ONION (*Allium cepa*)
Center rot; *Pantoea ananatis*
Sour skin; *Burkholderia cepacia*

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Effects of irrigation method, nitrogen rate, and fertilizer application timing on bacterial diseases in Vidalia onion, Georgia 2020.

The experiment was conducted at the University of Georgia - Vidalia Onion and Vegetable Research Center in Lyons, GA. Vidalia onion (cv. Candy Joy) was planted on 12 Oct, 2019 in nursery beds and transplanted to field-beds on 15 Dec, 2020. 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 comprised of 4 rows of onion with an in-row spacing of 4 in. Experimental plots were 30-ft long with 5 ft skip between plots within each bed. The experiment was carried out in a split-split-plot arrangement with two irrigation methods, three nitrogen (N) fertilizer rates and three different timing for last N fertilizer application, evaluated in a randomized complete block design with four replications. The first three N fertilizer applications were performed at transplanting, 23, and 47 days after transplanting (DAT), while the last N application was made either at 64, 74, or 84 DAT. Fertilizer was applied at the total rates of 75, 105 and 135 lb N/ac. Each application timing received 20% of the season total N applied, except for the last application, in which the remaining 40% of the season total N was applied either 2-weeks before (64 DAT) or at bulb-swelling (74 DAT) or 2-weeks after bulb swelling (84 DAT). Irrigation was performed according to the onion crop evapotranspiration using overhead and drip irrigation systems. During the entire season, crop management practices associated with the soil preparation, transplanting, and the management of pests, weeds and disease followed the University of Georgia Extension recommendations. Vidalia onions were harvested on 22 Apr, 2020 (128 DAT), cured for 20 days and graded according to the Georgia Department of Agriculture in: Colossal (> $3\frac{3}{4}$ in), Jumbo ($3\frac{3}{4}$ to $3\frac{1}{4}$ in.) and Medium (2 to $3\frac{1}{4}$ in.). Additionally, onion bulbs (n = 20 per plot) from replicated plots (four replicates) were bagged and stored at 39°F for 35 days. After period of storage at 33°F and 75-80% RH, onion bulbs were individually cut using a sterile knife for determining the center rot and sour skin incidence. Data for total yield, bulb size distribution, center rot, and sour skin incidences were analyzed using the JMP software. Statistical analyses were performed to compare irrigation, N rate, and timing for last N fertilizer application treatments using the Tukey`s test at $p \leq 0.05$.

Sour skin incidence was not significantly different among treatments. In contrast, center rot incidence was significantly different for irrigation method and timing of last N fertilizer application. There were no significant differences observed for the main factor (N rates) on center rot. Incidence of center rot was higher in onions under overhead irrigation (6.5%) than in onions under drip irrigation (3.6%). Among the last N fertilizer application treatments, the lowest incidence of center rot was observed when N was applied 2-weeks before bulb swelling (2.3%), while the highest incidences were observed when N was applied either at bulb swelling (6.25%) or 2-weeks after bulb swelling (6.6%). For yield parameters, Vidalia onions were mostly affected by N rates, but no significant differences were observed for the main effect of irrigation method. In addition, there were no significant differences for the main effect of last fertilizer application timing, except for the yield of medium-grade onions, where a reduction in yield was measured when N fertilizer was applied 2-week prior to bulb swelling. With respect to the main effect of N rate, the highest total yield was measured for the N rate of 135 lb/ac, followed by the N rate of 105 lb/ac. The lowest total yield was measured for the application of 75 lb of N/ac. Similar results were observed for the yield of jumbo-grade onions since they represent the majority of total yield (84.1% in average). For colossal-grade onions, the highest yield was observed for the N rate of 135 lb of N/ac, but no significant difference was observed between N- rates at 75 and 105 lb/ac.

Table 1. Effect of Irrigation, N rate and last N application timing on bulb yield and post-harvest incidence of bacterial diseases in bulb.

Treatments	Total yield	Colossal	Jumbo	Medium	Center rot [y]	Sour skin[z]
	Yield (40 lb bags/ac)				Incidence (%)	
Irrigation						
Overhead	1143 a	63 a	961 a	119 a	6.53 a[x]	0.97 a
Drip	1098 a	39 a	926 a	133 a	3.62 b	2.08 a
N rate (lb/ac)						
75	972 c*	20 b	797 c	154 a	5.42 a	1.45 a
105	1117 b	35 b	953 b	128 a	4.58 a	1.25 a
135	1274 a	98 a	1080 a	95 b	5.20 a	1.87 a
Last N appl. timing						
Before bulb swelling	1153 a	57 a	990 a	104 b	2.30 b	0.62 a
At bulb swelling	1104 a	52 a	917 a	133 a	6.25 a	1.66 a
After bulb swelling	1106 a	43 a	922 a	140 a	6.67 a	2.29 a

[z]Mean sour skin bulb incidence was calculated as number of bulbs with sour skin/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]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