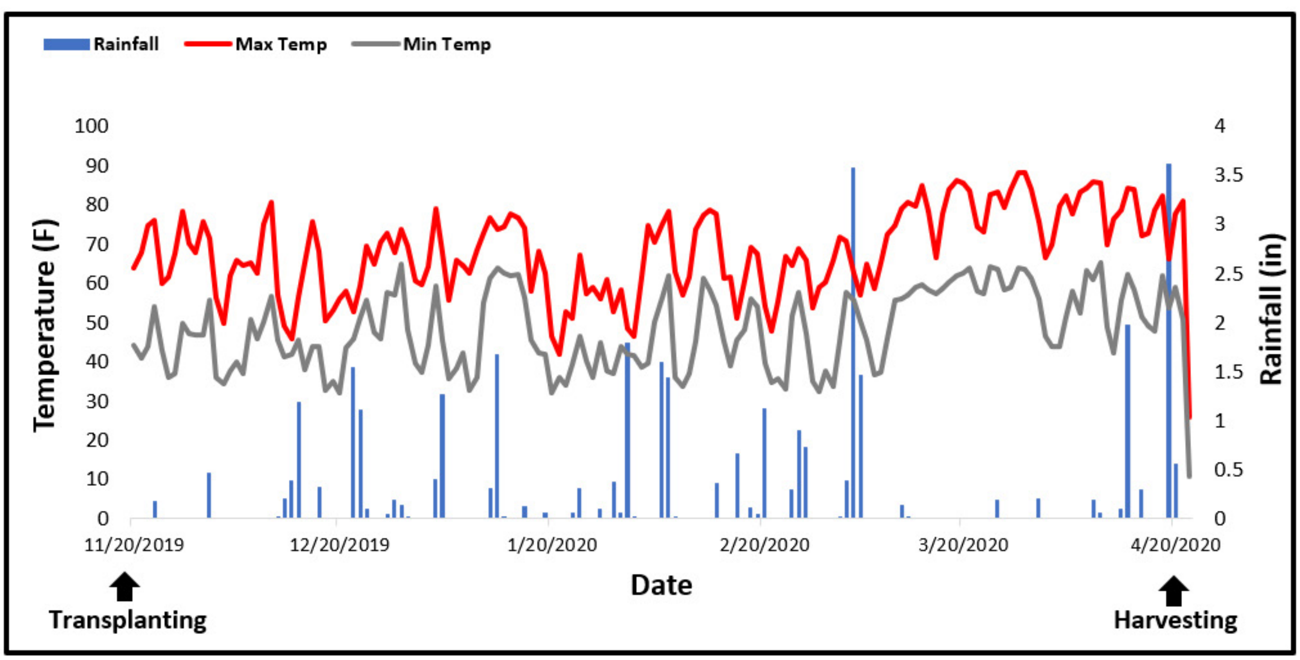

Figure 1. Weather condition of minimum and maximum temperature and rainfall during the 2019/2020 Vidalia onion season in Lyons, GA.

Late season and harvest (March-May 2020)

Frequent rain events continued into the beginning of March. These rain events were in addition to the already accumulated early season, consequently, there were waterlogged areas that caused delays in field applications, and caused concerns about leaching nutrients. The last 3 weeks of March turned dry and hot, with temperatures constantly pushing 90 °F with high amounts of solar radiation (clear, sunny days). This seemed to be quite a shock and stressor to many onions, as they were at the bulb initiation stage of crop development and recovering from the recent waterlogging/nutrient stress. Particularly, growers were facing onion leaf tips turn brown and necrotic. Some of this necrosis ran all the way down the leaf to the neck of the plant and as the season progressed, growers noted that bulbs were not sizing up to their expectations. Bacterial disease also began to show up, and lesions on leaves, wet necks, leaf death was observed. Samples from fields indicated that Center Rot, Sour Skin, and Slippery Skin were the bacterial pathogens responsible for disease incidence. As harvest began, the heat subsided, but the rains did not. This created more delays, and more bacterial issues were showing up across the growing region. A storm front brought hail to the area on April 8, 2020. This hail damaged a few onion fields in the area, and some growers were forced to abandon these fields. As growers transitioned from the fields to packing sheds, many saw reduced yields due to internal rot. Looking back on the latter half of the season, the rain and heat were driving forces of the bacterial disease that we saw. Many growers saw 30-40 inches of rain during the season, making a very wet year.

Growing degree day per onion variety

As aforementioned, temperature plays an important role in the onion vegetative, bulb initiation and bulb formation stages of crop development. Consequently, the use of the growing degree day (GDD) approach to estimate timing of onion maturity has proved being beneficial for Vidalia onion growers to prepare for harvesting time. In the 2019-20 Vidalia onion season, varieties were separated according to the GDD required to maturity (Table 1). The goal is to provide growers initial source of information on variety selection.

Conclusion

Weather conditions for the Vidalia onion season of 2019-20 was near optimum for onion production in the early season, allowing for a quick crop establishment and development after transplanting, in the mid-season. However, the heavy rainfall events and uncommon hot temperatures later season created environmental conditions optimum for disease development, while made difficulty field operations and harvesting. In conclusion, selecting varieties that allow different windows for field operation and harvesting is a good strategy to minimize issues caused by the weather variability of Georgia Vidalia onion season.

Table 1. List of Vidalia onion varieties according to maturity stage, planting date, harvest timing, days after transplanting (DAT), and growing degree days accumulated at harvest.

Varieties	Maturity	Planting Date	Harvest timing	DAT	GDD
Candy Joy, Fast Track, Quick Start	Very Early	11/13/19	4/7/20	146	822
Candy Kim, New Frontier, Vidora, DP 1407, Candy Ann	Early	11/13/19	4/14/20	153	896
Sweet Agent, WI-129, Sweet Emotion, Rio Dulce, J3009, Sofire, Dulciana, Vulkana, Althea	Medium	11/13/19	4/21/20	160	954
Tania (J3013), J3014, Sweet Harvest, Plethora, 2002-Nunhems, DP Sapelo Sweet, Red Sensation, Pirate, Hazera 3662	Late	11/13/19	4/28/20	167	1019
Sabrina, NT-AC0901, Super Ex, Emy 55126, Georgia Boy, Alison, Emy 55455, Sweet Magnolia, Century, Emy 55457, Sweet Azalea, Sweet Jasper, Macon, Granex Yellow PRR, SON-109Y, Lucille, Red Hunter, Mata Hari, Red Duke	Very Late	11/13/19	5/5/20	174	1094

* Letters that are the same between varieties indicate that those varieties are not significantly different according to Tukey test ($P \leq 0.05$)

UGA variety trial report for the 2019-20 Vidalia onion season

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Introduction

The University of Georgia evaluates short day onions to determine their performance characteristics in standardized growing practices. The varieties are placed in the trial by participating seed companies. These trials are conducted at the Vidalia Onion and Vegetable Research Center (VOVRC).

Material and methods

There were 45 varieties entered into the 2019-20 trial. The seedbeds were grown at the VOVRC in Lyons, Georgia. Seedbed treatment included a 75 gallon per acre fumigation treatment of metam sodium. The seedbeds were planted on September 16, 2019, and the trial was transplanted on November 13, 2019. Upon harvest and grading, one bag of jumbo onions per plot is sent to the Vidalia Onion Research Lab in Tifton, Georgia, to undergo controlled atmospheric storage conditions. The storage duration is carried out until September 15, 2019. Seedbed and trial fertility, as well as fungicide programs are listed below.

The trial evaluated all 45 varieties in 25-foot-long by 6-foot-wide plots. Each variety was replicated four times and harvested based on a committee Decemberision of maturity. The plant population for the trial was equivalent to 87,120 plants per acre.

Seedbed Fertility:

Date	Fertilizer
September 9	700 lb/A of 5-10-15 (preplant incorporated)
September 30	200 lb/A of 10-10-10
October 7	200 lb/A of 10-10-10
October 28	200 lb/A of 10-10-10
Total lb/acre applied: 95(N) – 130(P) – 165(K) – 57(S)	

Note: All fertilizer applications were applied with a First Products brand drop spreader.

Seedbed Pesticides Applied:

Date	Product Applied
August 8	Vapam HL (75 gal/A)
September 9	Lorsban (1qt/A preplant incorporated)
September 17	Dacthal (4 pt/A) + Diazinon (2 qt/A)
October 20	Pristine (18.5 oz/A) + Magna-Bon (12 oz/A)
November 1	Inspire Super (20 oz/A) + Magna-Bon (12 oz/A)
November 9	Pristine (18.5 oz/A) + Magna-Bon (12 oz/A)

Trial Fertility:

Date	Fertilizer
October 31	400 lb/A of 5-10-15 (preplant incorporated)
November 27	200 lb/A of 5-10-15
December 18	200 lb/A of 5-10-15
January 8	400 lb/A of 5-10-15
February 24	100 lb/A of calcium nitrate
March 9	150 lb/A of calcium nitrate
Total lb/acre applied: 98.5(N) – 120(P) – 180(K) – 36(S)	

Note: Soil sample test results called for 125 -150 lb/A nitrogen,60 lb/A of phosphorus, 90 lb/A of potash, and 40 – 60 lb/A of sulfur. All fertilizer applications were applied with a First Products brand drop spreader.

Trial Fungicide Schedule:

Date	Fertilizer
January 15	Luna Tranquility (27 oz/A)
January 22	Quadris Top (14 oz/A) + Magna-Bon (12 oz/A)
January 29	Miravis Prime (12 oz/A) + Kocide 3000 (.75 lb/A)
February 5	Inspire Super (20 oz/A) + ProPhyte (2 qt/A)
February 12	Merivon (11oz/A) + Bravo (3 pt/A)
February 1	Inspire Super (20 oz/A) + Bravo (3 pt/A)
February 26	Fontelis (24oz/A) + Kocide 3000 (.75 lb/A)
March 11	Miravis Prime (12 oz/A) + Kocide 3000 (.75 lb/A)
March 18	Orondis Ultra (8 oz/A) + Omega 500 (16 oz/A) + Magna-Bon (12 oz/A)
March 25	Miravis Prime (12 oz/A) + Magna-Bon (12 oz/A)

Other Pesticide Applications:

Date	Product Applied
November 1	Lorsban (1 qt/A) preplant incorporated
November 14	Goal 2XL (1 qt/A) + Prowl (1 qt/A)
February 3	Exirel (21 oz/A)
February 24	Radiant (10 oz/A)
March 9	Radiant (10 oz/A)

Harvest timing

Each variety was evaluated and selected for harvest based upon signs of weak tops and adequately sized bulbs. A committee of Extension Agents determined the harvest/pulling of varieties. Participating seed companies reserve the right to specify when or what characteristics determine the harvest of their variety. Varieties were dug 7 days prior to harvest date.

April 07: Candy Joy, Fast Track, Quick Start

April 14: Candy Kim, New Frontier, Vidora, DP 1407, Candy Ann

April 21: Sweet Agent, WI-129, Sweet Emotion, Rio Dulce, J3009, Sofire, Dulciana, Vulkana, Althea

April 28: Tania (J3013), J3014, Sweet Harvest, Plethora, 2002-Nunhems, DP Sapelo Sweet, Red Sensation, Pirate, Hazera 3662

May 05: Sabrina, NT-AC0901, Super Ex, Emy 55126, Georgia Boy, Alison, Emy 55455, Sweet Magnolia, Century, Emy 55457, Sweet Azalea, Sweet Jasper, Macon, Granex Yellow PRR, SON-109Y, Lucille, Red Hunter, Mata Hari, Red Duke

Production issues in 2020

Yields and quality were significantly lower than average for many varieties this year. Here are some the issues that contributed:

Bolting– There was a high incidence of bolting in the trial that reduced yield. Counts were taken on April 3 as harvest began. At that time, counts in some varieties were 10-30% bolted (see table). However, many varieties continued to bolt until harvest, and this late bolting reduced yields even further. At harvest, some varieties were 50% bolted.

Hail damage– A hail storm occurred at the Vidalia Onion and Vegetable Research Center on April 8, 2020. High winds accompanied the hail storm and damaged the onions that had not been harvested. The hail caused significant bruising of onion tissue, along with puncture wounds to the leaves.

Bacterial disease at harvest– Internal bacterial rots occurred at a very high percentage in onions harvested after April 15. Many of the varieties harvested after this time had marketable yields below 500 bags/acre. Samples from culls indicate that several pathogens were to blame. *Pantoea spp.*, the causal agent of Center Rot, and *Burkholderia spp.*, the causal agent of Sour Skin and Slippery Skin, were identified as the major contributors to the internal rot. Many of the onions affected had wet necks. In some instances, this internal rot was only detectable by cutting the onion open and inspecting it.

A photo of internal Decemberay found on the grading line at the Research Center. This onion showed no external symptoms of disease. The pathogen causing this Decemberay is believed to be from *Burkholderia spp.*, which is responsible for Sour Skin and Slippery Skin disease of onion.

COVID-19 and onion harvest– The 2020 harvest season brought unique challenges for the Vidalia Onion and Vegetable Research Center. The COVID-19 crisis coincided directly with harvest and grading of the variety trial. The inmates from Rogers State Prison that normally provide this labor were not allowed out of the prison due to quarantine. So with no labor available to harvest and grade, a plan was made for the county agents to safely harvest and grade the trial themselves, while practicing social distancing. Instead of harvesting entire plots, a 5 foot sample from each 25 foot plot was harvested and graded. County agents practiced social distancing in the field and grading shed by keeping a minimum 6 foot distance from others while working. The county agent crew harvested

A picture of hail damage at the Vidalia Onion and Vegetable Research Center taken on April 10, 2020, two days after the storm. Notice the severe bruising to the entire leaf with a few puncture wounds.

the variety trial over a period of 6 weeks, meeting twice per week to pull, clip, dry, and grade onions as they matured. Over 500 hours of volunteer manpower was logged in order harvest this trial. Many thanks to this hardworking group for making this trial a success!

Results and discussion

The following tables show field weights, marketable yields, colossal yields, jumbo yields, and medium yields. There is also information about cull weights, seed stem counts, and grading notes. For additional information regarding the performance of a given variety, please contact your Extension Agent or the Vidalia Onion and Vegetable Research Center. We would like to thank the participating seed companies as well as the Vidalia Onion Committee for their support of this trial.

COVID-19 brought many challenges to onion harvest and grading. Labor was not available for harvest, so county agents harvested and graded onions while maintaining social distancing. Pictured here at the onion grader are: (l-r) Aubrey Shirley – Tattnall County, Savannah Tanner – Emanuel County, Jason Edenfield – Toombs County, Derrick Bowen – Tattnall County. Not pictured: Steven Powell, Treutlen County.

Table 1. Vidalia onion total yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Total yield	
1	Sweet Emotion	1169	a
2	Macon	1097	a
3	Mata Hari	1059	ab
4	New Frontier	1021	abc
5	Candy Kim	1004	abc
6	Candy Ann	1004	abc
7	2002	999	abc
8	Sweet Agent	999	abc
9	Sweet Magnolia	970	abcd
10	1407	966	abcd
11	WI-129	966	abcd
12	Century	932	abcd
13	Althea	932	abcd
14	Quick Start	927	abcd
15	Sofire	923	abcd
16	Rio Dulce	923	abcd
17	Fast Track	868	abcde
18	Hazera 3662	868	abcde
19	Allison	864	abcde
20	Red Hunter	860	abcde
21	Dulciana	860	abcde
22	J3009	855	abcde
23	Sapelo	817	abcdef
24	Vulkana	817	abcdef
25	Candy Joy	788	abcdef
26	Superex	779	abcdef
27	Sweet Harvest	771	abcdef
28	Emy55455	762	abcdefg
29	Sweet Azalea	750	abcdefg
30	Granex Yellow PRR	737	abcdefg
31	Red Duke	737	abcdefg
32	Vidora	711	abcdefg
33	Sweet Jasper	695	abcdefg
34	Plethora	682	abcdefg
35	Tania (J3013)	678	abcdefg
36	Pirate	673	abcdefg
37	Bejo J3014	576	bcdefg
38	GA Boy	534	cdefg
39	SON-109Y	529	cdefg
40	NT-AC0901	491	defg
41	Red Sensation	381	efg
42	Sabrina	368	efg
43	Emy55457	347	fg
44	EMY 55126	339	fg
45	Lucille	263	g

Table 2. Vidalia onion marketable yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Marketable yield	
1	2002	932	a
2	Althea	881	ab
3	Rio Dulce	868	ab
4	New Frontier	834	abc
5	Sofire	813	abc
6	Candy Kim	800	abcd
7	Quick Start	783	abcde
8	1407	771	abcde
9	Macon	767	abcde
10	Fast Track	754	abcde
11	Sweet Emotion	745	abcdef
12	Sweet Agent	728	abcdef
13	Dulciana	728	abcdef
14	Candy Ann	699	abcdef
15	J3009	669	abcdefg
16	Candy Joy	661	abcdefg
17	Mata Hari	614	abcdefgh
18	Tania (J3013)	614	abcdefgh
19	Hazera 3662	606	abcdefghi
20	Sapelo	593	abcdefghi
21	Vidora	593	abcdefghi
22	Red Hunter	580	abcdefghi
23	WI-129	576	abcdefghi
24	Superex	542	abcdefghi
25	Pirate	521	abcdefghi
26	Allison	500	abcdefghi
27	Emy55455	495	abcdefghi
28	Vulkana	491	abcdefghi
29	Red Duke	453	abcdefghi
30	Plethora	445	abcdefghi
31	Bejo J3014	440	abcdefghi
32	Century	436	abcdefghi
33	Granex Yellow PRR	415	bcdefghi
34	Sweet Magnolia	390	bcdefghi
35	Sweet Harvest	347	cdefghi
36	Red Sensation	339	cdefghi
37	Sweet Azalea	305	defghi
38	GA Boy	301	defghi
39	NT-AC0901	280	efghi
40	SON-109Y	246	fghi
41	Sabrina	186	ghi
42	Sweet Jasper	178	ghi
43	Lucille	152	hi
44	EMY 55126	106	i
45	Emy55457	106	i

Table 3. Vidalia onion colossal yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Colossal	
1	Sweet Emotion	212	a
2	Sweet Agent	195	ab
3	Allison	169	ab
4	Macon	152	abc
5	New Frontier	144	abc
6	Emy55455	136	abcd
7	NT-AC0901	127	abcde
8	Sweet Magnolia	127	abcde
9	Candy Ann	114	abcde
10	Bejo J3014	102	abcde
11	Sweet Azalea	102	abcdef
12	Tania (J3013)	102	abcdef
13	Mata Hari	85	abcdef
14	Superex	85	abcdef
15	Century	76	abcdefg
16	GA Boy	76	abcdefg
17	Red Sensation	76	abcdefgh
18	2002	68	abcdefgh
19	Red Duke	68	abcdefghi
20	Plethora	68	abcdefghi
21	1407	59	abcdefghi
22	J3009	59	abcdefghi
23	Pirate	59	abcdefghi
24	Rio Dulce	59	abcdefghi
25	SON-109Y	59	abcdefghi
26	Sweet Harvest	59	abcdefghi
27	Candy Kim	51	abcdefghi
28	Granex Yellow PRR	34	abcdefghi
29	Lucille	34	abcdefghi
30	Sofire	34	abcdefghi
31	Vidora	34	abcdefghi
32	WI-129	34	abcdefghi
33	EMY 55126	25	bcdefghi
34	Dulciana	25	bcdefghi
35	Hazera 3662	25	cdefghi
36	Red Hunter	25	cdefghi
37	Sapelo	25	defghi
38	Vulkana	17	defghi
39	Sabrina	13	efghi
40	Althea	0	fghi
41	Candy Joy	0	ghi
42	Emy55457	0	ghi
43	Fast Track	0	hi
44	Quick Start	0	i
45	Sweet Jasper	0	i

Table 4. Vidalia onion jumbo yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Jumbo yield	
1	2002	847	a
2	Althea	822	ab
3	Rio Dulce	788	ab
4	Quick Start	762	abc
5	Sofire	762	abc
6	Candy Kim	711	abcd
7	Fast Track	695	abcde
8	1407	678	abcde
9	Dulciana	661	abcde
10	New Frontier	661	abcde
11	Macon	601	abcdef
12	J3009	593	abcdef
13	Candy Joy	576	abcdef
14	Candy Ann	572	abcdef
15	Sapelo	551	abcdefg
16	Vidora	534	abcdefg
17	Hazera 3662	525	abcdefgh
18	WI-129	517	abcdefgh
19	Sweet Emotion	517	abcdefghi
20	Sweet Agent	508	abcdefghi
21	Mata Hari	508	abcdefghi
22	Red Hunter	508	abcdefghi
23	Tania (J3013)	508	abcdefghi
24	Pirate	449	abcdefghi
25	Superex	432	abcdefghi
26	Vulkana	424	abcdefghi
27	Granex Yellow PRR	373	abcdefghi
28	Plethora	373	abcdefghi
29	Red Duke	373	abcdefghi
30	Century	356	abcdefghi
31	Emy55455	347	abcdefghi
32	Bejo J3014	339	abcdefghi
33	Allison	322	bcdefghi
34	Sweet Harvest	275	bcdefghi
35	Red Sensation	254	cdefghi
36	Sweet Magnolia	246	cdefghi
37	GA Boy	220	defghi
38	Sweet Azalea	195	defghi
39	SON-109Y	186	efghi
40	Sweet Jasper	178	fghi
41	Sabrina	169	ghi
42	NT-AC0901	144	ghi
43	Lucille	119	hi
44	Emy55457	102	i

Table 5. Vidalia onion medium yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Medium yield	
1	Candy Joy	85	a
2	Althea	59	ab
3	Fast Track	59	ab
4	Hazera 3662	55	abc
5	Vulkana	51	abc
6	Red Hunter	47	abcd
7	Dulciana	42	abcde
8	Candy Kim	38	abcde
9	1407	34	abcde
10	New Frontier	30	abcde
11	Superex	25	abcdef
12	Sweet Agent	25	abcdef
13	Vidora	25	abcdef
14	WI-129	25	abcdef
15	Mata Hari	21	abcdefg
16	Quick Start	21	abcdefg
17	Rio Dulce	21	abcdefgh
18	2002	17	abcdefgh
19	J3009	17	abcdefghi
20	Sapelo	17	abcdefghi
21	Sofire	17	abcdefghi
22	Sweet Emotion	17	abcdefghi
23	Sweet Magnolia	17	abcdefghi
24	Candy Ann	13	abcdefghi
25	Emy55455	13	abcdefghi
26	Macon	13	abcdefghi
27	Pirate	13	abcdefghi
28	Red Duke	13	abcdefghi
29	Sweet Harvest	13	abcdefghi
30	Allison	8	abcdefghi
31	Granex Yellow PRR	8	abcdefghi
32	NT-AC0901	8	abcdefghi
33	Red Sensation	8	bcdefghi
34	Sweet Azalea	8	bcdefghi
35	Century	4	cdefghi
36	EMY 55126	4	cdefghi
37	Emy55457	4	defghi
38	GA Boy	4	defghi
39	Plethora	4	efghi
40	Sabrina	4	fghi
41	Tania (J3013)	4	ghi
42	Bejo J3014	0	ghi
43	Lucille	0	hi
44	SON-109Y	0	i
45	Sweet Jasper	0	i

Table 6. Vidalia onion culls yield (40 lb. bags/acre) measured after grading.

Rank	Variety	Culls yield	
1	Sweet Magnolia	580	a
2	Sweet Jasper	517	ab
3	Century	495	ab
4	Sweet Azalea	445	abc
5	Mata Hari	445	abc
6	Sweet Harvest	424	abcd
7	Sweet Emotion	424	abcde
8	WI-129	390	abcde
9	Allison	364	abcde
10	Macon	330	abcde
11	Vulkana	326	abcdef
12	Granex Yellow PRR	322	abcdef
13	Candy Ann	305	abcdef
14	Red Duke	284	abcdef
15	SON-109Y	284	abcdefg
16	Red Hunter	280	abcdefg
17	Sweet Agent	271	abcdefgh
18	Emy55455	267	abcdefgh
19	Hazera 3662	263	abcdefghi
20	Emy55457	241	abcdefghi
21	Superex	237	abcdefghi
22	Plethora	237	abcdefghi
23	GA Boy	233	abcdefghi
24	EMY 55126	233	abcdefghi
25	Sapelo	224	abcdefghi
26	NT-AC0901	212	abcdefghi
27	Candy Kim	203	abcdefghi
28	1407	195	abcdefghi
29	J3009	186	abcdefghi
30	New Frontier	186	abcdefghi
31	Sabrina	182	abcdefghi
32	Pirate	152	abcdefghi
33	Quick Start	144	bcdefghi
34	Bejo J3014	136	bcdefghi
35	Dulciana	131	cdefghi
36	Candy Joy	127	cdefghi
37	Vidora	119	defghi
38	Fast Track	114	defghi
39	Sofire	110	efghi
40	Lucille	110	fghi
41	2002	68	ghi
42	Tania (J3013)	64	ghi
43	Rio Dulce	55	hi
44	Althea	51	i
45	Red Sensation	42	i

Table 7. Vidalia onion seed stem count measured at harvest.

Rank	Variety	Seedstem count / 25 sq. ft. plot	
1	EMY 55126	108	a
2	Red Sensation	101	ab
3	Sabrina	83	ab
4	GA Boy	77	abc
5	Vulkana	70	abc
6	Tania (J3013)	67	abcd
7	Vidora	64	abcde
8	Bejo J3014	57	abcde
9	J3009	57	abcde
10	Lucille	57	abcde
11	Emy55457	45	abcdef
12	Plethora	43	abcdef
13	NT-AC0901	37	abcdef
14	Sapelo	29	abcdef
15	Granex Yellow PRR	27	abcdefg
16	Pirate	27	abcdefg
17	Sweet Azalea	27	abcdefgh
18	2002	20	abcdefgh
19	Red Hunter	19	abcdefghi
20	Hazera 3662	17	abcdefghi
21	SON-109Y	17	abcdefghi
22	Dulciana	16	abcdefghi
23	Emy55455	16	abcdefghi
24	Sweet Jasper	15	abcdefghi
25	Red Duke	13	abcdefghi
26	Althea	13	abcdefghi
27	Rio Dulce	13	abcdefghi
28	Candy Joy	12	abcdefghi
29	WI-129	10	abcdefghi
30	1407	10	abcdefghi
31	Superex	9	abcdefghi
32	Quick Start	7	abcdefghi
33	Sweet Agent	7	bcdefghi
34	Sweet Magnolia	6	bcdefghi
35	Candy Kim	6	cdefghi
36	Macon	6	cdefghi
37	Candy Ann	4	defghi
38	Mata Hari	4	defghi
39	Century	4	efghi
40	Fast Track	4	fghi
41	Sweet Harvest	4	ghi
42	Allison	2	ghi
43	New Frontier	2	hi
44	Sweet Emotion	1	i
45	Sofire	0	i

UGA variety trial quality report for the 2019-20 Vidalia onion season

J. Lessl, D. Jackson, C. Tyson, A. da Silva, J. Edenfield, B. Reeves, A. Shirley, A. Bateman, D. Thigpen, S. Powell, S. Tanner, and Z. Williams

Introduction

Each season the University of Georgia, Agricultural and Environmental Services Laboratories evaluates the flavor-associated compounds in the short-day onions grown in the Variety Trial. These onion varieties are submitted by the participating seed companies, grown at the Vidalia Onion and Vegetable Research Center (VOVRC), and once harvested and dried, submitted to the Agricultural and Environmental Services Laboratories for analysis of the pungency-related compounds; pyruvic acid, lachrymatory factor, and methyl thiosulfinate content. Due to association of Vidalia onions with low pungency and sweet flavor, this annual evaluation provides useful information about the relative flavor quality of these onion varieties.

This publication summarizes the flavor analysis results from the 2019-20 growing season, as well as compares the performance of each variety over the past three growing seasons.

Material and methods

Forty-two onion varieties were analyzed as part of the 2019-20 variety trial. Each variety was grown at the VOVRC in quadruplicate plots. Harvested onions from each plot were dried and submitted to the lab individually. Cores were taken from 10 onions within each replicate, composited, and pressed to collect the onion juice which was analyzed following the procedures described in Kim *et al.* 2017.[1]

Results and discussion

The following tables compare the concentrations of flavor-associated compounds in onions grown as a part of the 2019-20 variety trial. As the three measured parameters Decemberrease, the onions are considered to be have superior flavor quality. In this year's variety trials, the pyruvic content ranged from 3.06-6.12 µmol/mL with 33% of the varieties measuring below the threshold of 4.8 µmol/mL for superior flavor. Lachrymatory factor ranged from 1.02-5.42 µmol/mL with 22% of the varieties meeting the criteria for superior LF criteria of <2.2 µmol/mL. Finally, methyl thiosulfinates ranged from 4-33 nmol/mL with only 1 variety measuring below the 4.3 nmol/mL threshold for superior flavor quality. Additionally, the cumulative variety flavor quality rankings are provided for this year's data and the past three growing seasons. For additional information regarding the performance of a given variety, please contact your Extension Agent or the Vidalia Onion and Vegetable Research Center.

We would like to thank the participating seed companies as well as the Vidalia Onion Committee for their support of this trial.

References

[1]Kim H, Jackson D, Adhikari K, Riner C, & Sanchez-Brambila G. 2017. "Relationship between consumer acceptability and pungency-related flavor compounds of Vidalia onions", Journal of Food Science. 82 (10): 2396-2402.

Table 1. Pyruvic acid content in onions submitted to the UGA Agricultural and Environmental Services Labs as a part of the 2019-20 variety trial.

Variety	Pyruvic Acid (μmole/g)	
Sapelo	6.1	a
Tania (J3013)	5.9	ab
Althea	5.8	ab
Quick Start	5.7	ab
1407	5.7	abc
3662	5.6	abc
Sabrina - EWR 1019	5.6	abc
Mata Hari	5.6	abc
Fast Track	5.6	abc
Candy Joy	5.5	abc
J3014	5.5	abc
Vulkana	5.4	abc
2002	5.3	abc
Candy Kim	5.3	abc
Sweet Emotion	5.3	abc
Rio Dulce	5.2	abc
Pirate	5.2	abcd
New Frontier	5.1	abcd
Superex	5.1	abcd
GA Boy	5.1	abcd
Sofire	5.1	abcd
Sweet Harvest	5.1	abcd
Sweet Agent	5.1	abcd
Dulciana	5.1	abcd
J3009	5.1	abcd
Emy55455	4.9	abcd
Red Sensation	4.9	abcd
Lucille	4.9	abcd
Alison	4.8	abcd
Candy Ann	4.7	abcd
WI-129	4.7	abcd
SON 109Y	4.6	abcd
Red Duke	4.5	abcd
Vidora	4.4	abcd
Macon	4.2	abcd
Granex Yellow PRR	4.2	abcd
Red Hunter	4.0	abcd
Sweet Magnolia	4.0	abcd
Century	3.9	bcd
Plethora	3.8	bcd
Sweet Azalea	3.5	cd
NT-AC0901	3.1	d
Emy55457	347	fg
EMY 55126	339	fg
Lucille	263	g

*Similar letters between varieties indicate those varieties are not significantly different according to Tukey test ($P \leq 0.05$). Data for EMY 55126 (5.3 μmole/g), Sweet Jasper (4.2 μmole/g), and EMY 55457 (3.3 μmole/g) were excluded as only two replicates were received.

Table 2. Onion lachrymatory factor (propanethial S-oxide) content in onions submitted to the UGA Agricultural and Environmental Services Labs as a part of the 2019-20 variety trial.

Variety	Lachrymatory Factor (μmole/g)	
Sapelo	5.4	a
Quick Start	5.3	ab
Sofire	4.8	abc
Tania (J3013)	4.4	abcd
Fast Track	4.2	abcde
Pirate	4.2	abcde
3662	4.2	abcde
Sabrina - EWR 1019	3.9	abcdef
Vidora	3.8	abcdef
Sweet Harvest	3.7	abcdefg
Candy Joy	3.6	abcdefg
Red Sensation	3.6	abcdefg
1407	3.5	abcdefg
Vulkana	3.5	abcdefg
Granex Yellow PRR	3.4	abcdefg
Rio Dulce	3.4	abcdefg
New Frontier	3.4	abcdefgh
J3009	3.4	abcdefg
Sweet Emotion	3.4	abcdefgh
2002	3.3	abcdefgh
WI-129	3.3	abcdefg
Althea	3.3	abcdefgh
Candy Ann	3.3	abcdefgh
Candy Kim	3.3	abcdefgh
Emy55455	3.2	abcdefgh
Mata Hari	3.0	bcdefgh
Lucille	3.0	bcdefgh
Red Duke	2.8	cdefgh
SON 109Y	2.8	cdefgh
Alison	2.8	cdefgh
Dulciana	2.7	cdefgh
Superex	2.6	cdefgh
J3014	2.5	cdefgh
GA Boy	2.5	cdefgh
Macon	2.4	cdefgh
Sweet Azalea	2.1	defgh
Century	2.0	defgh
Sweet Agent	1.9	efgh
Sweet Magnolia	1.7	fgh
Plethora	1.6	fgh
Red Hunter	1.3	gh
NT-AC0901	1.0	h
Emy55457	347	fg
EMY 55126	339	fg
Lucille	263	g

*Similar letters between varieties indicate those varieties are not significantly different according to Tukey test ($P \leq 0.05$). Data for EMY 55126 (2.2 μmole/g), Sweet Jasper (2.0 μmole/g), and EMY 55457 (1.7 μmole/g) were excluded as only two replicates were received.

Table 3. Methyl thiosulfinate content in onions submitted to the UGA Agricultural and Environmental Services Labs as a part of the 2019-20 variety trial.

Variety	Methyl Thiosulfinates (nmole/g)	
Sweet Agent	0.033	a
1407	0.032	a
Candy Joy	0.031	ab
WI-129	0.030	ab
Quick Start	0.030	abc
Candy Kim	0.030	abc
Candy Ann	0.029	abc
Fast Track	0.029	abc
Sweet Emotion	0.028	abcd
New Frontier	0.028	abcd
Sapelo	0.027	abcde
Lucille	0.027	abcdef
Mata Hari	0.025	abcdef
Sofire	0.023	abcdef
Macon	0.023	abcdefg
Red Hunter	0.021	abcdefg
GA Boy	0.020	abcdefg
Granex Yellow PRR	0.020	abcdefg
Superex	0.020	abcdefg
Emy55455	0.020	abcdefg
Alison	0.020	abcdefg
Pirate	0.020	abcdefg
Sabrina - EWR 1019	0.019	abcdefg
SON 109Y	0.019	abcdefg
Vidora	0.019	abcdefg
Sweet Harvest	0.019	abcdefg
2002	0.018	abcdefg
Rio Dulce	0.018	abcdefg
Althea	0.016	abcdefg
Red Sensation	0.016	abcdefg
Red Duke	0.016	abcdefg
3662	0.014	abcdefg
Sweet Azalea	0.014	abcdefg
J3009	0.012	cdefg
Vulkana	0.011	cdefg
Tania (J3013)	0.010	cdefg
Dulciana	0.009	defg
Sweet Magnolia	0.008	efg
Plethora	0.007	efg
J3014	0.006	fg
Century	0.006	fg
NT-AC0901	0.004	g
Emy55457	347	fg
EMY 55126	339	fg
Lucille	263	g

*Similar letters between varieties indicate those varieties are not significantly different according to Tukey test (P ≤ 0.05). Data for EMY 55126 (0.021µmole/g), Sweet Jasper (0.012 µmole/g), and EMY 55457 (0.008 µmole/g) were excluded as only two replicates were received.

Table 4. Overall flavor quality ranking of the 2020 variety trial onions ranked on lowest Pyruvic acid, Lachrymatory factor, and Methyl Thiosulfinates results.

Variety	Rank	Variety	Rank	Variety	Rank
NT-AC0901	1	Alison	16(t)	Candy Ann	30(t)
Emy 55457	2	GA Boy	16(t)	Althea	32(t)
Plethora	3	Granex Yellow PRR	16(t)	Mata Hari	32(t)
Century	4(t)	Superex	16(t)	Candy Kim	34(t)
Sweet Magnolia	4(t)	Emy 55126	20(t)	Sabrina - EWR 1019	34(t)
Sweet Azalea	6	Vidora	20(t)	New Frontier	34(t)
Red Hunter	7	Emy55455	22(t)	Tania (J3013)	34(t)
J3014	8(t)	Red Sensation	22(t)	WI-129	34(t)
Sweet Jasper	8(t)	Sweet Harvest	22(t)	Sweet Emotion	39
Dulciana	8(t)	2002	25(t)	Sofire	40
Red Duke	11(t)	Rio Dulce	25(t)	Candy Joy	41
Macon	11(t)	Lucille	25(t)	1407	42(t)
J3009	12(t)	Pirate	28(t)	Fast Track	42(t)
XON 109Y	12(t)	Sweet Agent	28(t)	Quick Start	44
Vulkana	15	3662	30(t)	Sapelo	45

Table 5. Overall flavor quality ranking of yellow variety trial onions grown in three consecutive years (2018-2020) ranked in order of lowest overall Pyruvic acid, Lachrymatory factor, and Methyl Thiosulfinates results. Only those varieties with data from all three growing seasons were included in the table.

Variety	Rank	Variety	Rank
Plethora	1	Granex Yellow PRR	14
Sweet Magnolia	2	Candy Joy	15(t)
Sweet Azalea	3	1407	15(t)
Century	4(t)	Candy Kim	15(t)
Sweet Agent	4(t)	Tania (J3013)	15(t)
Sweet Jasper	6	Macon	19
XON 109Y	7	WI-129	20(t)
Vidora	8(t)	Sweet Emotion	20(t)
Alison	8(t)	Candy Ann	22
Sweet Harvest	8(t)	EMY 55455	23(t)
J3009	11	Fast Track	23(t)
New Frontier	12	Quick Start	25
Pirate	13	Sapelo	26
XON 109Y	12(t)	Sweet Agent	28(t)
Vulkana	15	3662	30(t)

Postharvest life evaluation of Vidalia onion varieties under controlled atmosphere storage

A. Deltsidis, J. Pérez, C. Tyson, D. Thigpen, G. Gunawan, and A. Bateman

Introduction

Each season the University of Georgia, Agricultural and Environmental Services Laboratories evaluates the storage quality of short-day onions grown in the Variety Trial using standardized growing practices. These onion varieties are submitted by the participating seed companies, grown at the Vidalia Onion and Vegetable Research Center (VOVRC), and once harvested and dried, submitted to the Vidalia Onion Research Lab (VORL) for storage and postharvest evaluations.

Material and methods

There were 45 varieties entered into the 2019-20 trial. The seedbeds were grown at the Vidalia Onion and Vegetable Research Center in Lyons, Georgia. Seedbed treatment included a 75-gallon per acre fumigation treatment of metam sodium. The seedbeds were planted on September, and the trial was transplanted on November. Each variety was replicated four times and harvested based on a committee Decemberision of maturity. Upon harvest and grading, one bag of jumbo onions per plot was sent to the Vidalia Onion Research Lab in Tifton, Georgia, to be tested under controlled atmospheric storage conditions. The storage under controlled atmosphere storage was carried out from May 13 until September 21, 2019. The trial evaluated all 45 varieties in a controlled atmosphere storage environment of 3% O_2 plus 5% CO_2 at a temperature of 34 °F and 75% RH. Immediately after the end of storage (on September 21, 2019), the onions were allowed to warm up to 78 °F at ambient RH conditions and were weighed and graded on October 1-3, 2019.

Results

Table 1 and 2 show respectively the weight loss and disease/Decemberay after 4 months of storage at 3% O_2 plus 5% CO_2 at a storage temperature of 34 °F and 75% RH followed by 10 days of shelf life at 78 °F (ambient RH).

Table 1. Mean weight loss (%) of varieties during CA storage.

Variety, Company	Stats		Mean weight loss (%)
J3015, Bejo	A*		9.05
Sweet Emotion, Shamrock	A	B	8.60
Athena, Nunhems	A	B	8.52
EMY 55126, Emerald	A	B	7.96
Sweet Harvest, Sakata	A	B	7.85
J3010, Bejo	A	B	7.48
EMY 55455, Emerald	A	B	7.29
3662 Hazerra	A	B	7.29
J3017, Bejo	A	B	7.28
Pirate, Bejo	A	B	7.17
XON-109Y, Sakata	A	B	7.06
Plethora, Nunhems	A	B	6.99
Sweet Jasper, Sakata	A	B	6.93
J3016, Bejo	A	B	6.83
Sweet Agent, Seminis	A	B	6.79
Macon, Bejo	A	B	6.72
J3014, Bejo	A	B	6.60
Fast Track, Shamrock	A	B	6.57
Vulcana, Nunhems	A	B	6.33
Sweet Caroline, Nunhems	A	B	6.29
Sweet Magnolia, Seminis	A	B	6.10
EMY 55033, Emerald	A	B	6.09
Vidora, Nunhems	A	B	5.99
Century, Seminis	A	B	5.98
DP Sapelo Sweet, DP Seeds	A	B	5.96
EMY 55045, Emerald	A	B	5.95
WI-129, Wannamaker	A	B	5.78
Red Sensation, Bejo	A	B	5.78
Sweet Azalea, Seminis	A	B	5.73
Allison, Bejo	A	B	5.61
Granex Yellow PRR, Seminis	A	B	5.47
Candy Kim, Solar	A	B	5.40
3013, Bejo	A	B	5.22
Dulciana, Nunhems	A	B	5.10
2002, Nunhems	A	B	4.75
Candy Ann, Solar	A	B	4.74
DP 1407, DP Seeds	A	B	4.72
Candy Joy, Solar	A	B	4.58
Red Hunter, Bejo	A	B	4.46
New Frontier, Wannamaker	A	B	4.41
Quick Start, Shamrock	A	B	4.37
Mata Hari, Nunhems	A	B	4.29
Red Duke-Bejo	A	B	3.98
J3009, Bejo	A	B	3.91
Sofire, Nunhems		B	2.99

*Letters that are the same between varieties indicate that those varieties are not significantly different according to Tukey's LSD (P ≤ 0.05).

Table 2. Mean postharvest loss (%) of varieties during CA storage.

Variety, Company	Stats	Mean postharvest loss during storage (%)
Sweet Emotion, Shamrock	A*	65.79
Sweet Harvest, Sakata	A B	61.11
J3015, Bejo	A B C	51.91
WI-129 Wannamaker	A B C D	49.86
Sweet Agent, Seminis	A B C D E	42.37
EMY 55126, Emerald	A B C D E	40.35
Candy Kim, Solar	A B C D E	39.04
Athena, Nunhems	A B C D E F	37.76
Fast Track, Shamrock	A B C D E F	32.99
2002, Nunhems	B C D E F	31.57
Plethora, Nunhems	C D E F	29.55
J3014, Bejo	C D E F	28.62
XON-109Y, Sakata	C D E F	28.18
J3013, Bejo	C D E F	28.03
Vulcana, Nunhems	C D E F	24.80
DP 1407, DP Seeds	C D E F	24.66
Macon, Bejo	C D E F	23.95
DP Sapelo Sweet, DP Seeds	C D E F	23.63
Sweet Magnolia Seminis	C D E F	23.23
New Frontier, Wannamaker	C D E F	23.09
J3017, Bejo	C D E F	22.05
EMY 55455, Emerald	C D E F	21.58
EMY 55033, Emerald	C D E F	21.28
Candy, Ann-Solar	C D E F	20.74
Sweet Jasper, Sakata	C D E F	20.74
Candy Joy, Solar	D E F	20.52
J3016, Bejo	D E F	19.20
3662, Hazerra	D E F	19.05
Pirate, Bejo	D E F	18.66
Century, Seminis	D E F	18.44
Quick Start, Shamrock	D E F	16.12
Sweet Azalea, Seminis	E F	15.99
Red Sensation, Bejo	E F	15.64
Red Duke, Bejo	E F	14.79
Granex Yellow PRR, Seminis	E F	14.43
Sweet Caroline, Nunhems	E F	14.17
Red Hunter, Bejo	E F	13.33
Vidora, Nunhems	E F	13.28
J3010, Bejo	E F	13.14
Allison, Bejo	E F	12.75
EMY 55045, Emerald	E F	12.68
Dulciana, Nunhems	E F	11.46
Mata Hari, Nunhems	E F	11.35
Sofire, Nunhems	E F	11.16
J3009, Bejo	F	7.55

*Letters that are the same between varieties indicate that those varieties are not significantly different according to Tukey's LSD ($P \leq 0.05$).

Conclusion

There were significant weight loss differences among the 45 varieties stored under CA conditions after 4 months of CA storage at 3% O_2 plus 5% CO_2 at a temperature of 34 °F and 75% RH followed by 10 days of shelf life at 78 °F. Overall, Sofire (Nunhems) lost 2.99% of its weight after CA storage which was the lowest one observed. On the other hand, J3015 (Bejo) had a 9.05% weight loss at the end of the CA storage period (plus 10 days of shelf life). The rest of the varieties tested showed no significant differences among themselves.

When looking at the actual saleable onion after 4 months of CA storage at 3% O_2 plus 5% CO_2 at a temperature of 34 °F and 75% RH followed by 10 days of shelf life at 78 °F, we recorded significant postharvest loss differences among the 45 varieties tested. Overall, J3009 (Bejo) recorded a 7.55% loss during storage which was the lowest observed. On the other hand, Sweet Emotion (Shamrock) had a 65.79% postharvest loss at the end of the CA storage period (plus 10 days of shelf life). The rest of the varieties tested had weight losses ranging between the two extremes mentioned above.

For additional information regarding the performance of a given variety in this trial please contact your local Extension agricultural and natural resources agent or the Vidalia Onion and Vegetable Research Center.

We would like to thank the participating seed companies as well as the Vidalia Onion Committee for their support of this trial.

Fertilizer nitrogen rate and variety evaluation for Vidalia onion production

M. de Barros, C. Tyson, A. Shirley, J. Edenfield, A. da Silva, and L. Dunn

Introduction

Current recommendations for nitrogen (N) fertilizer application on Vidalia onion varies from 125-150 lb. of N/acre. However, growers have routinely produced high quality Vidalia onion crops using less than N fertilizer recommendations, which is due to the use of new varieties with relatively higher nitrogen fertilizer use efficiency. In 2019, the first-year study to update the N fertilizer recommendation for Vidalia onion production was conducted with three Vidalia onion varieties and 5 fertilizer rates.

Regardless of variety, yields were maximized with 105 lb of N/acre, demonstrating the potential for reduction in the N fertilizer recommendation without affecting yield. Consequently, there can be a reduction in the production cost, while increasing the sustainability of crop production in this industry. In 2020, a second-year study was conduct with the objective to identify N fertilizer application rates in different varieties of Vidalia onion that maximize plant growth and yield.

Material and methods

A field experiment was conducted in the 2020 Vidalia onion season at the University of Georgia, Vidalia Onion and Vegetable Research Center located in Lyons, GA. Soil in the experimental area is classified as Irvington loamy sandy soil type with 2% of slope and a low water holding capacity. Climate of the region is classified as a humid subtropical climate, characterized by high temperatures with accumulated rainfall events in the spring/summer and dry periods in the fall/winter (Koppen, 1931).

Vidalia onion (c.v. Pirate) was planted on September 17, 2019 in nursery beds, and transplanted to field beds on November 20, 2019. The experimental area was comprised of 4 adjacent field beds 5 inches tall, 370 feet long, and 6-ft center to center spacing. Each field bed was comprised of 4 onion rows with an in-row spacing of 4 inches, and experimental plots were 20-ft long with 5 ft skip between plots within each bed. During the entire season, crop management practices associated with soil preparation, transplanting, irrigation and management of pest, weeds and diseases followed the University of Georgia recommendation.

Five N fertilizer rates and three Vidalia onion cultivars were evaluated in a randomize complete block design with 4 replications (table 1). The N fertilizer treatments were applied at transplanting, and at 30, 58, and 92 days after transplanting (DAT) to a total N fertilizer rate of 75, 90, 105, 120 and 135 lb/acre, each application timing received 20% of the season total N applied, except by the last application when 40% of the season total N was applied. In addition to N fertilizer application, Vidalia onion plants received a total of 134 lb/acre of P and K, applied at transplanting and at 25 days after transplanting.

Vidalia onions were harvested on April 22, 2020 (154 DAT), cured for a week and graded according to the Georgia Department of Agriculture in: Colossal (> 3¾ inches), Jumbo (3¾ to 3¼ inches), and Medium (< 3¼ inches). The total yield was calculated as the sum of Colossal, Jumbo, and Medium. Statistical analyses were performed to compare total yield and bulb size distribution among treatments.

Table 1. List of treatments.

Treatments	Variety	N rate (lb/acre)
1	Sweet Magnolia	75
2	Sweet Magnolia	90
3	Sweet Magnolia	105
4	Sweet Magnolia	120
5	Sweet Magnolia	135
6	Vidora	75
7	Vidora	90
8	Vidora	105
9	Vidora	120
10	Vidora	135
11	Quickstart	75
12	Quickstart	90
13	Quickstart	105
14	Quickstart	120
15	Quickstart	135

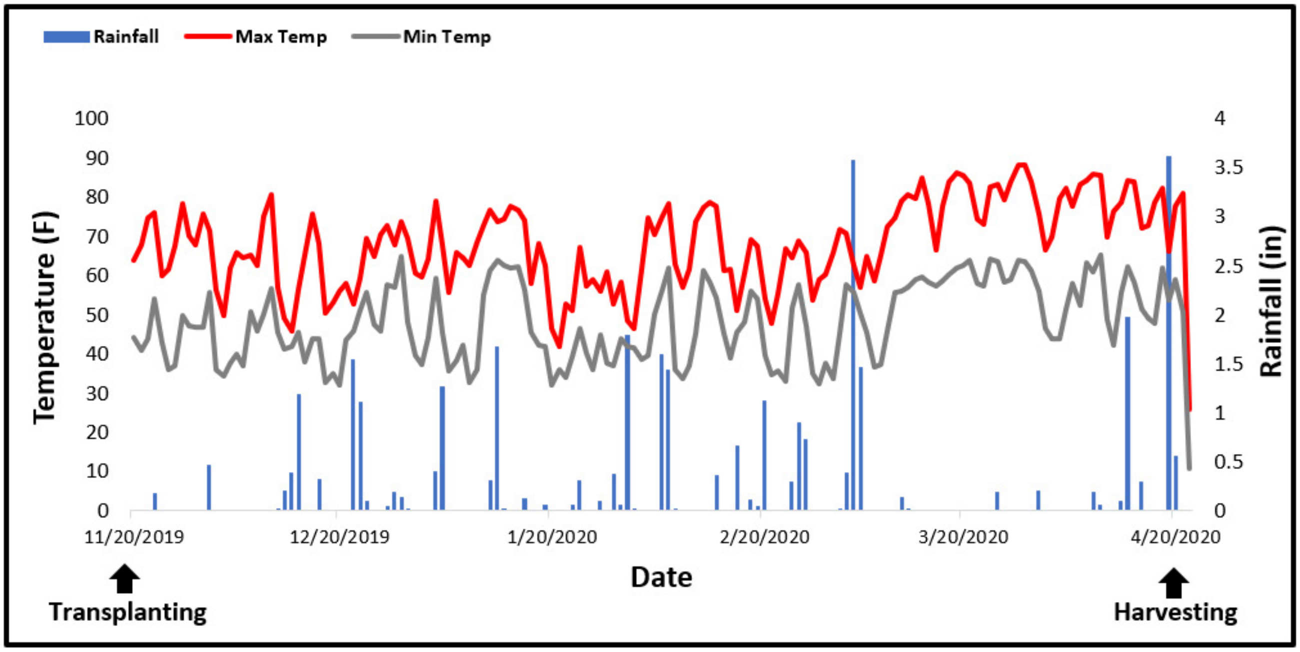

Figure 1. Weather condition of minimum and maximum temperature and rainfall during the 2019/2020 Vidalia onion season in Lyons, GA.

Table 2. Total yield and bulb size distribution for Vidalia onion grown in the 2019/2020 season.

Treatment	Total yield		Colossal		Jumbo		Medium	
	40 lb. bags / acre							
Nitrogen Rate								
135	1028	a*	183	a	748	ab	57	b
120	974	ab	104	b	774	a	58	b
105	986	ab	134	bc	744	ab	70	ab
90	878	bc	75	c	675	ab	95	a
75	840	c	54	c	620	b	102	a
Variety								
QuickStart	959	ab*	220	a	694	ab	66	b
Sweet Magnolia	877	b	96	b	658	b	102	a
Vidora	988	a	233	a	784	a	71	ab

*Values followed by similar letters indicate no significant difference ($p < 0.05$) among planting date or planting method.

Results and discussion

Rainfall accumulation was 32.3 inches during the 2020 onion season, which was higher than the onion water demand (12.96 inches) for the same period (data retrieved from http://irrigating.uga.edu). Heavy rainfall events (Figure 1) and soil saturation characterized the 2020 Vidalia onion season, while irrigation events were minimal.

Rainfall events induced nutrient leaching, particularly N, which considerably affected yields. Statistical analyzes had no significant interaction between N fertilizer rates and onion varieties for total yield or any onion size distribution, which had previously been reported in the 2019 onion season. However, the main effect of N fertilizer rate and variety were significant for total yield, Colossal, Jumbo, and Medium onions (table 2).

Total yield increased with the increase of N rates; however, the highest total yields were measured for the N fertilizer rates of 135, 120, and 105 lb/acre. The N fertilizer rate of 90 lb/acre had no significant difference from 120 and 105 lb of N/acre. While the lowest total yield was measured for 75 lb of N/acre. Colossal onions represented in average 11.7% of total yield, and the N rate of 135 lb/acre had the highest yield of Colossal. Jumbo onions represented in average 76% of total yield, and the highest yield of Jumbo onions were measured for the N rates 135, 120, 105 and 90lb/acre, while 75 lb/acre had the lowest yield of Jumbo onions. Medium onions had the highest yield for the N rates of 75 and 90 lb/acre, followed by the N rate of 105 lb/acre. The lowest Medium onion yields were measured for 135 and 120 lb/acre. In general, yield of Medium onions represented 8.2% of total yield.

The Vidalia onion varieties evaluated had minimal impact on yield. Total yield and yield of Jumbo onions were the highest for Vidora, and the lowest for Sweet Magnolia. QuickStart had no significant difference from Vidora and QuickStart for total yield and Jumbo. Yield of Colossal onions was the highest for Vidora and QuickStart, while yield of Medium onions was the highest for Sweet Magnolia, and the lowest for QuickStart.

Conclusion

Results from the nitrogen trial in 2020 were similar to those measured in 2019. Vidalia onion yields were mostly affected by N fertilizer rates, although significant differences were also measured for onion varieties. The effect of N fertilizer rates was attenuated in 2020 when compared to 2019 due to the heavy rainfall events that accumulated 32 inches of rain. The N rate of 135 lb/acre still had the highest onion yield, but no significant difference was measure from the 120 and 105 lb/acre. This indicated that the application of N rates higher than 105 lb/acre might not be necessary to increase Vidalia onion yield. Finally, it is also important to highlight that the 90 and 105 lb of N/acre sustained yield of Jumbo onions, which is the size of most interest for growers.

Effects of controlled release fertilizer on Vidalia onion production

M. de Barros, C. Tyson, and A. da Silva

Introduction

Fertilizer application is key on the yield and quality of Vidalia onions, especially under the current weather variability. While proper fertilizer rates must meet crop requirements, the timing of application ensures soil nutrient availability throughout the entire onion growing season. In the state of Georgia, fertilizer is typically applied four or five times for Vidalia onion production; however, the use of controlled release fertilizer applications is an alternative to reduce the number of fertilizer applications while maintaining yield. The objective of this study was to evaluate different fertilizer strategies including controlled release fertilizer for Vidalia onion production under the Georgia environmental conditions.

Material and methods

A field experiment was conducted in the 2020 Vidalia onion season at the University of Georgia, Vidalia Onion and Vegetable Research Center located in Lyons, GA. Soil in the experimental area is classified as Irvington loamy sandy soil type with 2% of slope and a low water holding capacity (USDA soil survey, 2018). Climate of the region is classified as a humid subtropical climate, characterized by high temperatures with accumulated rainfall events in the spring/summer and dry periods in the fall/winter (Koppen, 1931).

Vidalia onion (c.v. Pirate) was planted September 17, 2019 in nursery beds and transplanted to field beds on November 20, 2019. The experimental area was comprised of 4 adjacent field beds 5 inches tall, 145 ft long, and 6 ft center to center spacing. Each field-bed was comprised of 4 onion rows with an in-row spacing of 4 inches, and experimental plots were 20 ft long with 5 ft skip between plots within each bed. A factorial experimental design with six fertilizer strategies comparing the grower standard practices (GSP) against five (5) controlled release fertilizer strategies were replicated 4 times in a randomized complete block design. Table 2 has a list of fertilizer strategies with application times, date of fertilizer application, and nutrient rates applied in each application.

Weather conditions (i.e., maximum and minimum temperature, solar radiation, and rainfall) were hourly monitored using a weather station from the Georgia Automated Environmental Monitoring Network (**http://www.georgiaweather.net/**). Crop management practices associated with soil preparation, irrigation and management of pest, weeds and diseases followed the University of Georgia recommendation.

Vidalia onions were harvested on April 27, 2020 (159 DAT), cured for a week and graded according to the Georgia Department of Agriculture in: Colossal (> 3¾ inches), Jumbo (3¾ to 3¼ inches), Medium (< 3¼ inches). Statistical analyses were performed to compare total yield and bulb size distribution among treatments.

Results and discussion

During the Vidalia onion season of 2020, there was a rainfall accumulation of 32.3 inches (Figure 1), which was almost 3-fold higher than the onion water demand (12.96 inches) for the same period (data retrieved from **irrigating.uga.edu**). During the early season (January to February), there was an even distribution of rainfall events, while in the mid and late season (March and April), scattered heavy showers events might induced nutrient leaching, particularly nitrogen (N), which affect Vidalia onion yields.

Total yield had no significant difference among treatments and averaged 1103 bags of 40 lb/acre. Similar results were measured in the nitrogen fertility study of 2020, in which there were no significant different for total yield among treatments receiving a N rate range from 105 and 135 lb. of N/acre.

Regarding bulb size distribution, the CRF – 3 and GSP had the highest and lowest yield of Colossal onions, respectively. While, there was no significant difference among any other treatment for the Colossal onions. The CRF treatments and GSP had no significant difference for the yield of Jumbos and Medium onions, which averaged 878 and 56 bags of 40 lb/acre, respectively.

Conclusion

Rainy years benefit the use of controlled release fertilizers, as reported in the 2019; however, the excessive rainfall accumulated in 2020 had no significant difference for the yield of Vidalia onion when controlled release fertilizer strategies were compared to the current grower standard practice. Overall, the CRF – 1 and CRF – 2 demonstrated to potentiate onion yield and can be an alternative to growers to minimize the number of fertilizer applications during the growing season.

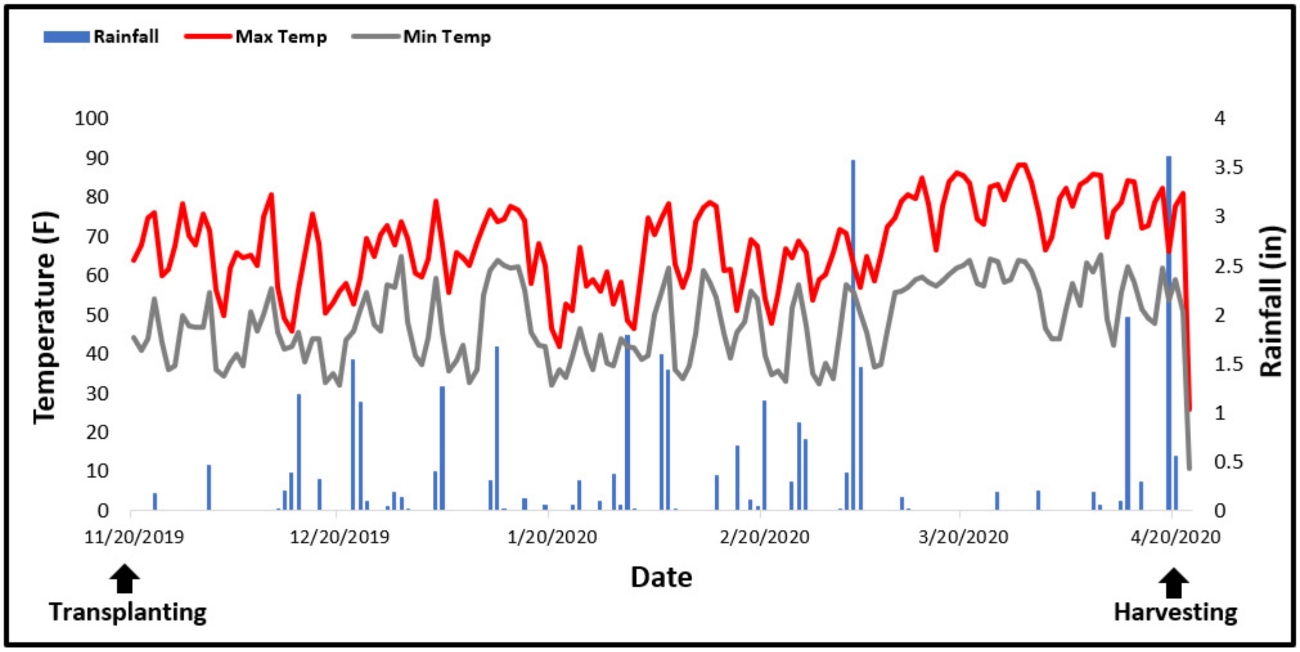

Figure 1. Weather condition of minimum and maximum temperature and rainfall during the 2019/2020 Vidalia onion season in Lyons, GA.

Table 1. Total yield and bulb size distribution for Vidalia onion grown in the 2018/2019 season.

Treatment	Total yield		Colossal		Jumbo		Medium	
	40 lb. bags / acre							
GSP	988	a*	101	b	814	a	72	a
CRF – 1	1077	a	141	ab	879	a	56	a
CRF – 2	1056	a	140	ab	849	a	66	a
CRF – 3	1183	a	249	a	889	a	45	a
CRF – 4	1204	a	230	a	923	a	50	a
CRF – 5	1113	a	151	ab	913	a	48	a
p value	***0.67***		***0.25***		***0.71***		***0.12***	

*Values followed by similar letters indicate no significant difference ($p < 0.05$) among planting date or planting method

Table 2. Description of treatment, number of applications, date, days after transplanting (DAT) and nutrient rates in 2019/2020 season.

Fertilizer Strategy	Number of fertilizer application	Application		Nutrients									
				N	P	K	Mg	Mn	B	Zn	Ca	Fe	S
		Date	DAT	lbs./acre									
GSP	4	11/20/19	0	20.0	40.0	60.0	4.0	1.0	0.4	0.4	36.0	0.0	12.0
		12/16/19	26	20.0	40.0	60.0	4.0	1.0	0.4	0.4	36.0	0.0	12.0
		01/31/20	72	20.0	40.0	60.0	4.0	1.0	0.4	0.4	36.0	0.0	12.0
		02/27/20	99	54.0	0.0	0.0	0.0	0.0	0.0	0.0	66.5	0.0	0.0
		Total		**114.0**	**120.0**	**180.0**	**12.0**	**3.0**	**1.2**	**1.2**	**174.5**	**0.0**	**36.0**
CRF – 1	1	11/20/19	0	96.0	96.0	144.0	12.0	3.0	0.1	1.2	108.0	20.4	50.4
		Total		**96.0**	**96.0**	**144.0**	**12.0**	**3.0**	**0.1**	**1.2**	**108.0**	**20.4**	**50.4**
CRF – 2	2	11/20/19	0	48.0	48.0	72.0	6.0	1.5	0.1	0.6	54.0	10.2	25.2
		12/16/19	26	48.0	48.0	72.0	6.0	1.5	0.1	0.6	54.0	10.2	25.2
		Total		**96.0**	**96.0**	**144.0**	**12.0**	**3.0**	**0.1**	**1.2**	**108.0**	**20.4**	**50.4**
CRF – 3	3	11/20/19	0	72.0	120.0	180.0	12.0	3.0	0.1	1.2	84.0	20.4	50.4
		01/31/20	72	27.1	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
		02/27/20	99	27.1	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
		Total		**126.3**	**120.0**	**180.0**	**12.0**	**3.0**	**0.1**	**1.2**	**150.5**	**20.4**	**50.4**
CRF – 4	4	11/20/19	0	36.0	60.0	90.0	6.0	1.5	0.1	0.6	42.0	10.2	25.2
		12/16/19	26	36.0	60.0	90.0	6.0	1.5	0.1	0.6	42.0	10.2	25.2
		01/31/20	72	27.1	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
		02/27/20	99	27.1	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
		Total		**126.3**	**120.0**	**180.0**	**12.0**	**3.0**	**0.1**	**1.2**	**150.5**	**20.4**	**50.4**
CRF – 5	4	11/20/19	0	24.0	40.0	60.0	4.0	1.0	0.0	0.4	28.0	6.8	16.8
		12/16/19	26	24.0	40.0	60.0	4.0	1.0	0.0	0.4	28.0	6.8	16.8
		01/31/20	72	24.0	40.0	60.0	4.0	1.0	0.0	0.4	28.0	6.8	16.8
		02/27/20	99	54.2	0.0	0.0	0.0	0.0	0.0	0.0	66.6	0.0	0.0
		Total		**126.3**	**120.0**	**180.0**	**12.0**	**3.0**	**0.1**	**1.2**	**150.5**	**20.4**	**50.4**

Effects of planting method and date of transplanting on Vidalia onion production

A. da Silva, M. de Barros, C. Tyson, A. Shirley, and D. Bowen

Introduction

Hand-transplant and harvest are the most cost and labor demanding practices for Vidalia onion growers. Alternatives to the hand-transplant is the use of a mechanical bulb set planter, which is currently available for growers in Georgia. In 2019, the mechanical planting method was evaluated for Vidalia onion production. Although no significant differences from the hand-transplanting was measured for the mechanical planter on total yield, the mechanical bulb set planter had lower yield of jumbo onions, but higher yield of medium bulbs compared to the hand-transplanting.

Therefore, a second year of trials were conducted to evaluate the performance of the mechanical bulb set planting as an alternative planting method to the hand-transplanting of Vidalia onions, and 2) to determine planting dates that can maximize bulb yield and quality for each planting method.

Material and methods

A field experiment was conducted in the 2020 Vidalia onion season at the University of Georgia, Vidalia Onion and Vegetable Research Center located in Lyons, GA. A two factorial experimental design with two planting methods and three planting dates (table 1) were replicated 4 times in a randomized complete block design. Each panel (plot) was comprised by 20 ft long and contain four rows of onion with a 10 ft border between adjacent plots in a bed. Onion beds were 6 ft center spaced, onion rows within each bed were 12 inches spaced with a 4 inches space between onion plants. Planting dates were November 25, 2019, Decemberember 16, 2019 and January 7, 2020.

Planting method treatments were the conventional hand-transplanting and a mechanical bulb set planting. The conventional hand-transplanting had seeds (cv. Pirate) planted on September 17, 2019 and were manual transplanted to experimental plots.

Table 1. Total yield and bulb size distribution for Vidalia onion grown in the 2018/2019 season.

Planting Method	Planting date
Bulb set	11/25/19 - Early
Bulb set	12/16/19 - Mid
Bulb set	01/07/20 - Late
Transplanting	11/25/19 - Early
Transplanting	12/16/19 - Mid
Transplanting	01/16/20 - Late

The mechanical planting of bulb sets (cv. Pirrot) was performed using a 4 rows suction onion bulb planter (J.J. Broach, Madrid, Spain). Bulb sets were 1 inch of diameter and planted 1/3 inch deep in the soil.

Crop and pest management practices followed the University of Georgia recommendations, excepted by herbicide application, where transplant treatments received herbicide at planting date, and bulb sets received two applications at 2 and 6 weeks after planting. This management was used to avoid bulb set mortality. Particularly, all treatments received 5 fertilize application: 1) 400 lb/acre of 5-10-15 at planting, 2) 400 lb/acre of 5-10-15 at 20 days after planting (DAP), 3) 400 lb/acre of 5-10-15 at 46 DAP, 4) 100 lb/acre of 15.5-0-0 at 92 DAP, and 5) 150 lb/acre of 15.5-0-0 at 105 DAP.

Vidalia onions were harvested 111, 133, and 154 DAT for early, mid, and late planting dates, respectively. Harvested bulbs were field cured, weighed and graded according to the Georgia Department of Agriculture in colossal (> 3¾ inches), jumbo (3¾ to 3¼ inches), and medium (< 3¼ inches).

Statistical analyses were performed using the software RStudio Version 3.5.1 (RStudio Team, 2018) to compare total yield and bulb size distribution among treatments. When the F value was significant, multiple mean comparisons were performed using the Tukey-Kramer at a *p value* of 0.05.

Results and discussion

There were no significant differences for the interaction of planting method and planting date for Vidalia onion yield parameters; however, significant differences for the main effect of planting method and planting date were measured for total yield, Colossal, Jumbo, and Medium (Table 2).

Table 2. Effect of planting date and planting method on Vidalia onion total yield and bulb size distribution.

Treatment	Total yield		Colossal		Jumbo		Medium	
	40 lb. bags / acre							
Planting date								
Early	1232	a*	90	a	1002	a	140	
Mid	1226	a	89	a	988	a	149	
Late	722	b	48	b	530	b	144	
p value	***		***		***		*ns*	
Planting method								
Bulb set	846	b	55	b	613	b	179	a
Transplanting	1277	a	97	a	1073	a	108	b
p value	***		***		***		***	

ns = not significant to the ANOVA; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

*Values followed by similar letters indicate no significant difference ($p < 0.05$) among planting date or planting method according to Holm-Tukey adjust.

The hand transplanted onions had higher total yield, and yield of Colossal and Jumbos than the mechanical bulb set planter. Contrarily, the mechanical bulb set planter had a higher yield of Medium onions than the hand transplant. Regardless of planting method, early and mid-planting dates had a higher total, Colossal, and Jumbo yields than the late planting date, while there was no significant difference among planting dates for the yield of Medium onions.

Conclusion

Contrary to the results obtained in 2019, the hand transplanted onions had higher yields than the mechanical planting method in 2020. Soil moisture at planting was the biggest challenge faced in this year for the use of the mechanical bulb set planter, since 32 inches of rainfall was accumulated, in response soil moisture affected the bulb set plant spacing. Particularly, the high soil moisture at planting led to a non-uniformity plant distribution in plots mechanically planted. Still, the mechanical bulb set planter demonstrated to be a potential for the Vidalia onion production; however, further investigation on crop management practices (i.e., fertilization, weed control, irrigation, and others) for this alternative planting method is required.

Effects of bulb set size for Vidalia onion mechanical planting

A. da Silva, M. de Barros, C. Tyson, A. Shirley, and D. Bowen

Introduction

The Vidalia onion production in Georgia requires intense labor during planting time. While previous studies demonstrated the benefits of direct seeding onions, such as reduction in labor, low nitrogen rates, and others, transplants overcome the direct seeding during the winter since smaller onion plants are prone to being lost due low temperature (Boyhan *et al*., 2008). The use of bulb sets for mechanical planting can be an alternative to minimize the intense labor required and guarantee onion plants can survive during the winter. However, the size of bulb sets used for planting play a key role on the success of this practices. The objective of this study was to determine the impact of bulb set size used in a mechanical planter on Vidalia onion for total and bulb size distribution.

Material and methods

A field experiment was conducted in the 2020 Vidalia onion season at the University of Georgia, Vidalia Onion and Vegetable Research Center located in Lyons, GA. A randomized complete block design (r = 3) was used to compare three sizes of bulb sets for mechanical planting using an onion bulb planter (J.J. Broach, Madrid, Spain). Bulb sets (c.v. Pirate) were separated in A (< ¾ in), B (¾ to 1-½ in), and C (> 1-½ in) (Figure 1), and planted in November 15, 2019, which was considered 0 days after planting (DAP).

A total of 9 adjacent onion beds with 230 ft long and 6 ft center spaced were used. Each panel (plot) was comprised by an onion bed that contained four rows of onion. Onion rows within each bed were 12 inches spaced with a 4 inches space between onion plants, and bulb sets were planted ⅓ inch deep in the soil using a 4 rows suction onion bulb planter. Crop and pest management practices followed the University of Georgia recommendations, excepted by herbicide application, which the experimental field received two applications of Gold 2XL and Prowl at a rate of 16 oz/acre each at 2 and 6 weeks after planting. This management was used to avoid bulb set mortality. Particularly, all treatments received 5 fertilize application:

1) 400 lb/acre of 5-10-15 at planting,
2) 400 lb/acre of 5-10-15 at 20 days after planting (DAP),
3) 400 lb/acre of 5-10-15 at 46 DAP, and
4) 100 lb/acre of 15.5-0-0 at 91 DAP,
5) 150lb/acre of 15.5-0-0 at 105 DAP.

Figure 1. Bulb set size distribution: A (<3/4 in), B (3/4 to 1-1/2 in), and C (>1-1/2 in).

Vidalia onions were harvested on April 28, 2020 (155 DAT), cured for a week and graded according to the Georgia Department of Agriculture in Colossal (> 3¾ inches), Jumbo (3¾ to 3¼ inches), and Medium (< 3¼ inches).

Statistical analyses compared total and bulb size distribution among treatments.

Results and discussion

Vidalia onion total yield was the highest for bulb set sizes B and C (Figure 2), which averaged 1090 and 914 bags of 40 lb/acre, respectively. The lowest total yield was measured for bulb set size A (722 bags of 40 lb/acre).

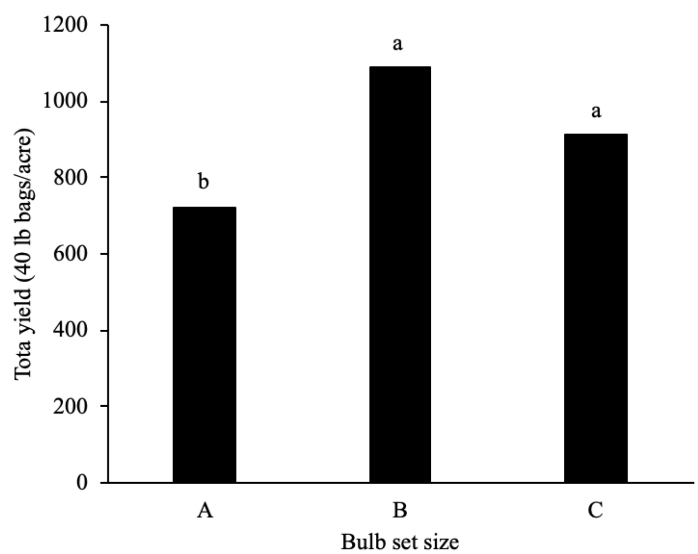

Figure 2. Difference on total yield for Vidalia onion among bulb set sizes A (<3/4 in), B (3/4 to 1-1/2 in), and C (>1-1/2 in).

Table 1 shows the total yield separated by bulb size distribution. Vidalia onions classified as Colossal represented the lowest portion of total yield, followed by the Medium size. The highest portion of harvested onions fell in the Jumbo size. Significant difference among bulb set size treatments were measured for the yield of Colossal and Jumbo onions, while there was no significant difference among bulb set size treatments for the yield of Medium onions. Bulb set sizes B and C had higher yield than size A for both Colossal and Jumbo onions, and these results were similar to those previously measured in the 2019 season.

Table 1. Difference on bulb size distribution for Vidalia onion among bulb set sizes A (<3/4 in), B (3/4 to 1-1/2 in), and C (>1-1/2 in).

Bulb Set Size	Colossal	Jumbo	Medium
40 lb. bags / acre			
A (<3/4 in)	14 b*	520 b	139 a
B (3/4 to 1-1/2 in)	30 a	776 a	177 a
C (>1-1/2 in)	24 a	810 a	103 a

*Values followed by similar letters indicate no significant difference ($p < 0.05$) among planting date or planting method according to Holm-Tukey adjust

Because Vidalia onions are typically planted end of Fall, overcome the winter, and are harvested in the spring, the size of bulb sets played an important role for plants to survive the low temperatures during the winter. In both year trials, the smaller onions of bulb set size A compared to B and C were more susceptible to being lost during the winter months or infected by diseases (i.e., botrytis neck rot) as previously described by Boyhan *et al.* (2008).

Conclusion

Results from the 2020 season validate those measured in the 2019 season, in which there is an increase in yield with the increase in the bulb set size. However, the bulb set size B was enough to maintain Vidalia onion yield, particularly Jumbo onions, which is of most interest for growers.

Because Vidalia onions are typically planted end of Fall, overcome the winter, and are harvested in the spring, the size of bulb sets played an important role for plants to survive the low temperatures during the winter. In both year trials, the smaller onions of bulb set size A compared to B and C were more susceptible to being lost during the winter months or infected by diseases (i.e., botrytis neck rot) as previously described by Boyhan *et al.* (2008).

Irrigation and nitrogen fertilizer strategies for Vidalia onion production

H. de Jesus, C. Tyson, B. Dutta, and A. da Silva

Introduction

Sandy loam soils of southeast Georgia combined with heavy rainfall events and excess of irrigation increase the risk of soil nitrogen (N) leaching that consequently minimize yield in the Vidalia onion production. The N fertilizer application is typically split into multiple applications to ensure soil nutrient availability during onion crop development. Particularly, the last N fertilizer application occurs at onion bulbing, when there is a high N demand by onion plants. However, the optimum timing of last N fertilizer application for onions have not been investigated yet in the Vidalia onion production areas of Georgia, and this can be detrimental to increase yield and quality of onions. The objective of this study was to evaluate the effects of irrigation methods, different N fertilizer rates, and timing for the last N fertilizer application on Vidalia Onion production.

Material and methods

A field experiment was conducted in the 2020 Vidalia onion season at the University of Georgia, Vidalia Onion and Vegetable Research Center located in Lyons, GA. Vidalia onion, cultivar Candy Joy, was planted on September 17, 2019 in nursery beds, and transplanted to field beds on Decemberember 15, 2019. The experimental area was comprised of 4 adjacent field beds 5 in tall, 370 ft long, and 6 ft center to center spacing. Each field-bed was comprised of 4 onion rows with an in-row spacing of 4 inches, and experimental plots were 30 ft long with 5 ft skip between plots within each management practices associated with soil preparation, transplanting, and management of pest, weeds and diseases followed the University of Georgia recommendation.

The experiment was carried out in a split-split-plot arrangement, with two irrigation methods, three N fertilizer rates, and three timings of last N fertilizer application evaluated in a randomized complete block design with 4 replications (Table 1). Irrigation methods (main-plot) were drip and overhead irrigation with water applied according to the evapotranspiration. The N fertilizer rates (sub-plot) were 75, 105, and 135 lb of N/acre, in which the first three N fertilizer application were performed at transplanting, 23, and 47 days after transplanting (DAT) and supplied 20% of total N each. The timing of last N fertilizer application (fourth N application); (sub-sub-plot) were 64 DAT (before bulbing), 74 DAT (at bulbing), or 84 DAT (after bulbing).

Table 1. Difference on bulb size distribution for Vidalia onion among bulb set sizes A (< 3/4 in), B (3/4 to 1-1/2 in), and C (> 1-1/2 in).

Irrigation method	N rate (lb/ac)	Last N fertilizer application
Drip	75	Before bulbing
Overhead	105	Bulbing
-	135	After bulbing

*Values followed by similar letters indicate no significant difference ($p < 0.05$) among planting date or planting method according to Holm-Tukey adjust

Vidalia onions were harvested on April 22, 2020 (128 DAT), cured for 10 days and graded according to the Georgia Department of Agriculture in: Colossal (> 3¾ inches) Jumbo (3¾ to 3¼ inches) and Medium (< 3¼ inches). Center rot and sour skin bulb symptoms were assessed 35 days after harvest following storage at 1 °C and 75-80% RH. Statistical analyses were performed to compare total yield, bulb size distribution, center rot, and sour skin among treatments.

Results

During the study period, there was a rainfall accumulation of 28 inches, which was far above the onion crop water demand. Consequently, rainfall allowed for few irrigation events. In response, there were no significant differences for the interaction irrigation method, N fertilizer rate, and timing of last N fertilizer application. However, there was a main effect of N fertilizer rate on total yield and yield of Colossal, Jumbo, and Medium (table 2). While irrigation method and timing of last N fertilizer application interacted to affect yield of Medium onions (table 3).

The highest total yield was measured with the N rate of 135 lb/acre, followed by the N rates of 105 lb/acre. The lowest total yield was measure for the N fertilizer rate of 75 lb/acre. Colossal onions represented 4.3% of total yield, in which 135 lb of N/acre had a higher yield of Colossal compared to 105 and 75 lb of N/acre. Jumbo onions represented 84% of total yield and similar to total yield, the highest yield of Jumbo onions was measured for 135 lb of N/acre, followed by the N rates of 105 lb/acre. The lowest yield of Jumbo was measured for the N fertilizer rate of 75 lb/acre. Medium onions represented 11.7% of total yield. Medium onions were the highest for the N rate of 75 lb/acre and the lowest for the application of 135 lb of N/acre.

Table 2. Total yield and bulb size distribution for Vidalia onion grown in the 2019/2020 season

Treatment	Total yield	Colossal	Jumbo	Medium
	40 lb. bags / acre			
N rate				
75lb/ac	972 c*	20 b	797 c	154 a
105lb/ac	1117 b	35 b	953 b	128 ab
135lb/ac	1274 a	98 a	1080 a	95 b
Irrigation method				
Drip	1098 a	39 a	926 a	-
Overhead	1143 a	63 a	961 a	-
Last N fertilizer application				
before bulbing	1153 a	57 a	990 a	-
bulbing	1104 a	52 a	917 a	-
after bulbing	1106 a	43 a	922 a	-

*Values followed by the same letters indicate no significant difference by the Tukey test (p<0.05) among N rates, irrigation methods or last N fertilizer application.

For the interaction between irrigation method and timing of last N fertilizer application (table 2), there was an increase in yield with a delaying in timing of last N fertilizer application under drip irrigation but not under overhead irrigation. Applying N fertilizer after bulbing increased the yield of Medium onions compared to the application of N before bulbing under drip irrigation; however, there was no significant difference between the last N fertilizer application at bulbing and before bulbing, or at bulbing and after bulbing. Comparing irrigation methods within the timing of last application was significant only when N fertilizer was applied after bulbing, in which drip irrigation had higher yield of Medium onions compared to overhead irrigation.

Table 3. Effect of the interaction for irrigation method and Last N fertilizer application on the yield of Vidalia onion size Medium

Irrigation method	Last N Fertilizer application		
	Before bulbing	*Bulbing*	*After bulbing*
	Yield (40lb bags/ac)		
Drip	100 Ab*	130 Aab	168 Aa
Overhead	108 Aa	137 Aa	112 Ba

*Values followed by the same capital letters within the columns and lower -case letter within the lines do not differ significantly by the Tukey test (p<0.05)

Similar to yield parameters, there was no significant interaction among N fertilizer rate, irrigation methods, and timing of last N fertilizer application for the incidence of center rot and sour skin. However, there was the main effect of irrigation method on sour skin, and the main effect of timing of last N fertilizer application on center rot and sour skin (table 4).

The drip irrigation method increased the incidence of sour skin compared to the overhead irrigation. While the N fertilizer applied before bulbing reduced center rot and sour skin compared to N fertilizer applied at bulbing and after bulbing.'

Table 4. Center rot and sour skin bulb incidence (%) after harvest

Treatments	Center rot	Sour skin
	Incidence (%)	
N rate		
75 lb/ac	5.20 a	1.45 a
105 lb/ac	5.86 a	1.25 a
135 lb/ac	4.58 a	1.87 a
Irrigation method		
Drip	4.44 a	2.08 a
Overhead	6.00 a	0.97 b
Last N fertilizer application		
before bulbing	3.54 b	0.62 b
bulbing	6.25 a	2.29 a
after bulbing	5.86 a	1.66 a

*Values followed by the same letters indicate no significant difference by the Tukey test (p<0.05) among N rates, irrigation methods or last N fertilizer application.

Conclusion

Vidalia onion yield parameters were more affected by N rate than irrigation methods and timing of last N application. Rainfall event induce soil N leaching and the application of 135 lb of N/acre increased the total yield of onions compared to 105 and 75 lb of N/acre. A second year of study is required to evaluate the effects of irrigation methods and N fertilizer rates in a different weather condition since proper irrigation management in drier years may minimize N losses and, consequently, may reduce N requirements to sustain onion yield.

Evaluation of herbicides for dry bulb onion set tolerance and weed control when planted in November, 2019-20

T. Grey and C. Tyson

Introduction

Registered herbicides have been tested and recommended for dry bulb transplant and seeded Vidalia onion production as found in Georgia Pest Management Handbook. Due to stand establishment and weed control issues with seeded onion, and labor costs associated with transplanting, growers could utilize dry bulb onion sets that can be mechanically planted. However, there is limited herbicide information about onion sets tolerance and weed control. Since mechanically planted onion sets have to establish their plants from a 'dry' bulb, they must initiate leaves through treated soils. Absorption of these herbicides could be an issue. Currently registered herbicides for residual control include Prowl 3EC, Goal, Dacthal, and Dual Magnum. With the advent of increased desire to plant onion sets, greater information about currently registered herbicides is needed. Therefore, herbicides need to be screened for potential injury, as well as weed control options when mechanically planting onion sets.

Material and methods

Field experiments were planted at the VOVRC in an area that was tilled by moldboard plowing then smoothed with a rotary tiller to form six-foot wide beds. The area was located in an area that had not been previously exposed to any of the herbicides evaluated for this experiment the previous year. Dry bulb onions sets were mechanically transplanted with a tractor November 25, 2019.

Treatments application and data collection (Table 1) began after planting and continued till April 2020. Treatments included Goal, Prowl EC, Dual Magnum in an onion set experiment. The intent was to evaluate herbicides at distinct timings, PRE right after planting, at emergence 1 week after planting, and 21 days after planting. The experimental design was a randomized complete block with four replications and plots had four onion rows per bed 25 feet long.

Injury ratings for stunting were visually estimated during the course of the study and prior to harvest (Table 1). Heights and stand counts were taken multiple times during the season. Final yield was determined by hand harvesting all onion from 10 feet of center two rows of each plot, and recording their number and weight. Cumulative number and yield per acre were determined, with weight per fruit determined by dividing the total fruit yield by total bulb count.

Results

Planting was uniform with the equipment used. Bulbs were uniform in size, but some leaf extension from the tip of the bulbs could have led to some variability. This could be possibly alleviated if the bulbs are somehow uniformly sized and prevention of sprouting prior to planting, or other methods to remove excess tissue from the top part. Overall planting and emergence of dry bulbs was uniform as observed in early season stand counts (January 16, 2020) ranging from 19 to 21 bulbs per 2 meters of row (Table 1).

Herbicide treatments did not cause any foliar injury for the 3 treatment dates (day after planting (A), 7 days after planting (B), and 21 days after planting (C), and heights were similar (data not shown), indicating that dry bulb tolerance was similar to hand transplanting. Season long control ratings indicated that cutleaf evening primrose as the predominate weed (Figure 1). Overall harvested yields were not as abundant, and bulb size reduced (Table 1),

Figure 1. Dry bulb onion experiment prior to harvest in April 2020.

Conclusion

Overall the objective of this research was achieved as dry bulb onion was tolerant to the registered herbicides, season long weed control was achieved with Goal herbicide tank mixtures. Overall this study was similar to hand transplanted studies previously conducted by the researchers.

Table 1. Weed control and yield of dry bulb mechanically transplanted onion at Lyons, GA 2020.

				Stand count	Cutleaf evening primrose	Onion mass	Onion number	Onion size per bulb
			Rating Date	1/16/2020	4/29/2020	4/29/2020	4/29/2020	4/29/2020
			Part Rated	Stand	Weed	Harvested	Harvested	Harvested
			Rating Type	Count	Control	Bulb Yield	Bulb Yield	Bulb
			Rating Unit	2m row	percent	lbs per acre	# of acres	oz per bulb
No.	Treatment Name	Rate Unit	Appl Code					
1	NONTREATED			19	0	30,715	76,968	6.5
2	PROWL EC	16 fl oz/a	A	19	24	30,758	79,146	6.3
3	GOAL 2XL	16 fl oz/a	A	19	76	41,505	83,503	8.0
4	PROWL EC	16 fl oz/a	A	19	84	39,914	84,955	7.6
	GOAL 2XL	16 fl oz/a	A					
5	PROWL EC	32 fl oz/a	A	19	31	31,992	82,777	6.2
6	GOAL 2XL	32 fl oz/a	A	19	90	43,639	84,229	8.4
7	PROWL EC	32 fl oz/a	A	20	96	37,511	79,872	7.5
	GOAL 2XL	32 fl oz/a	A					
8	DACTHAL	96 fl oz/a	A	21	35	32,850	88,586	5.9
9	PROWL EC	32 fl oz/a	B	19	98	43,320	79,872	8.8
	GOAL 2XL	32 fl oz/a	B					
10	PROWL EC	16 fl oz/a	A	21	53	38,223	90,794	5.1
	DUAL MAGNUM	16 fl oz/a	B					
11	PROWL EC	16 fl oz/a	A	19	94	37,627	73,337	8.2
	GOAL 2XL	32 fl oz/a	B					
12	PROWL EC	16 fl oz/a	A	19	99	38,019	75,516	8.1
	GOAL 2XL	16 fl oz/a	A					
	PROWL EC	16 fl oz/a	C					
	GOAL 2XL	16 fl oz/a	C					

Application codes:

A = 1 day after transplanting (November 26th, 2019)

B = 7 days after transplanting (Decemberember 3rd, 2019)

C = 21 days after transplanting (Decemberember 19th, 2019)

Mapping and correlating soil characteristics to onion pungency

D. Jackson, J. Lessl, C. Tyson, A. da Silva, R. Sharma, J. Mullican, D. Platero, and M. Levi

Introduction

Previous research from the Vidalia region has shown that variability in soil physical properties (for example: soil type, texture, and depth to claypan) can affect both nutrient availability and onion pungency. Utilizing precision mapping techniques, this study was conducted to characterize the relative variability in soil properties within a single onion field and explore relationships between those properties and the yield and flavor profile of the onions produced.

Material and methods

A survey study was conducted on a 26 acre portion of a Vidalia onion production field in Tattnall County, GA, which was selected due to the diversity in soil types represented in the field (53% Tifton loamy sand, 32% Dothan loamy sand, and 15% Leefield loamy sand). The field was divided into 0.5 acre grids for soil and tissue sampling (51 total samples). Soil samples were collected prior to planting from both the top 6 inches of soil and the top 6 inches of the underlying claypan. The claypan depth was recorded and the soil samples were analyzed for pH, nutrient content, and texture. Foliar nutrient samples were collected at bulb initiation and again at maturity. At maturity, 25 bulbs representing each of the 51 sample locations were collected to determine yield and onion flavor quality. The field was planted with Pirate onions (Bejo Seeds, Inc.) and managed under the grower's standard cultivation program.

Results

Large variations were seen across the field for soil sulfur content, depth to the claypan, yield, and onion bulb pyruvic acid and sulfur content (Figure 1). The areas of the field where the claypan was both shallow and had high sulfur (greater than 45 lb/acre), corresponded with higher pyruvic acid and bulb sulfur content. Alternatively, field locations with the deepest claypan had onions with the least pyruvic acid and bulb sulfur content, despite the claypan also having high sulfur content. We believe where the claypan is shallow (less than 15 inches) and the soil sulfur content is elevated, the roots may be able to access these sulfur deposits earlier in their growth cycle, producing more pungent onions. Meanwhile, where the claypan was deep (greater than 25 inches), even though the sulfur content of the claypan was also high (above 80 lb/acre), the depth may have made the sulfur less accessible to the plant.

Onion yields were greatest in areas with a shallow claypan and was substantially reduced in those same field locations that contained deep claypans and low pungency onions, which may indicate a potential sulfur deficiency in these field locations. However, environmental conditions need to be considered as well, as the Vidalia region exceeded normal rainfall totals by an additional 10 inches (roughly 33%) during the growing season, and the lower elevations of the field, which also happened to be the area with the deepest claypan, stayed saturated for much of the season leading to higher incidence of disease. The Leefield soil series is also a poorly drained soil which may have contributed to the significant weed pressure encountered during the growing season and otherwise poor growing conditions for onions in the lower elevation zone, which may have played a role in the reduced yields observed in these locations. Due to the environmental factors faced, and to ensure the observations identified are consistent across the production region, this work should be repeated in the coming season at multiple locations.

Conclusion

Soil characteristics, yield, pungency, and bulb sulfur content are all interconnected, and can vary widely within a single Vidalia onion field. While this work needs to be repeated, these results indicate that site-specific fertilizer recommendations and management plans may be needed based on site-specific soil characteristics including depth to claypan and residual sulfur in the claypan, both of which appear to play a role in onion quality and yield.

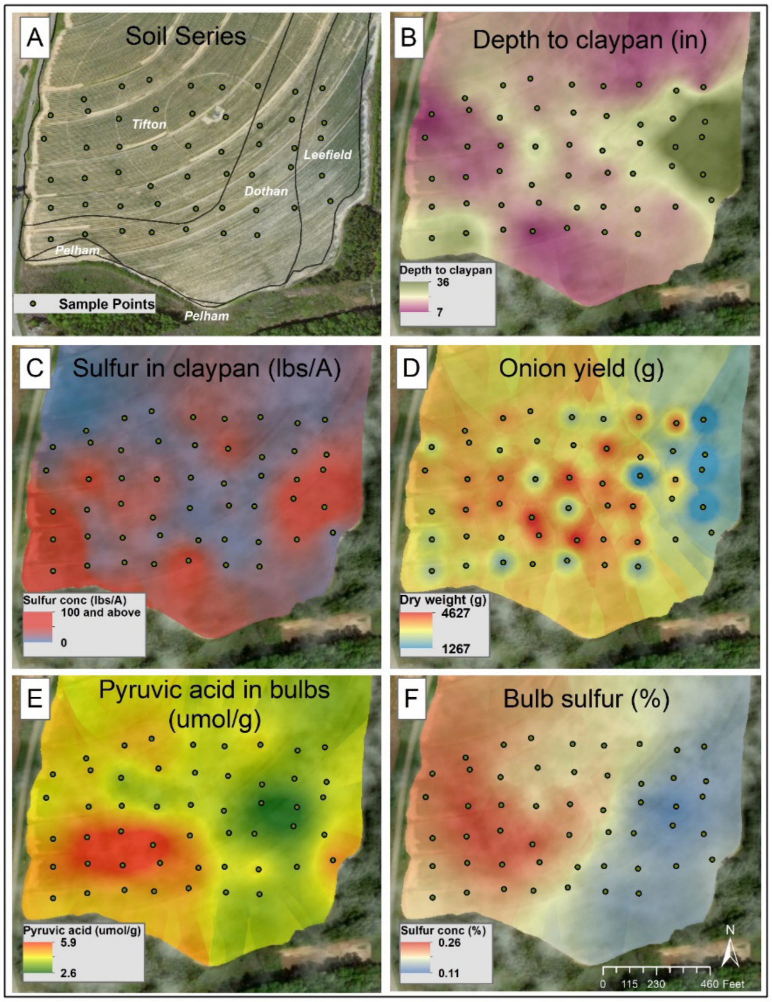

Figure 1. Field maps of the study location showing;
A) the 51 sampling locations and three major soil types
B) depth to reach the underlying soil claypan (inches),
C) sulfur content (lb/acre) in claypan soil layer at planting (prior to fertilizer application),
D) onion dry weight yield (grams),
E) pyruvic acid (µmol/g) content of onion bulbs, and
F) onion bulb sulfur content (%) at harvest.

Service layer credits – source: Esri, DigitalGobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

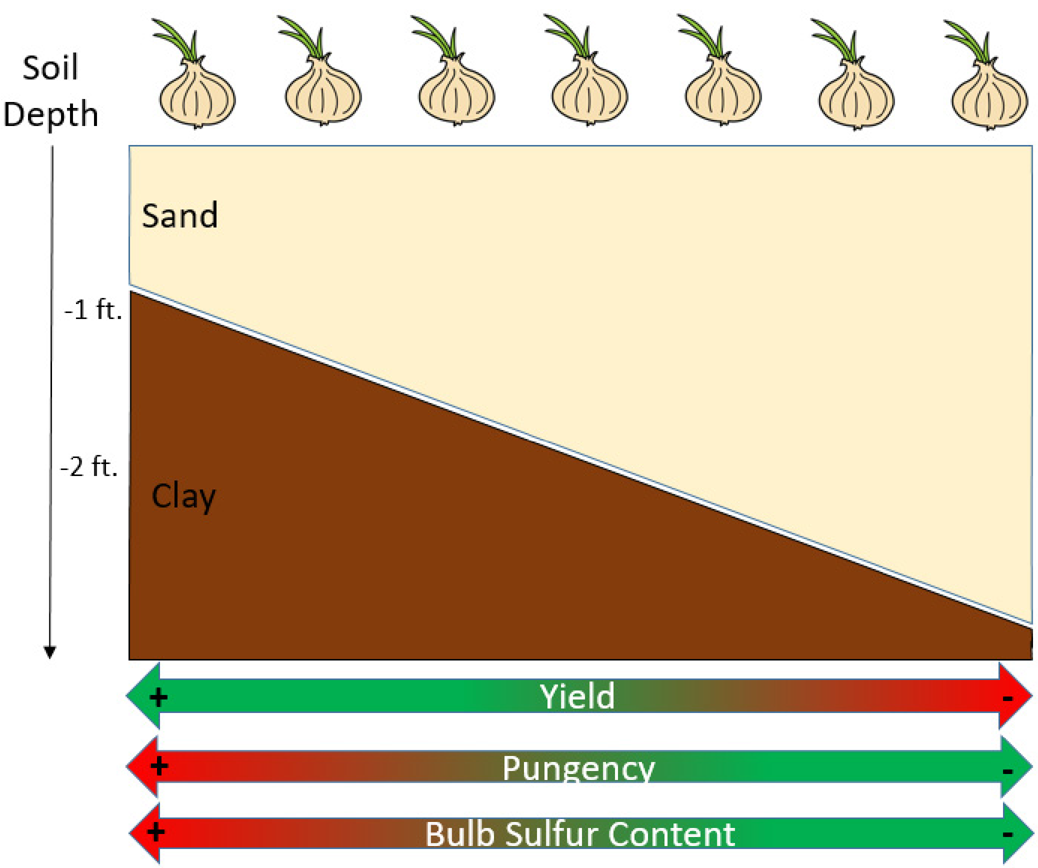

Figure 2. Diagram showing the general relationships identified in this study between the depth of the underlying soil claypan, and onion yield, pungency, and sulfur content.

Vidalia onion yield in response to organic and chemical fertilization

J. Perez and J. Bautista

Introduction

There is an increasing interest in the use of organic amendments and fertilizers to increase environmental sustainability. Additionally, the impact of organic fertilizers on vegetable crops yield and quality is still unclear. The objective of this study was to evaluate the effects of organic, chemical, and a mixed fertilizer on sweet onion bulb yield.

Material and methods

The study was conducted at the Horticulture Farm, Tifton Campus, University of Georgia, in the winters of 2013, 2014, and 2017. The experimental design was a randomized complete block with three treatments and four replications. Fertilization treatments consisted on organic fertilizer [100% nitrogen (N)], chemical fertilizer (100% N), and a mixed fertilizer [organic (50% N) + chemical (50% N)]. In all treatments, the crop received a total of about 134 lb ac-1 N. Organic fertilizer (microSTART60 3–2–3; Perdue AgriRecycle, LLC) was incorporated into the soil (bed area) with a rototiller-bed shaper before planting.

Results

Fertilizer treatments had no effect on onion bulb number and marketable and total yields (Table 1). There were also no differences in the incidences of bolting, doubles, Botrytis and sour skin among fertilization treatments (data not shown). Onion yields varied by year, with the highest marketable and lowest cull yield in 2017.

Conclusions

Onion bulb yields showed variability by year but not in response to fertilizer treatments. Data showed that the fertilizer type (organic or conventional fertilizer) had no impact on onion yield, as long as plants had sufficient availability of soil nutrients. Onion yields varied by year, which indicates that environmental factors play an important role in crop responses.

Table 2. Effect of planting date and planting method on Vidalia onion total yield and bulb size distribution.

Treatment	Marketable		Total	
	(1000·ac⁻¹)	*(t· ha⁻¹)*	*(1000·ac⁻¹)*	*(t·ha⁻¹)*
Fertilizer				
Chemical z	71.3	27.3	100.3	33.6
Mixed y	76.1	29.8	103.8	36.8
Organic x	68.9	27.2	99.6	33.9
Year				
2013	72.2	25.9	108.7	32.5
2014	53.1	21.6	93.8	33.7
2017	85.5	35.2	99.5	37.8
Significance				
Fertilizer	0.341	0.291	0.666	0.191
Year	<0.0001	<0.0001	0.029	0.027
F x Y	0.879	0.879	0.684	0.689

[z] Chemical fertilizer: 100% N (134 lb/ac) as chemical or synthetic fertilizer.

[y] Mixed fertilizer: 50% N (67 lb/ac) as organic fertilizer applied before planting + 50% N (67 lb/ac) as chemical fertilizer applied during the growing season through the drip system.

[x] Organic fertilizer: 100% N (134 lb/ac) applied before planting as organic fertilizer (microSTART60 3–2–3; Perdue AgriRecycle, LLC, Seaford, DE).

[v] Means followed by the same letter are not significantly different based on Fisher's protected least significant difference test at 95% confidence.

Evaluation of fungicides to manage Botrytis leaf blight on onion in Georgia, 2020

B. Dutta, M.J. Foster, and W.M. Donahoo

Material and methods

Four rows of 'Allison' onion were transplanted into 6 ft beds (panels) on December 8, 2019 at the Vidalia Onion and Vegetable Research Center, Lyons, GA. The fertility and insecticide programs were consistent with the University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with five replications. Treated plots were 20 ft long and were separated on each side by non-treated border panels. Plots were separated by a 3 ft bare-ground buffer within the row. Treatments were applied with a backpack sprayer calibrated to deliver 40 gal/acre at 75 to 80 psi through TX-18 hollow cone nozzles. Treatment applications were made on February 14, February 28 and March 13. Plots were irrigated once a week using overhead irrigation. Natural inoculum was relied upon. Disease severity was assessed on April 9 and April 20 as percent leaf area with symptoms per plot. Data were analyzed in the software ARM (Gylling Data Management, Brookings, SD) and means compared using the Fisher's protected LSD test at $P \leq 0.05$.

Results and discussion

The mean rainfall received during December 2019 and April 2020 was 6.5 in. and 3.5 in., respectively. The average high and low temperatures for the month of December 2019 were 58 °F and 42 °F, respectively and for the month of April 2020 were 81 °F and 58 °F, respectively.

Botrytis leaf blight symptoms were first appeared on April 9 with significantly higher disease severity for the non-treated check (85.0%) than for the fungicide-treated plots. Omega 500 and Merivon had significantly lower disease severity compared to other treatments. Disease progressed over a two-week period and reached 90.0% (disease severity) on April 20, in non-treated plots, which was significantly higher than the fungicide-treated plots. Among the treatments, Botrytis leaf blight severity was significantly lower for the Omega 500, Miravis Prime and Merivon treatments compared to Scala and Rovral. Phytotoxicity was not observed with any of the treatments used.

Treatment and rate of product per acre	Application No.[z]	Initial disease severity (%) on 9 April[y]	Final disease severity (%) on 20 April
Rovral 1.5 pt	1-3	60.0 bx	61.3 b
Scala 18 fl oz	1-3	47.5 bc	68.8 b
Luna Tranquility 16 fl oz	1-3	56.3 bc	57.5 bc
Omega 500 1 pt	1-3	40.0 c	47.5 c
Miravis Prime 11.4 fl oz	1-3	44.5 bc	48.2 c
Merivon 11 fl oz	1-3	52.5 c	45.0 c
Non-treated check	**-**	**85.0 a**	**90.0 a**

[z] Chemical fertilizer: 100% N (134 lb/ac) as chemical or synthetic fertilizer.

[y] Mixed fertilizer: 50% N (67 lb/ac) as organic fertilizer applied before planting + 50% N (67 lb/ac) as chemical fertilizer applied during the growing season through the drip system.

[x] Organic fertilizer: 100% N (134 lb/ac) applied before planting as organic fertilizer (microSTART60 3–2–3; Perdue AgriRecycle, LLC, Seaford, DE).

[v] Means followed by the same letter are not significantly different based on Fisher's protected least significant difference test at 95% confidence.

Evaluation of onion growth stage directed chemical applications and thrips management program on center rot incidence in onion bulbs in Georgia, 2020.

B. Dutta, C. Tyson, J. Edenfield Z. Williams, S. Tanner, A. Shirley, D. Bowen, and S. Powell

Material and methods

Four rows of 'Alison' onions were transplanted into 6 ft beds (panels) on December 5 at the Vidalia Onion and Vegetable Research Center located in Lyons, GA. The fertility program was consistent with University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with four replications. Treated plots were 20 ft long and were separated on each side by non-treated border panels. Plots were separated by a 3 ft bare-ground buffer within the row. Treatments were applied with a backpack sprayer calibrated to deliver 33 gal/acre at 40 psi through TX-18 hollow cone nozzles. Applications were made at two growth stages (bulb initiation and bulb swelling) with a total of three applications per growth stage at 7-day intervals.

Bactericide treatments were applied with or without an insecticide program for thrips management. Thrips management program was followed according to the UGA Cooperative Extension recommendation. Natural infection was relied upon. Plots not treated with bactericides were considered as negative control. Center rot bulb symptoms were assessed 3 days after harvest following incubation at 28 °C and 50% RH on May 15. Marketable yield was also calculated for each treatment. Data for mean center rot incidence and marketable yield were analyzed within each growth stage using the Fisher's protected LSD test at $P \leq 0.05$. Weather during the experiment was moderately wet with 18.5 in. of accumulation occurring between March 15 and April 30.

Results and discussion

For treatments where thrips management program was not utilized, non-bactericide treated check had significantly higher center rot incidence in bulb and lower marketable yield compared to other treatments. Bactericide treatments were not significantly different from each other in terms of center rot incidence and marketable yield. For treatments where thrips management program was followed, non-bactericide treated check had significantly higher center rot incidence in bulb and lower marketable yield compared to other treatments. Bulb incidence and marketable yield for bactericide treatments was not significantly different from each other. Phytoxicity was not observed with any of the treatments.

Growth stage, treatment and rate per acre	Application timing[z]	Center rot bulb incidence (%)[y]	Marketable yield (lb/plot)[v]
Without thrips management program - *Bulb initiation and bulb swelling*			
Kocide 3000 1.5 lb	1-6	46.2 b	59.2 x
Agrititan 1% (v/v)	1-6	49.4 b	58.5 x
Kocide 3000 1.5 lb +Agrititan 1% (v/v)	1-6 1-6	39.8 b	61.4 x
Nordox 1lb	1-6	41.5 b	56.2 x
Untreated check	-	70.2 a	37.5 y
P-value	**-**	***0.015***	***<0.001***
With thrips management program - *Bulb initiation and bulb swelling*			
Kocide 3000 1.5 lb	1-6	35.2 b	68.5 x
Agrititan 1% (v/v)	1-6	39.8 b	65.5 x
Kocide 3000 1.5 lb +Agrititan 1% (v/v)	1-6 1-6	28.2 bc	58.5 x
Nordox 1lb	1-6	36.2 b	62.8 x
Untreated check	-	63.5 a	35.2 y
P-value	**-**	***0.036***	***<0.001***

[z] Bactericide-treatment applications were made: 1 = 20 February, 2 = 27 February, 3 = 5 March, 4 = 12 March, 5 = 19 March, and 6 = 26 March

[y] Mean center rot bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.

[x] Means followed by the same letter(s) within each growth stage are not significantly different according to Fisher's protected LSD test at P≤0.05.

[v] Mean marketable yield (lb) per treatment calculated as difference between mean field weight (lb) and weight of cull (lb).

Evaluation of digging methods on postharvest incidence of center rot and sour skin in onion, Georgia 2020.

B. Dutta, and C. Tyson

Material and methods

Four rows of 'Plethora' onions were transplanted into 6 ft beds (panels) on 8 December at the commercial onion grower farm located in Lyons, GA. The fertility program was consistent with University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with four replications. Treated plots were 20 ft long and were separated on each side by non-treated border panels. Plots were separated by a 3 ft bare-ground buffer within the row. Thrips and disease management program was followed according to the UGA Cooperative Extension recommendation. Natural infection was relied upon. Two methods of digging was evaluated; chain digger (TopAir, Inc.,) and bed ridge frame undercutter (Parma Inc.,). After three days of field curing, onion bulbs were manually clipped leaving 5-6 inches from the neck region. Roots were also clipped but care was taken not to clip too close to the basal plate. Onion bulbs from replicated plots (four replicates) were bagged and stored at 4 °C for one month. After period of storage, onion bulbs were individually cut using a sterile knife for the center rot and sour skin incidence. Data for mean center rot and sour skin incidences were analyzed using the Fisher's protected LSD test at $P \leq 0.05$. Weather during the experiment was moderately wet with 8.5 in. of accumulation occurring between March 15 and April 30.

Results and discussion

Center rot and sour skin were evaluated on onion bulbs are a month of storage under conditions mentioned above. The method of digging had a significant effect on center rot and sour skin bulb incidences in storage. Significantly higher incidences of center rot sour skin were observed with bed-ridge undercutter compared with chain digger. Bulb rot with postharvest fungi (*Botrytis* sp. and *Aspergillus* sp.) were not observed.

Methods of onion digging	Center rot bulb incidence (%)[y]	Sour skin bulb incidence (%)[z]
Chain digger	6.2 b[x]	3.5 b
Bed ridge undercutter	12.5 a	10.2 a
P-value	***0.016***	***<0.001***

[z]Mean sour skin bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.
[y]Mean center rot bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.
[x]Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P≤0.05.

Evaluation of harvesting methods on postharvest incidence of center rot and sour skin in onion, Georgia 2020.

B. Dutta, and C. Tyson

Introduction

Four rows of 'Plethora' onions were transplanted into 6 ft beds (panels) on December 12 at the commercial onion grower farm located in Lyons, GA. The fertility program was consistent with University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with four replications. Treated plots were 20 ft long and were separated on each side by non-treated border panels. Plots were separated by a 3 ft bare-ground buffer within the row. Thrips and disease management program was followed according to the UGA Cooperative Extension recommendation. Natural infection was relied upon. At harvest maturity, onion bulbs were undercut using a bed ridge frame undercutter (Parma Inc.,) followed by a three-day field curing period. Following curing, two different harvesting methods were evaluated: manual harvest and mechanical harvest using Nicholson Onion Harvester (South Georgia Equipment and Supply, Inc.,). For manual harvest, onion bulbs were clipped leaving 5-6 inches from the neck region. Roots were also clipped but care was taken not to clip too close to the basal plate. Onion bulbs from replicated plots (four replicates) were bagged and stored at 4 °C for one month. After period of storage, onion bulbs were individually cut using a sterile knife for the center rot and sour skin incidence. Data for mean center rot and sour skin incidences were analyzed using the Fisher's protected LSD test at $P \leq 0.05$.

Results and discussion

Center rot and sour skin were evaluated on onion bulbs are a month of storage under conditions mentioned above. The method of digging had a significant effect on center rot and sour skin bulb incidences in storage. Significantly higher incidences of center rot sour skin were observed with bed-ridge undercutter compared with chain digger. Bulb rot with postharvest fungi (*Botrytis* sp. and *Aspergillus* sp.) were not observed.

Methods of onion digging	Center rot bulb incidence[y] (%)	Sour skin bulb incidence[z] (%)
Mechanical harvest	2.2 b[x]	5.5 b
Manual harvest	10.5 a	13.2 a
P-value	***0.016***	***<0.001***

[z]Mean sour skin bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.
[y]Mean center rot bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.
[x]Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P≤0.05.

Efficacy of newly introduced non-fumigant nematicides in control of stubby-root nematodes on sweet onion

A. Hajihassani and C. Tyson

Abstract

The efficacy of four non-fumigant nematicides, Velum Prime, Nimitz, Salibro and Vydate, and a fumigant, Vapam, was evaluated under greenhouse conditions for the control of stubby-root nematode, *Paratrichodorus minor* on onion. Vydate significantly reduced soil populations of the nematode and increased onion yields compared to other nematicides.

Introduction

Stubby-root nematode (*Paratrichodorus minor*) is one of the yield-limiting nematode pests of vegetable crops in Georgia. Stubby-root nematode is a soilborne ectoparasite that feeds on the root tips of host plants. Belowground symptoms of *P. minor* damage include stunted or "stubby" appearing roots, root proliferation or branching. In the field, the aboveground symptoms include patches of stunted plants with retarded growth and necrotic leaf tips (Hajihassani *et al.*, 2018). The affected plants produce lower yields or exhibit sensitivity to drought because of impaired feeder roots. In our recent survey for plant-parasitic nematodes conducted in May 2018 in Tattnall and Tombs counties 62% of 30 onion fields sampled were infested with varying population densities of stubby-root nematodes (Hajihassani *et al.*, 2018; 2019).

Multiple nematode-infested fields were also found in these two counties in the growing season of 2019-20, indicating the importance of this nematode species on Vidalia onion in Georgia. Control of the stubby-root nematode is a challenge for growers due to their capability of vertical movement at varying depths in the soil. Metam sodium (trade name: Vapam) is currently among the most popular fumigant chemicals for control of weeds and nematodes in onion production in Georgia. Until recently, only one non-fumigant nematicide, Vydate (active ingredient: Oxamyl) was available for use in onion. More recently, Nimitz (fluensulfone) and Velum Prime (fluopyram) were registered for control of plant-parasitic nematodes in vegetable crops including onions. Salibro (fluazaindolizine) is a new nematicide which will be entered the market in the near future. Limited information is available about the efficacy of these newly introduced nematicides in control of stubby-root nematodes on onion. The objective of this greenhouse study was to evaluate the potential of Nimitz, Velum Prime, Salibro, and Vydate in control of the stubby-root nematode and improving onion yield compared with Vapam.

Material and methods

The stubby-root nematode (*P. minor*) population used in this experiment was isolated from an onion field in Tattnall County, GA, and increased on hairy vetch in the greenhouse for 3 months. Small polyethylene pots (vol. 1000 mL) were filled with sterilized field soil and then infested with 1 ml of aqueous solution of the nematode which contained 500 mixed *P. minor* life stages. Soil drench application of Velum Prime (6.5 fl oz/acre), Nimitz (80 fl oz/acre), Salibro (30.5 fl oz/acre), and Vydate (64 fl oz/acre), and Vapam (70 gal/acre) corresponded with the field application rates were made three days after nematode inoculation. Pots treated with Velum Prime, Salibro and Vydate were seeded one days after application, whereas those with Vapam and Nimitz, 21 and 7 days, respectively. Three seeds of hybrid sweet onion were planted in each pot and seedlings were then thinned to one plant per pot after germination. Onion plants infested with the nematode and treated with water were used as controls. Pots were arranged in a completely randomized design with 10 replicates for each nematicide. At harvest (8 weeks after seeding), onion leaf was cut from the soil surface and bulbs were weighed. Potted soils were mixed thoroughly and stubby-root nematodes were extracted from 100 cm^3 (cc) sub-sample of soil using centrifugal flotation method and then counted under a microscope to determine the final population density of the nematode per pot. Data were analyzed and treatment means were separated using Tukey's test at $P = 0.05$.

Results and discussion

Pots treated with Nimitz adversely affected the germination of onion seed thus this treatment was excluded from the trial. A similar trend was also observed for some of the pots treated with Salibro resulting in plants being weak during the experiment. In contrast, Vapam, Velum Prime and Vydate had very little or no toxic effect on the seed germination (Figure 1). At harvest, pots treated with Vydate had greater (P>0.05) yields (bulb weight) compared to other treatments. Treatment with Velum prime and Vapam did not have a significant influence on onion yield compared to the untreated control (Figure 2A). Plants treated with Salibro had significantly lower yield than that of other treatments (Figure 2B). In neither treatment was the stubby-root nematode completely eradicated from treated soils. Vydate significantly (P<0.05) reduced the nematode populations compared with the other treatments. There was no significant difference in nematode numbers between Vapam, Salibro and Velum Prime; however, these nematicides significantly reduced the nematode numbers compared to the control. Our data indicate that Vydate shows promise as an alternative to Vapam for the control of stubby-root nematode. Salibro appears somewhat more effective than Vapam and Velum prime in nematode control but its adverse effect on onion growth may undoubtedly limit its application.

However, these data should be treated with caution in view of this study being conducted in the greenhouse conditions. Different results may be obtained when these materials are used in the field where the application method, soil types and temperatures are different. However, the results of this study are encouraging, especially in light of the fact that Vydate is a very mobile nematicide in sandy soils, and thus it is capable of affecting *P. minor* that typically survives deep in the soil. In recent years, Vapam has been employed as the soil fumigant in onion producing systems in Georgia. However, recent outbreaks of stubby-root nematodes in the region suggest that this material is not effective against *P. minor* and other fumigant chemicals should be investigated for their potential in reducing soil populations of stubby-root nematodes below the damage threshold.

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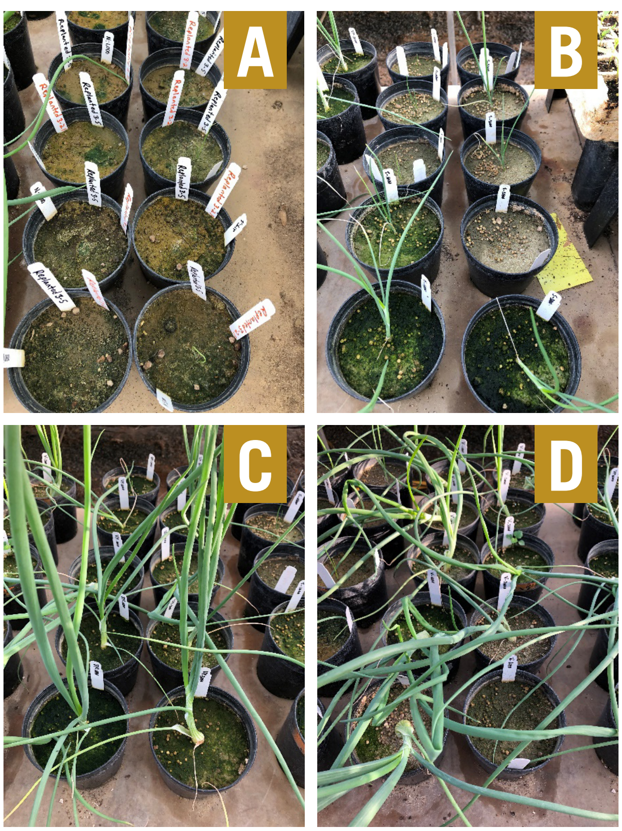

Figure 1. Onion plants treated with Nimitz (A), Salibro (B), Velum Prime (C) and Vydate (D) 25 days after seeding. The seed germination was negatively affected by application of Nimitz and Salibro.

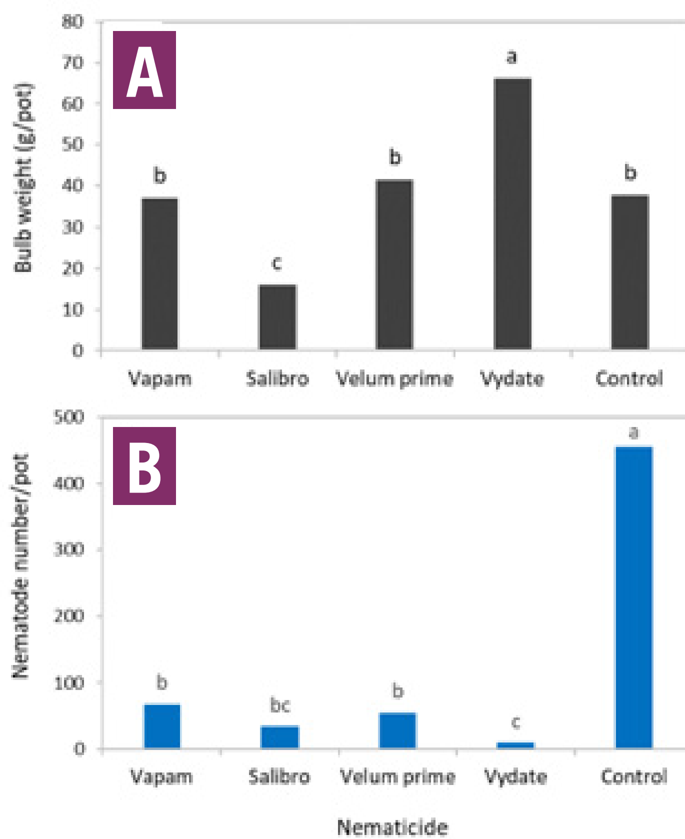

Figure 2. Onion yields (A) and stubby-root nematode populations (B) in pots treated with different nematicides. Bars (treatment means) accompanied with the same letter do not differ significantly P <0.05)

Evaluation of bactericides and plant defense inducers to manage center rot of onion in Georgia, 2020

B. Dutta, M.J. Foster, and W.M. Donahoo

Material and methods

Four rows of 'Century' onion were transplanted into 6 ft beds (panels) on December 8, 2019 at the University of Georgia, Tifton, GA. The fertility and insecticide programs were consistent with the University of Georgia Extension Service recommendations. Experimental design consisted of a randomized complete block with four replications. Treated plots were 20 ft long and were separated on each side by non-treated border panels. Plots were separated by a 3 ft bare-ground buffer within the row. Treatments were applied with a backpack sprayer calibrated to deliver 40 gal/acre at 75 to 80 psi through TX-18 hollow cone nozzles. Treatment applications were made on March 20, March 27, April 3, April 10, April 17, and April 24. Plots were irrigated once a week using overhead irrigation. Natural inoculum was relied upon. Disease severity was assessed on March 25, April 9 and April 28 as percent leaf area with symptoms per plot. Onion from the center of each plot with dimension 6 ft × 3 ft were hand-harvested on April 30, field cured (2 days) and then stored at 4 °C for 30 days. On June 2, onions from each plot were individually cut using a sterile knife and rate for the presence of center rot symptoms. Data for foliar disease severity, area under disease progress curve (AUDPC) and percent center rot incidence in bulb were analyzed and means compared using the Fisher's protected LSD test at $P \leq 0.05$.

Results and discussion

The mean rainfall received during December 2019 and April 2020 was 6.5 inches and 3.5 inches, respectively. The average high and low temperatures for the month of December 2019. were 58 °F and 42 °F, respectively and for the month of April (2020) were 81 °F and 58 °F, respectively.

Foliar symptoms of center rot were first appeared on March 25 with significantly higher disease severity for the non-treated check (44.9%) than for the Mankocide-treated plots. Disease progressed over a four-week period and reached 87.5% (disease severity) on April 28, in non-treated check plots, which was significantly higher than the bactericide-treated plots expect for Oxidate. Interestingly, during the same period, center rot severity for plant defense inducers (Leap and Actigard) were not significantly different from the non-treated check. AUDPC also followed the similar trend. Center rot bulb incidence was significantly lower for the treatments; Mankocide, Kocide 3000, Champ, Agrititan, Nordox, Mastercop, and NuCop compared with Oxidate, Leap, Actigard and non-treated check. Phytotoxicity was observed with Oxidate but not with other treatments.

Treatment and rate of product per acre	Application No.[z]	Initial disease severity (%) on 25 Mar	Final disease severity (%) on 28 Apr[y]	AUDPC[x]	Center rot incidence in bulb (%)[w]
Mankocide 2.5 lb	1-6	10.7 bx	43.8 c	358.8 c	9.1 cv
Kocide 3000 1.5 lb	1-6	28.9 ab	50.0 bc	540.7 bc	29.8 bc
Champ 1.5 lb	1-6	15.1 ab	51.3 b	464.8 bc	18.0 c
Oxidate 5.0 32 fl oz per100 gal	1-6	40.0 a	71.3 a	791.2 ab	55.2 a
Agrititan 800 ppm	1-6	29.4 ab	58.8 b	602.8 bc	19.5 c
LifeGuard 2 fl oz	1-6	22.7 ab	48.8 bc	469.2 bc	26.8 bc
Nordox 1 lb	1-6	18.0 ab	53.8 b	502.4 bc	17.2 c
Mastercop 1 pt	1-6	23.7 ab	48.9 bc	489.6 bc	12.2 c
Leap 1 qt	1-6	32.4 ab	70.0 a	703.8 ab	52.5 ab
Actigard 0.5 fl oz	1-6	34.9 ab	70.0 a	699.5 ab	57.5 ab
NUCop 1.5 lb	1-6	15.2 ab	55.0 b	485.4 bc	18.8 c
Non-treated check	-	44.9 a	87.5 a	1012.2 a	74.8 a

[z]Application dates were 1=20 Mar; 2=27 Mar; 3=3 Apr; 4=10 Apr; 5=17 Apr and 6=24 April
[y]Foliar disease severity was rated on a 0 to 100 scale (0 = no infection and 100 = 100% of leaf area infection) on 25 Mar, 9 Apr and 28 April
[x]AUDPC was calculated from ratings taken on 25 Mar, 9 Apr and 28 April
[w]Mean center rot bulb incidence was calculated as number of bulbs with center rot/total number of bulbs evaluated × 100.
[v]Means followed by the same letter in each column are not significantly different according to Fischer's LSD at P<0.05

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