

THE EFFECTS OF MINITUBER SIZE AND  
HARVEST DATE ON GERMINATION, TUBER SET,  
AND YIELD OF RUSSET BURBANK POTATOES

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ABSTRACT

An experiment was established in 1985 at Powell Butte to evaluate production from Russet Burbank minitubers versus cut seed. Three size categories of minitubers harvested in October, November, and March and two sources of cut seed were evaluated in the trial. Plants grown from minitubers sized less than 7 grams had poorer emergence, fewer stems per plant, fewer tubers per plant and less total yield than plants produced from larger minitubers or cut seed. Minitubers sized 7-21 grams and 21-42 grams were comparable in plant characteristics and yield to cut seed.

Minitubers harvested in March and planted in May did not emerge until late in the growing season; less than 50% emergence was achieved. March-harvested minitubers produced only 5 cwt/acre total yield; other minituber sizes and cut seed produced more than 300 cwt/acre total yield. Treating March-harvested minitubers with bromoethane did not shorten dormancy requirements.

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Meristem culture, nodal cuttings, and transplant and minituber production are rapidly becoming standard procedures in western seed potato programs. These relatively new techniques provide mechanisms for disease elimination and control and rapid clonal increases that were formerly impossible with traditional cut seed/stem cutting programs.

Minitubers are generally produced in greenhouse flats from seedlings cultured from in vitro mother plants and range in size from a few grams to more than 100 grams. Several crops of minitubers can be grown each year in a disease-free environment, and after a suitable storage period, they can be shipped to seed growers. Minitubers present an advantage over transplants in several respects; (1) they can easily be shipped over large distances; (2) growers can easily utilize them with a minimum of specialized equipment, and (3) they can recover from frost damage.

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This study was undertaken to evaluate minituber size and the storage interval required for successful production of Russet Burbank potatoes.

### METHODS

A randomized, complete block experiment was established at Powell Butte in 1985 to evaluate minituber size and harvest date on the production of Russet Burbank potatoes. The trial area was pre-treated with 5.5 pints per acre of Eptam 7-E on May 15, 1985. One thousand pounds per acre of 16-16-16-7 (NPKS) was banded at planting on May 16, 1985.

Planted seed was either Russet Burbank minitubers or cut seed. The minitubers were produced in greenhouses by Plant Genetics, Inc., Davis, California (PGI). The cut seed originated from six to eight-ounce tubers produced in PGI greenhouses or a commercial seed grower in Powell Butte, Oregon. Twenty-five minitubers/seedpieces were spaced nine inches apart in each plot. Plots were single rows, 20 feet long, and separated by two hills of "All Blue" potatoes. Rows were spaced 36 inches apart. Ten treatments were randomized in four replicates; treatments are shown in Table 1. Half of the minitubers harvested in March were treated with bromoethane, a compound used to break the dormancy requirement of some potato varieties.

Table 1. Experimental treatments

SEED TYPE	SEED SOURCE	SEED SIZE gr	SEED HARVEST DATE	SEED TREATMENT
Minituber	PGI	21-42	October	None
Minituber	PGI	7-21	October	None
Minituber	PGI	< 7	October	None
Minituber	PGI	21-42	November	None
Minituber	PGI	7-21	November	None
Minituber	PGI	< 7	November	None
Minituber	PGI	7-21	March	Bromoethane
Minituber	PGI	7-21	March	None
Cut Seed	PGI	57	October	Captan
Cut Seed	Grower	57	October	Captan

The trial area was treated with 0.25 lbs AI/acre of metribuzin on June 20, 1985, when plants were two to four inches in height. The trial was sprinkler irrigated as needed throughout the growing season. The vines were dessicated with a mixture of two quarts per acre of dinitro and 15 gallons per acre of diesel on September 22, 1985. The plots were harvested on October 16, 1985, and graded one week later. Emergence data was recorded on July 9, 1985 and again before

harvest. Also, before harvest, the number of stems per plant was recorded.

## RESULTS

Plant emergence data are shown in Table 2. Minitubers sized less than 7 grams harvested in October and November resulted in 60 to 70% stands, which were significantly less than the stands obtained from 21 to 42-gram and 7 to 21-gram minitubers. Minitubers harvested in March and planted in May did not germinate until later in the growing season. In stand counts taken September 27, less than 50% of the March harvested minitubers germinated. Treatment with bromoethane did not significantly increase stand counts.

Minituber size had a marked effect on tuber size and set characteristics (Table 3). Plants grown from less than 7-gram sized minitubers had fewer stems, but more tubers per stem and also larger tubers than 7 to 21-gram or 21 to 42-gram minitubers. The production of larger tubers on plants grown from minitubers sized less than 7 grams is a result of decreased competition from other plants. March harvested minitubers produced few tubers of very small size. There were no statistically significant ( $P=0.05$ ) differences among the cut

Table 2. Emergence data for plants produced from Russet Burbank minitubers or cut seed

SEED TYPE	SEED SIZE gr	SEED HARVEST DATE	EMERGENCE		JULY 9 REMARKS
			JULY 9 %	SEPT 27 %	
Minituber-PGI	21-42	October	98	98	Good
Minituber-PGI	7-21	October	91	91	1/3 weak
Minituber-PGI	< 7	October	70	70	Spotty-Poor
Minituber-PGI	21-42	November	99	99	Good
Minituber-PGI	7-21	November	95	95	1/2 weak
Minituber-PGI	< 7	November	60	60	All weak
Minituber-PGI	< 7 + BE	March	0	49	Nothing
Minituber-PGI	< 7	March	0	40	Nothing
Cut Seed-PGI	57	October	100	100	Excellent
Cut Seed-Local	57	October	99	99	1/3 weak
LSD 5%	--	--	9	15	--

seed treatments and 21-42 gram or 7-21 gram minitubers for either tuber size or the number of tubers per stem. Minituber size had a significant effect on the number of stems per plant; smaller minitubers produced plants with fewer stems.

Yields are shown in Table 4. Minitubers sized less than 7-grams yielded significantly less than all other treatments and those harvested in March produced 5 cwt/acre whether or not they were treated with bromoethane. The data suggests March harvested Russet Burbank minitubers should not be planted in May or June. Yields of 7 to 21-gram or 21 to 42-gram sized minitubers were not significantly different from yields obtained from local cut seed. Cut seed provided by Plant Genetics, Inc. was superior in yield performance as compared with locally produced cut seed.

Table 3. Tuber set and size characteristics for Russet Burbank minituber and cut seed production

SEED TYPE	SEED SIZE gr	SEED HARVEST DATE	SEED	TUBERS	TUBERS	TUBER
			STEMS PLANT	STEM	PLANT	SIZE
			no.	no.	no.	oz.
Minituber-PGI	21-42	October	4.5	2.2	9.9	4.4
Minituber-PGI	7-21	October	3.6	2.6	8.8	4.8
Minituber-PGI	< 7	October	2.3	3.0	6.9	6.1
Minituber-PGI	21-42	November	3.9	2.4	9.2	4.5
Minituber-PGI	7-21	November	3.2	2.7	8.3	4.9
Minituber-PGI	< 7	November	2.2	3.4	7.0	7.0
Minituber-PGI	< 7 + BE	March	1.0	0.2	0.2	1.9
Minituber-PGI	< 7	March	1.1	0.7	0.7	1.0
Cut Seed-PGI	57	October	4.5	2.2	9.9	4.7
Cut Seed-Local	57	October	3.9	2.0	7.7	5.2
LSD 5%	--	--	0.7	0.8	1.1	1.8

### SUMMARY

Percent emergence, number of stems per plant, number of tubers per plant, and total yield of plants produced from minitubers less than 7-grams were significantly less than that of larger minitubers or cut seed. Minitubers sized 7 to 21-grams and 21 to 42-grams were comparable in plant characteristics and yield to cut seed.

Minitubers harvested in March and planted in May did not emerge until late in the growing season; less than 50% emergence was achieved. March-harvested minitubers produced only 5 cwt/acre total yield. Treating March-harvested minitubers with bromoethane did not shorten dormancy requirements.

Table 4. Yields of Russet Burbank potatoes produced from various minituber sizes and harvest dates compared with traditional cut seed

SEED TYPE	SEED SIZE gr	SEED HARVEST DATE	YIELD							
			NO. ONES				NO.		CULLS	TOTAL
			< 4 OZ.	4-6 OZ.	6-10 OZ.	10+ OZ.	TWOS	cwt/A		
cwt/A	cwt/A	cwt/A	cwt/A	cwt/A	cwt/A	cwt/A				
Minituber-PGI	21-42	October	177	106	96	21	37	41	478	
Minituber-PGI	7-21	October	129	82	90	43	30	54	427	
Minituber-PGI	< 7	October	50	58	92	53	33	50	337	
Minituber-PGI	21-42	November	147	106	100	19	38	53	462	
Minituber-PGI	7-21	November	124	111	94	25	30	49	433	
Minituber-PGI	< 7	November	51	33	63	57	41	76	322	
Minituber-PGI	< 7 + BE	March	0	0	0	2	2	1	5	
Minituber-PGI	< 7	March	5	0	0	0	0	0	5	
Cut Seed-PGI	57	October	162	113	110	31	63	40	519	
Cut Seed-Local	57	October	106	99	106	38	33	68	449	
LSD 5%	--	--	32	25	43	21	19	32	62	