

ONION PRODUCTION FROM FIELD-GROWN TRANSPLANTS

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Introduction

Our earlier research showed that onions can be harvested in July when grown from transplants started in the winter (Shock et al. 2004). Transplants must be grown locally due to the marketing order onion white rot quarantine that prohibits importation of onion transplants. Onion transplant production in the Treasure Valley of eastern Oregon and western Idaho is expensive due to the need for heated greenhouse production during the winter.

In order to make early onion production from transplants cost effective, we hypothesized that transplants might be produced by growing transplants outdoors in late summer at a high density and transplant them either in the fall or in March. The problem with this alternative is that no one had ever done this, so we had no idea whether or not it could work.

Materials and Methods

The transplants were grown from seed in a field of Greenleaf silt loam during the fall and winter of 2004-2005. Onion seed of 7 overwintering varieties was planted in plots 4 double rows wide and 27 ft long on August 30, 2004. Seed was planted in double rows spaced 3 inches apart at 21 seeds/ft of single row. Each double row was planted on beds spaced 22 inches apart with a customized planter using John Deere Flexi Planter units equipped with disk openers. Roundup® at 1 lb ai/acre was applied in 32 gal/acre of water on September 8. Emergence started on September 10. Repeated insecticide applications were needed to control thrips. On September 11, the onions were sprayed with Malathion at 1 lb ai/acre. On September 17, the onions were sprayed with Malathion at 2 lb ai/acre. On September 23 and October 4 the onions were sprayed with Warrior® at 0.03 lb ai/acre. On October 4, Buctril® at 0.12 lb ai/acre and Poast® at 0.28 lb ai/acre were applied to control weeds. Due to unusually wet weather during the fall of 2004, fall transplanting was not possible.

On March 9 and 10 the seedlings were transplanted to a field of Nyssa-Malheur silt loam. The seedlings were manually dug up and planted in double rows on 22-inch beds. The spacing between plants in each single row was 6 inches, equivalent to 95,000 plants per acre. Plots of each variety were 20 ft long by 4 double rows wide arranged in a randomized complete block design with five replicates. The field was drip irrigated on March 10 using drip tapes buried at 4-inch depth between the double onion

rows. Thereafter the trial was irrigated when the soil water tension at 8-inch depth reached 20 cb. Soil water tension was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrrometer Co., Riverside, CA) installed below the onion row at 8-inch depth.

Weeds were controlled with an application of Prowl® at 1 lb ai/acre on April 8, and Goal® at 0.2 lb ai/acre, Buctril at 0.3 lb ai/acre, and Poast at 0.38 lb ai/acre on April 22. A root tissue sample taken on June 9 showed the need for nitrogen (N) and phosphorus (P). The field had 50 lb N/acre applied on April 28 as N-phuric injected through the drip system. On June 14, 20 lb N/acre as N-phuric and P at 10 lb/acre as phosphoric acid were injected through the drip system. After lay-by the field was hand weeded as necessary.

On July 7 and again on July 26, 9.5 ft of the middle two rows in each plot were topped and bagged. Decomposed bulbs were not bagged. The onions from the first and second harvests were graded on July 8 and July 27, respectively. Bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), bulbs infected with neck rot (*Botrytis allii*) in the neck or side, plate rot (*Fusarium oxysporum*), or black mold (*Aspergillus niger*). The No. 1 bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Bulb counts per 50 lb of supercolossal onions were determined for each plot of every variety by weighing and counting all super colossal bulbs during grading.

Ten randomly chosen bulbs from every plot of the three highest yielding varieties from the July 7 and July 26 harvests were shipped on July 29 via UPS ground to Vidalia Labs International in Collins, Georgia. The bulb samples were analyzed for pyruvic acid content on August 5. Bulb pyruvic acid content is a measure of pungency with the unit being micro mols pyruvic acid per gram of fresh weight (µmols/g FW). Onion bulbs having a pyruvate concentration of 5.5 micro mols or less are considered sweet according to Vidalia Labs sweet onion certification specifications.

On August 2 onion bulbs from the July 26 harvest were rated for single centers. The onions from each plot were cut equatorially through the bulb middle and, if multiple centered, the long axis of the inside diameter of the first single ring was measured. These multiple-centered onions were ranked according to the diameter of the first single ring: "small double" had diameters less than 1½ inch, "intermediate double" had diameters from 1½ to 2¼ inches, and "blowout" had diameters over 2¼ inches. Single-centered onions were classed as a "bullet". Onions were considered "functionally single centered" for processing if they were a "bullet" or "small double".

Varietal differences were compared using ANOVA and protected least significant differences at the 5 percent probability level, LSD (0.05).

Results and Discussion

Onions for transplants grew very well in 2004. It was our intention to transplant onions in October of 2004 as well as March of 2005, but rainy weather in October of 2004 did not allow field operations or fall transplanting.

July 7 harvest

Varieties 'Megane' and 'Stansa' were among the varieties with the highest total and marketable yield from the July 7 harvest (Table 1). Megane had the highest colossal onion yield. Megane and Stansa had pyruvate concentration low enough (5.5 or less) to be considered "sweet" according to Vidalia Labs sweet onion certification specifications (Table 2). 'McBee' had the highest percentage of "bullet" single-centered bulbs. McBee and 'Hi Keeper' had among the highest percentage of functionally single-centered bulbs. Hi Keeper, 'Toughball', 'Olympic', and McBee had maturity ratings above 60 percent on July 5 and were terminated at the July 7 harvest.

July 26 harvest

The July 26 harvest included Megane, Stansa, and 'XON-430Y'. Megane and Stansa had the highest total and marketable yield (Table 1). Megane and Stansa also had the highest jumbo onion yield. Only Megane and Stansa had pyruvate concentration low enough (5.5 or less) to be considered "sweet".

References

Shock, C.C., E.B.G. Feibert, and L.D. Saunders. 2004. Onion production from transplants in the Treasure Valley. Oregon State University Agricultural Experiment Station Special Report 1055:47-52.

Table 1. Performance data for experimental and commercial onion varieties produced from field-grown transplants and harvested on July 7, and July 26, 2005, Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Total yield	Marketable yield by grade				Non-marketable yield		Maturity	Bolters
			Total	4-4¼ in	3-4 in	2¼-3 in	No. 2s	Small	July 5	
			----- cwt/acre -----				-- cwt/acre --		%	#/plot
July 7										
A. Takii	Hi Keeper	202.7	131.6	0	13.3	118.3	0	71.2	74	0
	Toughball	176.8	102.2	0	7.1	95.1	0	74.6	78	0
Bejo	Megane	526.8	510.6	13.1	416.3	81.2	9.2	7	19	1.6
	Olympic	250.8	198.1	0	38	160.1	0	52.7	63	0
	Stansa	470.2	442.7	3.1	318.8	120.7	11.3	16.2	41	1
Sakata	XON-430Y	406.6	359	0	247	112	28.8	18.7	14	8.6
Scottseed	McBee	79.8	20.8	0	2.2	18.6	0	59	93	0
LSD (0.05)		67.2	72	7.2	74	36.2	11.5	13.9	5.3	2.5
July 26										
Bejo	Megane	609.4	573.1	11.9	513.8	47.5	28.9	7.3		
	Stansa	590.1	571	2.5	505	63.5	16.2	2.9		
Sakata	XON-430Y	464.2	352.6	52.3	244.4	55.9	102	9.7		
LSD (0.05)		92.4	71.2	NS	128.7	NS	NS	NS		

Table 2. Pyruvate concentrations and multiple center rating for selected onion varieties produced from field-grown transplants, Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Pyruvate concentration		"Blowout"	"Intermediate double"	"Small double"	"Bullet"	Functionally single centered "small double + bullet"
		July 7	July 26					
		µmols/g FW		----- % -----				
A. Takii	Hi Keeper	na*	na	0.8	24.8	70.4	4	74.4
	Toughball	na	na	5.6	37.2	54.1	3.2	57.2
Bejo	Megane	5.3	4.68	56	42.4	1.6	0	1.6
	Olympic	na	na	1.6	29.6	65.6	3.2	68.8
	Stansa	5.32	5.06	55.2	35.2	9.6	0	9.6
Sakata	XON-430Y	5.62	5.66	61.6	32	6.4	0	6.4
Scottseed	McBee	na	na	3.2	2.4	20.8	73.6	94.4
LSD (0.05)		0.31	0.7	10.8	20.5	23.5	64.9	24.2

*na, not available.