

Managing Planting Density for Production of Whole Seed Potatoes

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Background

Whole seed potatoes may offer advantages to planting cut tubers. It is suggested that whole seed has higher vigor, produces increased stem counts, produces an increased tuber set, and a uniform tuber size due to the heavier set (Nolte, 2011). Eliminating seed cutting and planting whole seed potatoes may also be an effective cultural control method of reducing the tuber to tuber spread of bacterial soft rot organisms *Pectobacterium* and *Dickeya* (Charkowski, 2016).

Planting whole seed potatoes can also reduce the wounding of seed tubers associated with cutting and handling. Less handling may decrease the incidence of infection by decay organisms due to the reduction of seed piece bruising (Johnson, 2015). Eliminating seed cutting and reducing handling may also result in labor and capital cost savings to growers.

Objective

The objective of this project was to determine the volume of 2 to 2.5 ounce whole seed potatoes that could be produced in traditional 36 inch rows by decreasing in row seed spacing and planting whole seed potatoes. This trial compared 5, 6, and 8 inch in row seed spacing and cut versus whole seed.

Materials and Methods

This project was hosted by commercial seed potato operations in New Limerick and Presque Isle, Maine. Experimental design was randomized complete block with 6 treatments replicated 4 times in New Limerick and 3 times in Presque Isle. Individual treatments measured 12 feet (4 rows) wide by 20 feet long (240 square feet) in New Limerick and 12 feet (4 rows) wide by 15 feet (180 square feet) in Presque Isle. Weight of seed pieces were determined by averaging 18 representative samples of cut and whole seed potatoes from growers stock. Whole seed planted at the New Limerick site weighed 2.28 ounces and cut seed weighed 2.3 ounces. Whole seed planted at the Presque Isle site weighed 2.3 ounces and cut seed weighed 2.32 ounces. Treatments and seeding rate per acre are described in Table 1.

Table 1: Description of Treatments and Seeding Rates

Location	Treatment	Seeding Rate (cwt/a)	Location	Treatment	Seeding Rate (cwt/a)
NL	8 inch whole	31	PI	8 inch whole	31.3
	8 inch cut	31.3		8 inch cut	31.6
	6 inch whole	41.4		6 inch whole	41.7
	6 inch cut	41.7		6 inch cut	42.1
	5 inch whole	49.7		5 inch whole	50.1
	5 inch cut	50.1		5 inch cut	50.5

The variety grown in New Limerick was a round white chipping potato and the variety grown in Presque Isle was Dark Red Norland. The experimental plots were managed using standard grower practices for seed treatment, in furrow fertilizer, broadcast fertilizer, and herbicide (Table 2).

Table 2: Management Practices

Location	Plant Date	Seed Trmt	Fertilizer (at planting)	Fertilizer (broadcast)	Herbicide
NL	24-May	cm, mz, mx	185-145-220	60 K ₂ O	1.5 pt LX + 1 oz MT
PI	1-Jun	mx2, ad	110-165-165	120 K ₂ O	.5 lb Sencor

cm=cruiser maxx, mz=manzate, mx=maxim 4F, mx2=maxim mz, lx=linex, mt=matrix, ad=admire

Experiments were planted on May 24 and June 01 in New Limerick and Presque Isle respectively. Rows were formed and fertilizer was applied in furrow by commercial 4 row potato planters. Seed pieces were hand planted at a depth of 2.5 inches and covered with soil. Soil temperature and condition in New Limerick were 50°F and dry, while the Presque Isle site had higher soil moisture and 45°F soil temperatures. Soil test results and lime applications were obtained from grower files (Table 3). Soil type in New Limerick was Winooski and the Presque Isle site was Caribou gravelly loam.

Table 3: Soil Analysis

Location	Soil Type	pH	OM %	P	K	Ca	Mg	Lime
NL	Winooski	5.3	3.2	319 ppm	98 ppm	497 ppm	38 ppm	1 ton hi-mag
PI	Caribou gravelly loam	6.1	3.2	305 ppm	354 lbs/a	1857 lbs/a	228 lbs/a	not known

The experiments were monitored frequently throughout the season. Emergence data was collected on June 17 in New Limerick and on June 24 in Presque Isle. Stem counts were collected in New Limerick on July 8 and on July 6 in Presque Isle. Vine desiccation occurred on August 26 at the New Limerick site and on August 20 in Presque Isle. Plots were harvested on September 7 in New Limerick and on September 8 in Presque Isle. Data was collected from two 10 foot strips from the center 2 rows of each treatment. All tubers from the data collection strips were hand harvested and sized using a mechanical grading table. Sizing cards were then used to grade the tubers into the following profiles: undersize (0 – 1.5 inches), “B” size (1.5 – 2.25 inches), total seed size (1.5 – 3.25 inches), and oversize (greater than 3.25 inches).

Results

The 2016 growing season in both New Limerick and Presque Isle was warmer than the 30 year historical average. Rainfall was slightly below average at the New Limerick site and greater than 3 inches above average in Presque Isle. Historical data was taken from NOAA data from 1981-2010. 2016 Presque Isle data was taken from the National Weather Service in Caribou, Maine and data from the New Limerick site was obtained from a Spectrum Technologies WatchDog™ 2000 Series portable weather station located at the field site (Table 4).

Table 4. 2016 versus 30 year historic (1981-2010) weather data

New Limerick, ME	May	June	July	August	Sept
Average Temperature (°F)	57.1	61.5	67.6	66.3	57.4
Departure from Normal	6	1.3	2.5	2.5	2.3
Rainfall (In)	1.98	2.15	3	6.74	0.99
Departure from Normal	-1.32	-0.15	0.66	3.06	-2.41

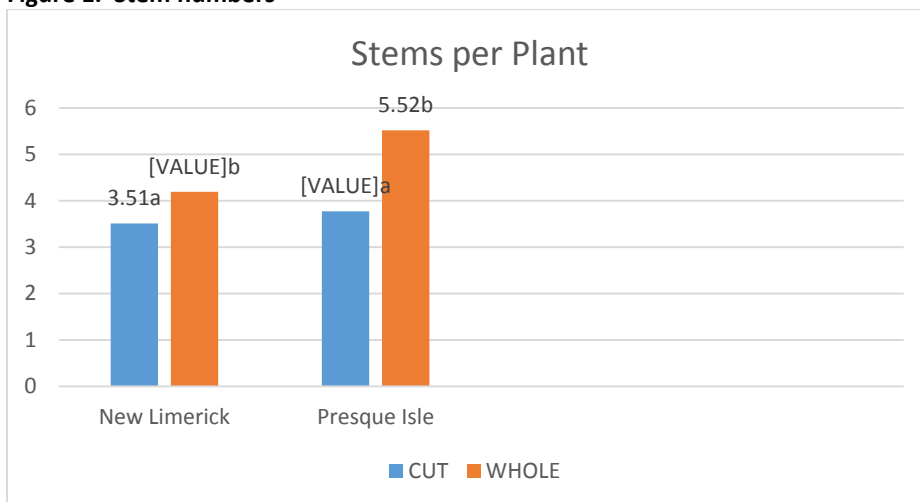
Presque Isle, ME	May	June	July	August	Sept
Average Temperature (°F)	53.9	61.4	66.8	66.6	58.6
Departure from Normal	2.4	0.7	1.2	3	3.6
Rainfall (In)	2.96	3.65	5.64	5.89	2.48
Departure from Normal	-0.37	1.17	1.56	2.13	-0.84

Data was analyzed using Systat software and ANOVA (analysis of variance) methodology. Percent emergence, stem number, and yields of undersized tubers, seed sized tubers, and oversized tubers were measured and analyzed.

Emergence data was collected from the New Limerick site on June 17. Percent emergence of whole seed treatments was 96 percent which was significantly greater than 83 percent emergence of cut seed treatments. Cut and whole seed at 6 inch spacing had significantly higher percent emergence than 5 and 8 inch cut and whole seed treatments. There was no difference in the percent emergence between 5 and 8 inch treatments. Emergence data was collected from Presque Isle on June 24. There was no difference between any of spacing treatments or cut versus whole treatments.

Stem counts were taken on July 8 in New Limerick and July 6 in Presque Isle. At both sites, the stem numbers per plant were significantly greater in the whole seed treatments. In New Limerick, whole seed averaged 4.16 stems per plant compared to 3.51 stems per plant in the cut seed treatments. Presque Isle averaged 5.52 stems per plant in the whole seed treatments and cut seed averaging 3.77 stems per plant (Figure 1). Stem number per plant was not significantly different between cut and whole seed pieces. There was no measurable difference in yield with regard to the increased stem count of whole seed.

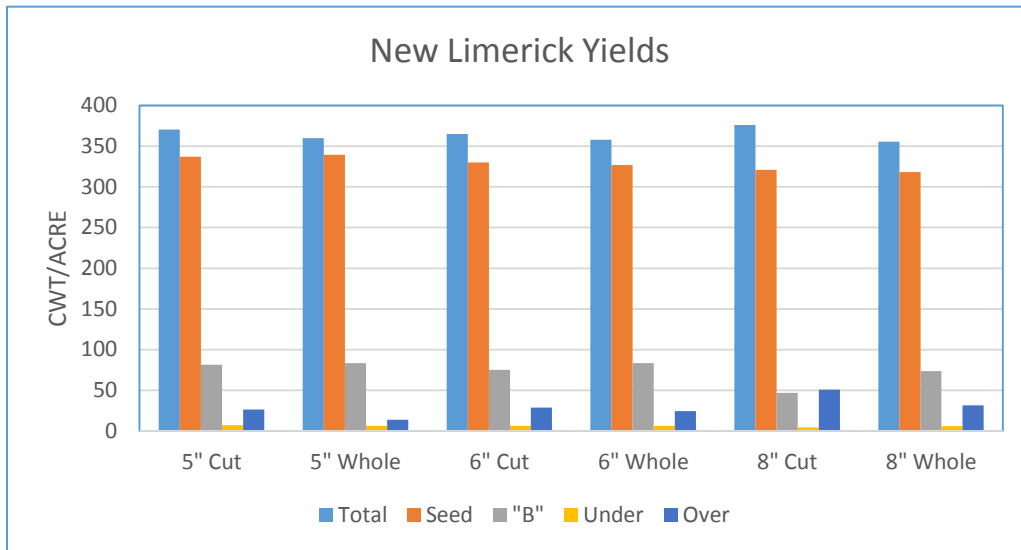
Figure 1. Stem numbers



Total yields from the New Limerick site ranged from 355.5 cwt per acre to 376 cwt per acre (Figure 2). There was no significant difference in total yield, seed size yield, or undersize yield. 8 inch seed spacing produced significantly greater yields of oversized tubes than 5 inch spacing. "B" yields ranged from 46.9 to 83.5 cwt per acre and showed the greatest variability. Whole seed produced a significantly greater volume of "B's" than cut seed. 5 and 6 inch seed spacing produced greater "B" yields than 8 inch

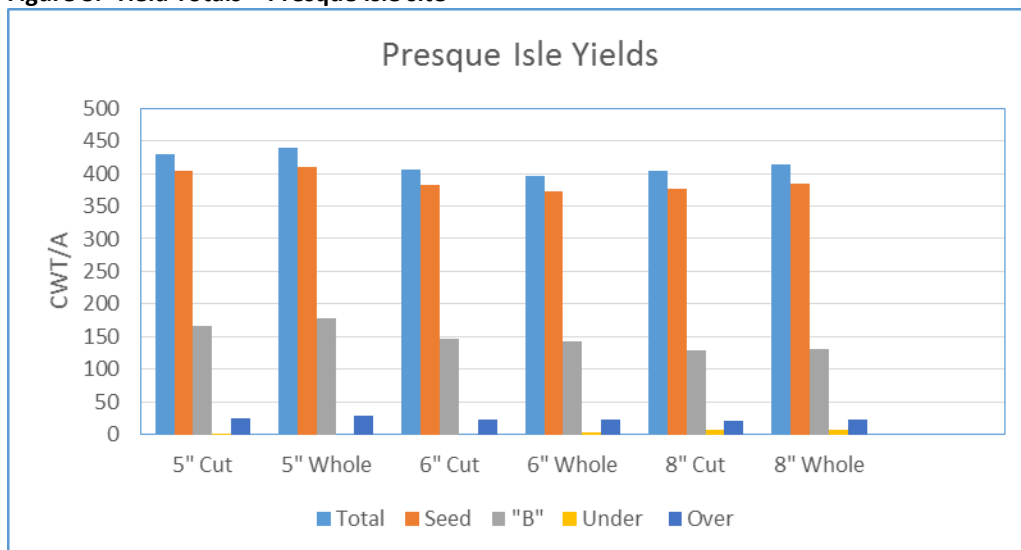
spacing but were not significantly different from one another. 5 inch spacing using cut seed produced significantly greater yields of "B's" than 8 inch cut seed.

Figure 2. Yield Totals – New Limerick Site



Total yields from the Presque Isle site ranged from 404.3 to 439.6 cwt per acre (Figure 3). There was no significant difference in total yield, seed size yield, or undersize yield. 8 inch spacing produced significantly higher yields of oversize tubers than 5 and 6 inch spacing. "B" yields ranged from 129.8 to 178.6 cwt per acre. There was no significant difference in "B" yields between cut and whole seed treatments. 5 inch seed spacing yielded significantly more "B's" than 6 or 8 inch spacing.

Figure 3. Yield Totals – Presque Isle site



Discussion

Weather conditions, precipitation, and varieties differed between research sites however, results from the New Limerick site and the Presque Isle locations show more similarities than differences.

Results from this project indicate that yields of “B” size (1.5-2.25 inch) potatoes can be increased using closer in row seed spacing. In comparing all treatments, 5 inch spacing yielded more “B” potatoes than the 8 inch spacing. The increased production of “B” potatoes did not add to the total yield or total seed size yield therefore the additional cost associated with the higher seeding rate cannot be justified.