Planting method and date of transplanting impact on Vidalia onion production

Andre Luiz Biscaia Ribeiro da Silva, Joara Secchi Candian, Christopher Tyson, Aubrey Shirley

Introduction

Annually, almost 14,000 acres of Vidalia onion are produced in Georgia. Seeds are planted in nursery beds in September, hand-transplanted to fields in November/December, and harvested in April/May. Transplanting and harvestings, due to the high labor demanding, are very cost in the onion production industry in Georgia. Alternative methods of transplanting are available for growers, however, such methods have never been used or introduced to Georgia growers. Particularly, the performance of a mechanical planting method, such as the onion bulb planter, require investigation under the onion production conditions of Georgia (e.g., weather conditions, soil type, and others). Thus, the objectives of this study are 1) to evaluate the performance of 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 2018/2019 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 two 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 11 November, 2018, and 19 December, 2018. 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 17th and were manual transplanted to experimental plots. 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.

Table 1. List of treatments.

Planting Method	Planting date
Bulb set	11/21/18 (Early)
Bulb set	12/12/18 (Late)
Transplanting	11/21/18 (Early)
Transplanting	12/12/18 (Late)

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 4 fertilize application: 1) 400 lbs/ac of 5-10-15 at planting, 2) 300 lbs/ac of 5-10-15 at 34 days after planting (DAP), 3) 200 lbs/ac of 5-10-15 at 58 DAP, and 4) 320 lbs/ac of 15.5-0-0 at 92 DAP.

Vidalia onions were harvested 127 DAP for both planting dates. Harvested bulbs were field cured, weighed and graded according to the Georgia Department of Agriculture in colossal (>$3^{3/4}$ inches), jumbo ($3^{3/4}$ to $3^{1/4}$ inches), medium (2 to $3^{1/4}$ inches), culls (< 2 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 was no significant differences for the interaction or main effects of planting method and planting date for Vidalia onion total yield (table 2), indicating that mechanical planting for onion production had similar total yield to hand-transplanting. Hand transplanted areas had higher yield of Jumbo onions, but lower yield of Medium onions than the mechanical planted areas. Planting method had no significant difference for cull onions, but the later planting date increased the cull onions compared to the early planting date.

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

Treatment	Total yield	Jumbo		Medium		Culls	
		40 lb. bags / acre					
Planting date							
Early	1170	901		115		87	b
Late	1327	917		86		216	a
p value	ns	ns		ns		***	
Planting method							
Bulb set	1168	821	b†	124	a	174	
Transplanting	1351	1011	a	71	b	135	
p value	ns	*		*		ns	

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.

Table 3. Effect of the interaction planting date and planting method on the yield of Vidalia onion size Colossal.

Planting method	Planting date			
	40 lb. bags / acre			
	Early		Late	
Bulb set	70	a† A‡	25	a B
Transplanting	61	b A	188	a A

† Values followed by similar high case letters within a planting date indicate no significant difference ($p < 0.05$) among planting method according to Holm-Tukey adjust.

‡ Values followed by similar lower case letters within a planting method indicate no significant difference ($p < 0.05$) among planting date according to Holm-Tukey adjust.

Particularly, Vidalia onions size Colossal presented an interaction between planting method and planting date, in which the mechanical planted areas had higher yield of Colossal onions for the early planting date, while the later planting date increased the yield of Colossal onions for the hand transplanting areas.

Conclusion

The alternative mechanical planting using bulb sets showed potential to maintain onion yield compared to the conventional hand-transplanting method. However, the mechanical planting method should be used by growers seeking for a Medium onion size market, since this method of planting had higher Medium onion yield but lower Jumbo onion yield compared to conventional hand transplanting method. Overall, planting method had no impact on yield of cull onions, but a delay in planting date will increase the yield cull onions.