

AIM Research Trial Report: Evaluation of Foliar Fertility Program

Working Group: Science & Technology

Crop Year: 2021

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Project Rationale:

The merits and management of foliar fertility application continues to be a topics of considerable discussion among Prince Edward Island potato growers. Over the years, a number of different companies have developed numerous foliar fertilizer products that have been marketed to potato growers, particularly to address potential deficiencies in essential micronutrients or to supply nutrients directly to the plant at a time of water stress. At the same time, there has not been much local research completed in recent years to evaluate these products and programs by a third-party.

In 2020, there was a desire from the AIM Science & Tech Working Group to conduct an evaluation of foliar fertility programs, but complications largely due to the COVID-19 pandemic resulted in this research not taking place. In 2021, a processing grower indicated that he would be interested in conducting this trial on his farm, and made arrangements to set up and conduct the trial with support from AIM for in-season crop monitoring as well as yield evaluations at harvest.

Project Overview:

This trial was established in 2021 in Augustine Cove, PEI. The trial field consisted of two long strips. In each strip, roughly half of the strip was managed without any foliar fertility applications, while the remaining half of the strip was managed according to recommendations from representatives of a foliar fertility company, based on the results of weekly petiole tissue samples. At harvest, four 10 foot yield samples were harvested from each of the control (GSP) and foliar fertility treatments in each of the two strips, with each sample having the same number of plants per sample. Therefore, a total of eight 10 foot yield samples were harvested for both the control and the foliar fertility treatments. In-row seed spacing was 12 inches and the variety was Mountain Gem Russet. Planting date was May 27th, 2021. The same crop protection program was performed on the entire field.

Average fertility from soil tests for this field were (averaged from multiple grid samples per strip):

Strip	OM %	pH	ppm							CEC
			P	K	Mg	Ca	S	Zn	B	
Cut 1	2.8	6.0	211	155	98	692	15	2.3	0.2	7.2
Cut 3	2.3	5.7	234	173	97	715	15	2.7	0.5	8.0

While there were some differences in organic matter and pH between the two strips, soil test values for individual nutrients are very similar. Phosphorus and potassium are at levels rates as High (testing from A&L Labs). Magnesium is rated as Medium for both strips, while calcium is rated as Very Low. Sulfur is Moderate to High, zinc is Low, and boron is low to very low. In general, both strips present as fields that are sufficient for most macronutrients (except Ca) but possibly deficient in micronutrients.

The pre-plant fertilizer application consisted of a variable rate broadcast of 0-0-60 on both strips. The average amount applied was 190 lbs/acre on strip Cut #1 and 205 lbs/acre on Cut #3

The in-planter fertilizer application consisted of 975 lbs/acre of 13-18.2-9.1-2.3 Mg-0.1 B-0.3 Zn. Blend was composed of CAN, DAP, MOP, and KMag. Boron and zinc supplied by both granular and pro-cote.

A further 110 lbs/acre of urea was applied at hilling, coated with N Yield.

Total applied nutrients from the fertility program were:

	N	P	K	Mg	B	Zn
Strip Cut #1	178	177	203	22	1	3
Strip Cut #3	178	177	212	22	1	3

For the foliar fertility treatment, the recommended applications based on weekly petiole sampling plus the initial soil tests and fertility program were:

Products	Cost per acre
Calcium & Zinc products in-furrow	\$39.20
Mn/Zn/P product and Mg product	\$20.00
Mn and B products	\$14.15
B product	\$2.95
B product and Mg product	\$17.60
B, Mg, and N products	\$23.60
B and K products	\$28.10
	Total: \$145.60

Tissue samples were performed for 8 weeks (14 samples) at a cost of \$38.50 per sample. This equates to a \$15.40 per acre cost for tissue samples. Therefore, the total cost of the foliar fertility program equaled \$161.00 per acre in additional costs.

Results:

Table 1: Yield and quality for Mountain Gem Russets

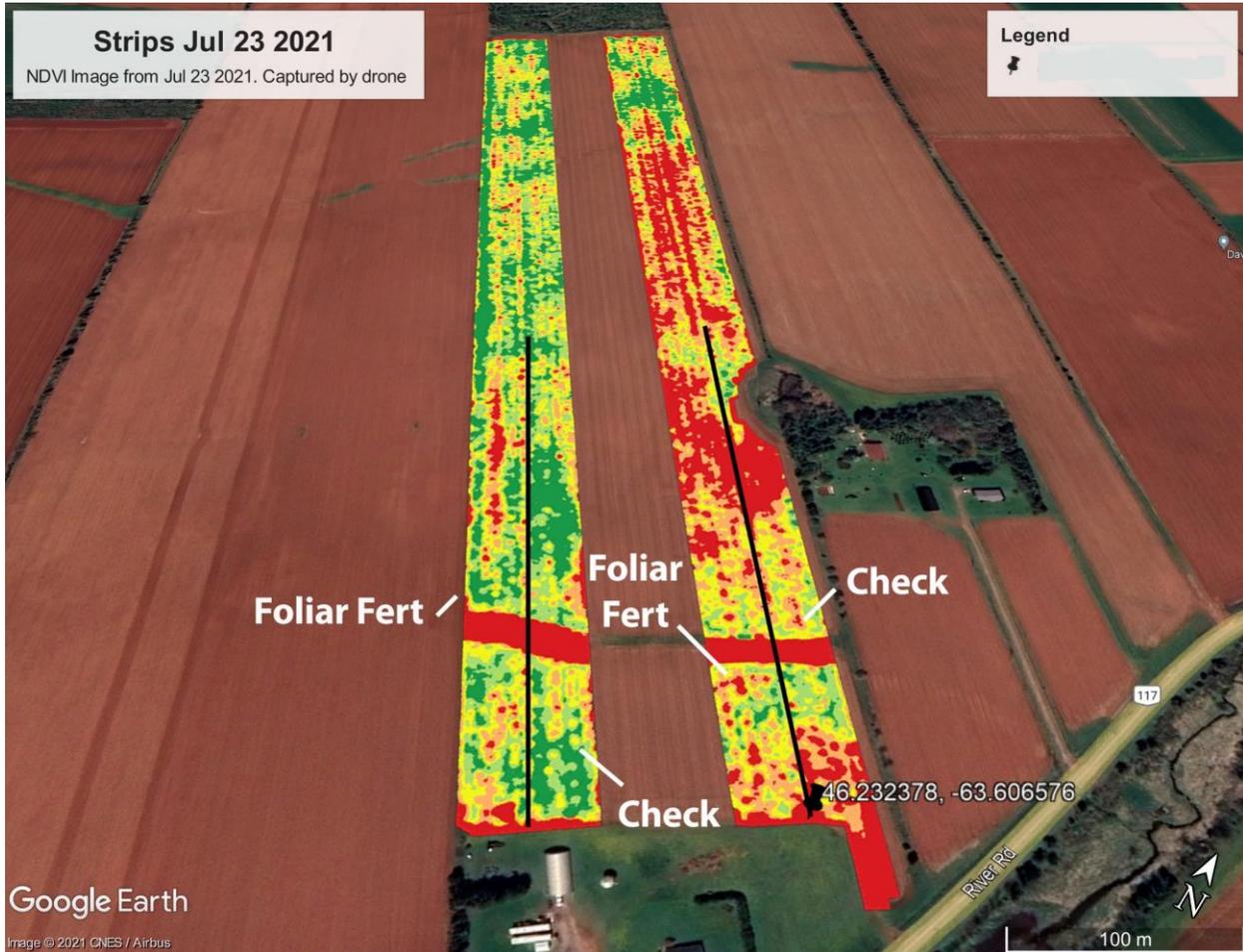
Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout \$/acre
Control (GSP)	336.4	5.6	21.9	14.1	1.085	279.6	\$3611
Foliar Fertility	325.2	5.2	27.6	11.6	1.085	281.0	\$3689
Difference	-11.2	-0.4	+5.7	-2.5	0	+1.4	\$78

From the 10 foot yield samples that were collected on both the control rows and the rows under the foliar fertility program, there was no significant differences observed in yield, size profile or quality metrics. Samples were taken in similar parts of the field for both the control and foliar fertility treatments in an effort to compensate for any background differences in soil characteristics.

The participating farm also conducted some gross truck weights to verify the results from the 10 foot samples. Each truck weight was based on an identical length and number of rows for both the control

and foliar fertility treatments. The average weight from 6 trucks coming from the control treatment was 28,393 lbs, while the average weight from 6 trucks coming from the foliar fertility treatment was 28,347 lbs, a difference of 46 lbs per truck or 0.1%. This lack of difference is very much in line with what was seen in the 10 foot samples.

Crop Health:



Drone-based imagery was performed on July 23rd, 2021 on both strips to assess whether there was any detectable difference in crop health between the control and foliar fertility treatments. From the NDVI map provided above, there was no obvious trend in NDVI between treatment and control.

Summary:

Key findings from this trial were:

- There was no difference in yield or quality between the grower's standard fertility program and the recommended foliar fertility program.
- There were no detectable differences in crop health taken by drone imagery on July 23rd.
- The foliar fertility program had an additional cost of \$161.00 per acre. Based on the results of this trial, there was not a return on that additional investment.
- While the 2021 was considered very favourable with adequate rainfall, this should have benefitted both treatment and control equally. Foliar fertility recommendations were based on the results of weekly tissue testing. This brings into question whether the concentrations of nutrients in tissue testing are well correlated with nutrient requirements.

Thank you to the participating farm for taking on the significant work to conduct this trial and for working with the AIM team on this project. Thank you to Evan MacDonald with SWAT Maps for providing us with drone imagery for NDVI comparison. Thank you also to Morgan McNeil for her assistance in data collection and analysis and to Cavendish Farms Central Grading for helping us to grade these samples.