

AIM Research Trial Report: **Effect of Seed Piece Size on Emergence & Marketable Yield**
Working Group: Seed Management
Crop Year: 2021
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Project Rationale:

There has been a lot of discussion in recent years regarding the effect that seed piece size has on both plant emergence and marketable yield. Research in other areas has shown that yield potential is generally higher with large sized seed pieces. At the very least, there has been an interest in eliminating small, cut seed pieces before planting, as these seed pieces are thought to have reduced yield potential.

The Seed Management Working Group was interested in setting up a demonstration trial to compare the emergence and yield potential of four different cut seed piece sizes in two processing varieties. David Main, Research Biologist at AAFC and member of the AIM Seed Working Group, agreed to establish this trial at AAFC Harrington Farm in 2021.

Project Overview:

Seed was obtained for two processing varieties of interest in Prince Edward Island: Dakota Russet and Mountain Gem Russet. Seed was cut 12 days prior to planting. 100 seed pieces were cut and weighed at four sizes: 1.5 ounces, 2.0 ounces, 2.5 ounces, and 3.0 ounces.

Seed was planted in 25 foot rows, replicated four times in a randomized split plot design (main = variety, sub = seed size). The planting date was May 25th. Emergence was monitored over multiple dates, beginning on June 8th and finishing on June 28th. Stem counts were completed on September 8th. The same in-row seed spacing (12 inches) was used for all varieties and treatment. The same fertility and crop protection program was used for all varieties and treatments. All plants were topkilled on September 24th and 27th and harvest was done on October 19th. Potatoes were graded into five categories: less than 1 7/8th inch diameter (smalls), between 1 7/8th inch diameter and 10 ounce weight, greater than 10 ounce weight (10 oz), off-type (rough, knobs, other defects) and sunburn (greening).



Left: Mountain Gem seed being cut and weighed for the 2.5 oz treatment. Right: Comparing the size of plants for Dakota 1.5 oz seed (center) with Dakota 3.0 oz seed (left of center).

Results:

Table 1: Emergence and Stem Count Results – Dakota Russet

Treatment	Emergence Jun 15 plants/row*	Emergence Jun 17 plants/row*	Emergence Jun 22 plants/row*	Total Plants in 4 plots	Total Stems/row	Stems per Plant
1.5 ounce	6.0	14.8	26.5	100	36.5 a	1.46 a
2.0 ounce	5.8	16.8	26.5	100	42.0 ab	1.68 ab
2.5 ounce	5.3	14.0	25.8	100	46.8 b	1.87 b
3.0 ounce	6.0	18.0	26.8	100	60.5 c	2.42 c

* includes 2 guard plants in each row

Table 2: Emergence and Stem Count Results – Mountain Gem Russet

Treatment	Emergence Jun 14 plants/row*	Emergence Jun 15 plants/row*	Emergence Jun 17 plants/row*	Emergence Jun 22 plants/row*	Total Plants in 4 plots	Total Stems/row	Stems per Plant
1.5 ounce	7.0	14.5	23.5	26.8	93	59 a	2.54 a
2.0 ounce	8.75	17.0	24.3	26.8	95	73 b	3.07 b
2.5 ounce	14.5	19.0	25.0	26.8	98	88 c	3.58 c
3.0 ounce	12.3	20.0	24.8	26.5	95	94 c	3.98 d

* includes 2 guard plants in each row

Regarding plant emergence, there did not appear to be much of a difference between the four treatments for the Dakota Russet variety at any date. For Mountain Gem Russet, it appears that emergence was slightly advanced for the larger seed piece treatments, but this advantage was only one or two days. By June 22nd, all plots were at or close to full emergence for both varieties.

For both varieties, there is a very obvious trend that the larger the seed piece, the more stems per plant were produced. For Dakota Russet, a 3.0 ounce seed piece produced almost 1 full additional stem per plant than the 1.5 ounce seed piece. For Mountain Gem, the 3.0 ounce seed piece produced 1.44 more stems per plant than the 1.5 ounce seed pieces. There were statistically significant differences between treatments for both varieties, as noted in the above tables. These differences in stems per plant will be important to remember as we examine the yield data.

Also, it should be noted that due to detection of symptomatic plants for both PVY and blackleg in the Mountain Gem variety, there were not the same number of total plants in each yield sample at harvest. The 1.5 ounce treatment lost 7 plants total, compared with the 2.0 and 3.0 ounce treatments losing 5 plants and the 2.5 ounce treatment only losing 2 plants. This may prove to confound yield and quality results for the Mountain Gem variety.

Table 3: Yield and quality for Dakota Russet

Treatment	Total Yield cwt/ac	Smalls cwt/ac	Smalls %	> 10 oz cwt/ac	> 10 oz %	Specific Gravity	M. Yield cwt/ac
1.5 ounce	358.2 a	52.0 a	14.5	38.9 a	10.9	1.085	306.2
2.0 ounce	376.9 a	51.7 a	13.7	24.4 a	6.5	1.084	325.2
2.5 ounce	413.2 b	80.3 b	19.4	11.3 a	2.7	1.084	331.1
3.0 ounce	409.2 b	90.7 b	22.2	10.5 a	2.6	1.085	317.2

Table 4: Yield and quality for Mountain Gem Russet

Treatment	Total Yield cwt/ac	Smalls cwt/ac	Smalls %	> 10 oz cwt/ac	> 10 oz %	Specific Gravity	M. Yield cwt/ac
1.5 ounce	447.1 ab	41.4 a	9.3	93.2 b	20.8	1.086	404.1
2.0 ounce	439.0 a	47.3 a	10.8	65.0 ab	14.8	1.085	386.4
2.5 ounce	472.1 b	52.8 a	11.2	79.5 b	16.8	1.085	415.1
3.0 ounce	457.5 ab	67.3 a	14.7	40.1 a	8.8	1.087	385.5

For Dakota Russets, there was a significantly higher yield for the 2.5 and 3.0 ounce treatments than the 1.5 and 2.0 ounce treatments; however, this increase in yield was overwhelmingly to be found in the tubers less than 1 7/8th inch diameter (smalls). This resulted in non-significant differences in marketable yield across treatments. It should be noted that there was a substantial number of tubers in all Dakota plots with sunburn. As there did not appear to be a significant difference in sunburn percentage between treatments, the weight of sunburned potatoes was added in to the Marketable Yield column.

While the difference in tubers greater than 10 ounces was no significant (at $p < 0.05$) for Dakota, there is a definite trend in this trial that with increase seed piece size, the percentage of tubers greater than 10 ounces was reduced.

Similar results were observed for Mountain Gem Russet. Differences in total yield was only statistically significant ($p < 0.05$) between the 2.0 and 2.5 ounce treatments; however, there was a similar upward trend in total yield for the large seed piece sizes, with much of this increase in yield coming from small tubers. For Mountain Gem, the yield of tubers greater than 10 ounces was statistically smaller for the 3.0 ounce treatment than two of the other three treatments.

Both the effect on percentage of smalls and percentage greater than 10 ounce appears to be directly related to the increased number of stems per plant as seed piece size increases. This has been seen over many years in previous trials by other researchers. This emphasizes the need to increase in-row seed spacing as seed piece size increases. If a grower is able to plant seed by size category (either whole or cut seed), there is a need to adjust in-row spacing accordingly.

Summary:

Key findings from this trial were:

- As seed piece size increased, the number of stems per plant also increased
- This increase in stems per plant can have an undesired impact on the percentage of small tubers and large tubers if in-row seed spacing is not adjusted.
- Slightly accelerated rates of emergence were observed for the Mountain Gem variety from larger seed pieces; however, this improved emergence was short-lived and did not impact final emergence rates.
- Results from the Mountain Gem variety were perhaps impacted by plants infected with blackleg and PVY in the trial.

Thank you to Dave Main with AAFC Charlottetown for agreeing to host this trial and for all of the hard work from AAFC staff to manage and complete this research in 2021.