

Comparison of Tuber yields and Quality from Precision Spaced

Potato Seed Pieces vs. Irregularly Spaced Seed

Robert Coffin, William Hardy

2009

Cavendish Farms

Abstract

Growers are assessing different cultural practices to improve the marketable yield of potatoes. One of the major challenges of potato production has been modifications of planting equipment to deliver uniform spacing of seed pieces in the row. A innovation developed by Bluefield Seeding Solutions Inc. (BSSi) in partnership with Allan equipment, PEI is the press wheel for potato planters. Traditional planting equipment delivers irregular spacing of seed pieces, especially if the ground speed of the planter is too fast. The press wheel planter allows the planter to travel more quickly and still maintain good uniformity of seed spacing (less rolling and bouncing of seed pieces). A replicated field trial was established with two seed lots of Russet Burbank. One treatment was to hand plant seed pieces at a uniform spacing of 18 inches. The other treatment was to plant the same number of seed tubers per unit of row but at irregular spacing (some doubles and gaps). In theory, the uniform seed spacing should permit more uniform plant competition for nutrients and sunlight. The tuber yield should be comprised of more uniform sized tubers, with similar maturity.

The research plots were harvested and graded to Cavendish Farms contract specs. Although no statistical difference between treatments were confirmed, some positive trends were obvious. The average financial return, calculated from the Cavendish Farms contract, was \$82.00 per acre more financial returns for uniform spacing of seed. The percentage of large tubers was greater in the irregular spacing as well as in increase in hollow heart and other defects. Research should be continued with different varieties in “side by side” field trials.

INTRODUCTION

There has been increasing interest from farmers and processors to plant seed tubers at uniform spacing in the rows. Many planters deliver irregular spacing of seed pieces, especially if the planter is used at high speeds. Progress has been made in planter design, especially press wheels, to give improvements in the uniformity of seed piece placement. Two different seed lots of Russet Burbank tubers were utilized to establish a replicated field trial in 2009 at Cavendish Farms. The purpose of the experiment was to compare tuber yields and quality when seed pieces were hand planted with precision at 14 inch spacings for comparison to irregularly spaced seed pieces (to give some doubles and skips in the row). There were the same number of tubers planted in every harvest row (13 tubers). Plant emergence was 100%. While the uniform placement of seed tubers is an interesting feature, the key issue is the effect on the potato yields, quality and dollar value. Potato tubers, from research plots, were graded to Cavendish contract specifications and financial returns were calculated. An overall average from the two seed lots indicated an increased dollar value of \$82.00 per acre for the crop produced from the precision planted seed tubers.

To make defensible claims regarding the benefits of precision planting, more performance data needs to be collected from paired field trials with different potato varieties. Under PEI conditions, Russet Burbank is usually planted at 12 -16 inch spacings, whereas other processing varieties such as Shepody and Prospect and some chipping varieties are planted at 8-10 inch spacings. Russet Burbank often produces 12-17 tubers per plant where as Shepody and Prospect only produce 5-6 tubers per plant.

Methods and materials

The experimental design of the trial was a replicated trial with 4 harvest rows of 20 feet for each seed lot and treatment. Fresh cut seed tubers were utilized to establish the trial (13 seed pieces per 20-foot row). The plots were fertilized by banding fertilizer with a planter without hilling discs. The precision planting was accomplished by hand planting seed pieces at 18-inch spacings in an open furrow. Irregular seed spacing was hand planted to give variable distances between seed pieces; also, to include a few doubles and gaps in the row. Seed tubers were treated with in-furrow applications of Admire insecticide; and covered with disc hillers.

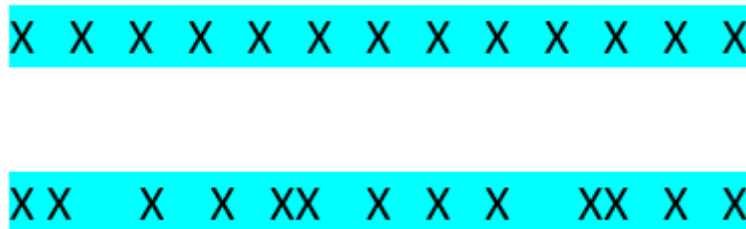


Fig. 1

Precision placement of seed compared to irregular spacing of potato seed (13 seed pieces per 20 plot).

Results and Discussion

A search of published studies revealed the results of numerous studies on seed spacing; but negligible information (yield, tuber size and quality) is available from crops produced from evenly spaced seed compared to irregularly spaced seed.

There are a number of theoretical benefits from the uniform planting pattern of seed tubers i.e.

- uniform competition between plants for nutrients, water and sunlight
- more uniformity of tuber size and maturity, less defects
- -less oversized tubers, possibly with hollow heart (dockage) where a plant had too much space

- more uniform maturity of tubers could affect sugar concentrations and subsequent processing colour variations in chips and fries. There may be less variation of specific gravity among tubers from evenly spaced seed tubers.

Monitoring the field plots revealed that the plant stands in the precision planted plots was uniform and an irregular pattern was evident in the plots with variable seed distribution. All seed pieces produced plants (100% emergence).

While the more uniform plant spacing is a positive feature, does it translate into improved benefits to the grower and processor (financial returns)? A big question is how much do potato plants compensate in response to irregular spacing?

Plots were top-killed in late September and graded to specifications for the Cavendish Farms French Fry contract. A summary of the grading data and statistical analyses is below.

Feb-17-2020 (Spacing Trial 2009) AOV Means Table Page [PageNo] of [PageCount]									
Cavendish Farms									
Character Rated	Small Cwt	2"-10oz Cwt	>10oz Cwt	% Hollow Heart	% Total Defects	Specific Gravity	Pay Cwt	\$ / Acre	
Trt No.	Treatment Name	1	2	3	4	5	6	7	8
1	#1 irregular spacing	63.5 a	206.5 a	51.0 a	8.0 a	11.8 a	1.097 a	242 a	2202.50 a
2	#2 irregular spacing	50.3 a	233.8 a	45.8 a	7.3 a	12.0 a	1.099 a	263 a	2328.00 a
3	#1 uniform spacing	65.5 a	231.8 a	35.5 a	5.0 a	7.3 a	1.098 a	263 a	2338.30 a
4	#2 uniform spacing	67.5 a	234.0 a	38.8 a	3.3 a	7.8 a	1.097 a	264 a	2355.80 a
LSD (P=.05)		12.96	31.96	36.20	4.85	7.49	0.004	27.38	245.53
Standard Deviation		8.10	19.98	22.63	3.03	4.69	0.002	17.12	153.50
CV		13.14	8.82	52.95	51.61	48.36	0.220	6.64	6.66
Bartlett's X2		1.41	2.26	0.52	1.82	3.25	1.144	0.76	0.74
P(Bartlett's X2)		0.70	0.52	0.92	0.61	0.35	0.766	0.86	0.86
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)									
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.									

Fig 2.

The objective of the field trial was to verify the effect of even spacing of Russet Burbank speed to tubers compared to irregular spacing. Two different seed sources of RB seed were used for the replicate small plot trial thirteen seed pieces were planted in each of the four 20-foot replications. Potato tubers were graded to contract specifications. The data summary is above. Although there were arithmetic trends for less hollow heart, less defects in the plots, a statistical analysis did not indicate statistical differences. Where there is high variability in each replication within a treatment, there needs to be a large difference between different treatments to have a statistical difference.

The following observations are noteworthy:

- The average dollar returns, from both seed lots, indicated that payment of the crop from the evenly spaced seed was \$81.80 (2009) per acre more than the crop produced from irregularly spaced seed (\$2347.05 minus \$2265.25 = \$81.80). **Increase in revenue of 3.5%.**
- There was slightly more weight of large tubers from the plots with irregularly spaced seed
- As well, there was more percent weight of tubers with hollow heart and defects from plots of irregularly spaced seed (most likely from the large tubers having a propensity to go hollow).

Allan Equipment, based in PEI, is the only company currently manufacturing modified press wheels for planters. Growers have assessed the modified planters and reported that they can plant at higher than normal ground speeds and still retain good seed and plant spacing.

From this study, uniform spacing of seed provided some benefits to growers (more financial returns) and processors (more uniform crop of tubers to process).