AIM Trial Report: Biostimulant product Megafol effects on potato plant response to stress
Working Group: AIM Science & Technology
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Project Rationale

Biostimulant products are beginning to be commonplace in the agricultural industry. These are generally products that are not considered "crop protectants" (ie. pesticides); nor are they considered fertilizers. Instead, they are often described as products that improve a plant's response to biotic or abiotic stress. In Prince Edward Island, the majority of potato acres are grown without use of irrigation; therefore, periods of heat and drought stress are relatively common. In this project, we wanted to assess the use of a currently available biostumulant (Megafol ®) applied at tuber initiation and before an anticipated period of drought and/or heat stress on potato yield and quality.


Project Overview

Two farms participated in this trial, each contributing two fields. In each field, a significant portion of the field was sprayed with Megafol® at the label rate of 1 L/acre at tuber initiation and again approximately 2-3 weeks later ahead of anticipated period of heat and/or drought stress. A portion of the field was not sprayed with Megafol as a control treatment. Farm A was located in West Prince, with one field planted in Mountain Gems (planted May 30) and the other with Prospect (May 31). Farm B was located in Eastern Kings, and both fields were planted to Russet Burbank (mid-May planting).

At Farm A, the treatment was applied on July 15th (tuber initiation) and August 2nd (early bulking). At Farm B, the two treatment dates were July 9th (tuber initiation) and August 3rd (early bulking). In each field, petiole samples were collected before and after treatment applications in a designated area of each of the control and Megafol treatments. These were submitted to the PEI Analytical Lab for analysis.

On October 1st, the Mountain Gem field at Farm A was sampled by digging six, ten-foot strips in both treated and untreated areas. The same was done in the Farm A Prospect field on October 2nd. The samples were then taken to Cavendish Farms Central Grading on November 14th and graded. A factor of 13 was used to calculate cwt/acre when multiplied by lbs per 10 feet.

At Farm B, ten-foot samples were unable to be harvested due to logistical challenges at harvest. The grower reported no observed differences in yield between the product and control treatment areas in either field. NDVI imagery from satellite (sourced from Climate FieldView) of both fields is included for comparison.

Weather

Farm A Weather

Farm B Weather
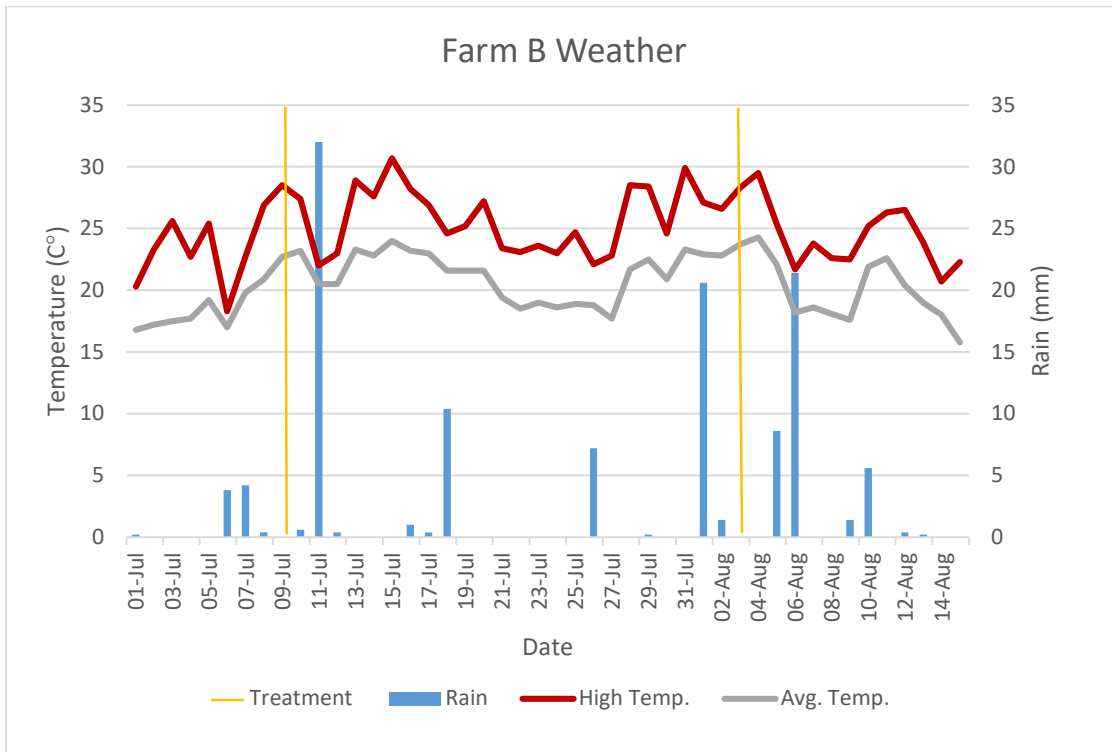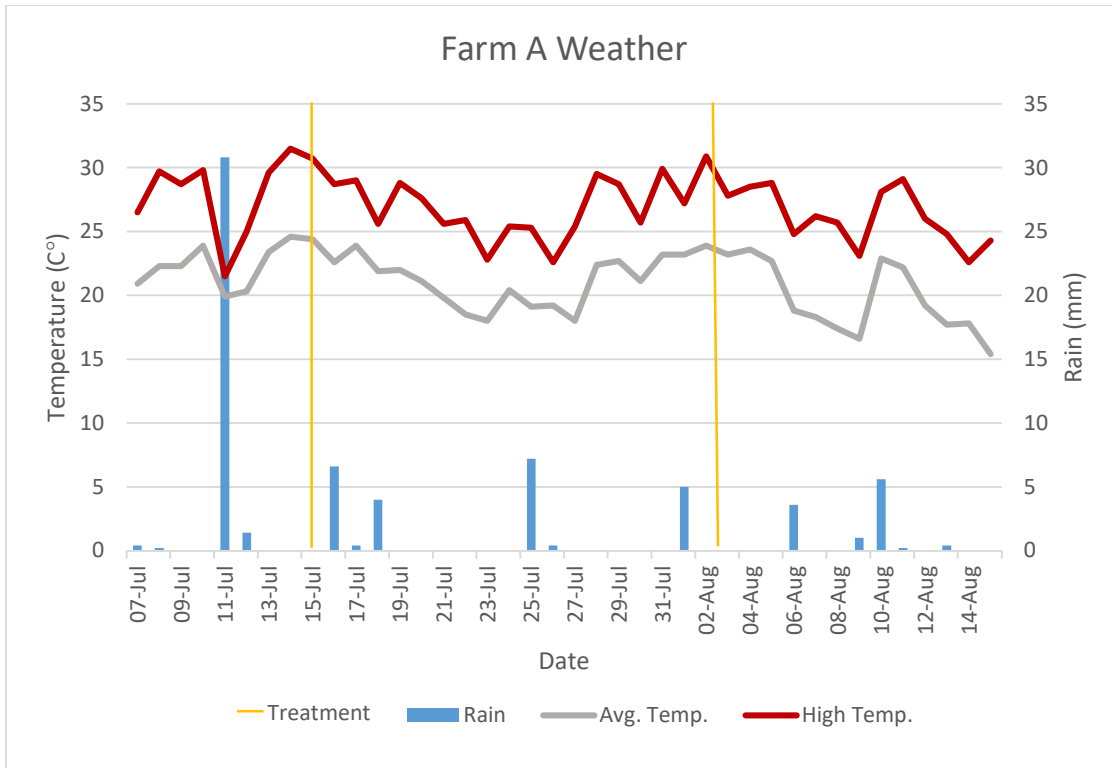
From these graphs, we see that temperatures (averaged by week) stayed relatively consistent during the treatment period at both farms, with slightly higher temperatures were observed at Farm A. There were some individual days of +30 C temperatures observed but no long periods of extremely hot temperatures. At Farm A, there was a significant rainfall in the week prior to the first product application, followed by four weeks of limited rainfall. At Farm B, there was a significant rainfall two days after the first application and three days after the second application. However, conditions were dry in Eastern Kings County in June and July prior to the first application and remained relatively dry through the growing season.

Petiole Samples

Farm A: Mountain Gem

	Date	Treatment	Nitrate	K	Mg
				%	
Pre-Trt.	July 15	Megafol	2.14	10.41	0.18
		Check	2.49	11.15	0.15
Post-Trt.	July 24	Megafol	1.59	10.36	0.61
		Check	1.99	10.68	0.57
Pre-Trt.	August 1	Megafol	1.39	8.76	0.88
		Check	2.17	9.63	0.83
Post-Trt.	August 9	Megafol	0.95	7.94	0.54
		Check	1.78	9.91	0.33

Farm A: Prospect

	Date	Treatment	Nitrate	K	Mg
				%	
Pre-Trt.	July 15	Megafol	3.25	10.8	0.40
		Check	3.52	9.11	0.47
Post-Trt.	July 26	Megafol	1.78	9.69	0.41
		Check	1.94	9.99	0.48
Pre-Trt.	August 1	Megafol	2.35	9.85	0.56
		Check	3.10	9.93	0.75
Post-Trt.	August 9	Megafol	2.09	10.05	0.56
		Check	2.12	9.95	0.66

No significant trends observed with regards to petiole concentrations of N, K or Mg after treatment with Megafol in either field at Farm A. In both fields, concentration of N was lower on the Megafol treatment area prior to treatment. The post-treatment concentrations were proportionally similar, with the exception of the second post-treatment collection in the Prospect field, when the Megafol treated sample appeared to make up some of the gap observed 8 days previously. However, it should be noted that these petiole samples were not replicated so no statistical analysis is possible.
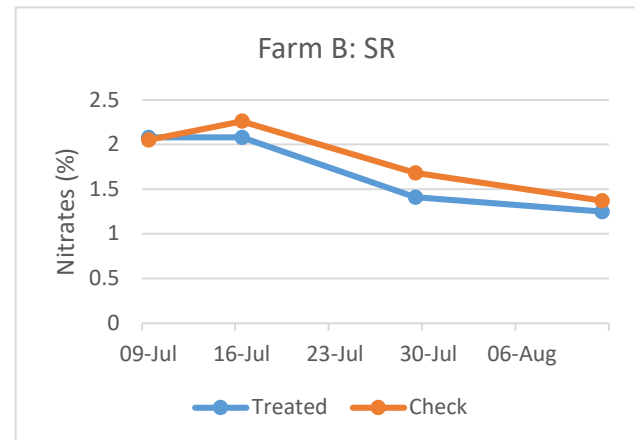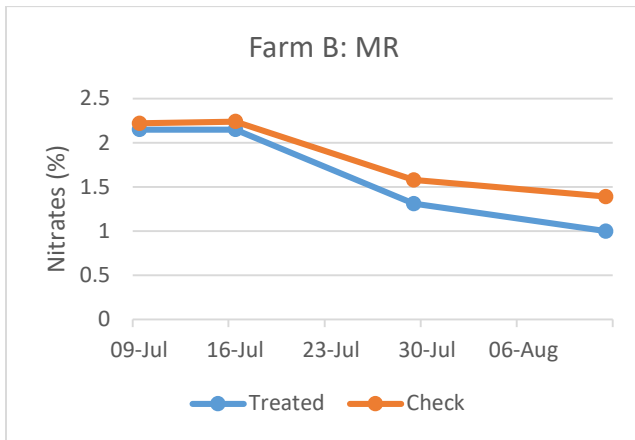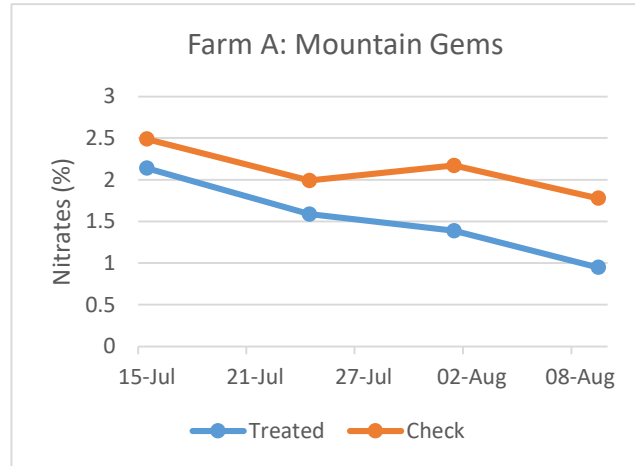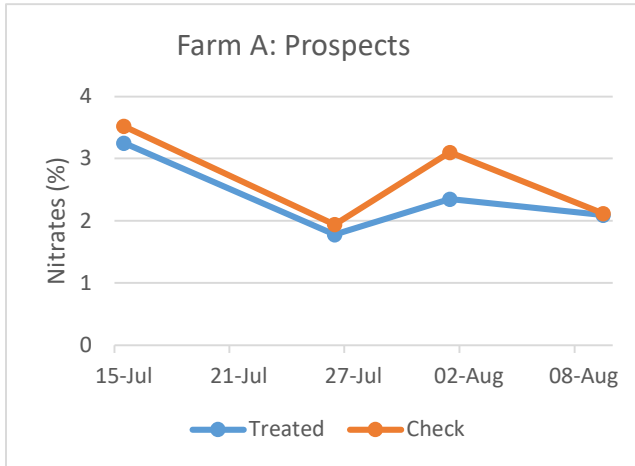
Farm B: Russet Burbank 1

	Date	Treatment	Nitrate	K	Mg
				%	
Pre-Trt.	July 9	Megafol	2.15	11.04	0.26
		Check	2.22	10.94	0.27
Post-Trt.	July 16	Megafol	2.15	10.90	0.24
		Check	2.24	10.08	0.29
Pre-Trt.	July 29	Megafol	1.31	10.64	0.42
		Check	1.58	10.37	0.46
Post-Trt.	August 12	Megafol	1.00	10.54	0.55
		Check	1.39	10.11	0.66

Farm B: Russet Burbank 2

	Date	Treatment	Nitrate	K	Mg
				%	
Pre-Trt.	July 9	Megafol	2.08	11.24	0.25
		Check	2.05	10.88	0.27
Post-Trt.	July 16	Megafol	2.08	9.79	0.27
		Check	2.26	9.87	0.27
Pre-Trt.	July 29	Megafol	1.41	9.51	0.45
		Check	1.68	9.91	0.42
Post-Trt.	August 12	Megafol	1.25	9.18	0.82
		Check	1.37	8.32	0.71

Likewise, there was very little difference in petiole concentrations of N, K or Mg between the Megafol and control treatments either before or after product application in either fields at Farm B. Nutrient concentrations are within the suggested ranges for each nutrient. Therefore, we can assume that there was no significant impact of the use of Megafol on nutrient uptake during this time period.

Nitrate Concentrations:

Farm A: Prospects — Nitrates (%) vs date (15-Jul to 08-Aug), Treated and Check.

Farm A: Mountain Gems — Nitrates (%) vs date (15-Jul to 08-Aug), Treated and Check.

Farm B: MR — Nitrates (%) vs date (09-Jul to 06-Aug), Treated and Check.

Farm B: SR — Nitrates (%) vs date (09-Jul to 06-Aug), Treated and Check.

Farm B - Russet Burbank 1

Farm B - Russet Burbank 2

These are satellite images from August 7th at Farm B, with the black line denoting the split between treatment and control. In Field 1, the control is south of the line. In Field 2, the control is east (right) of the black line. No real difference was observed in NDVI in these fields.
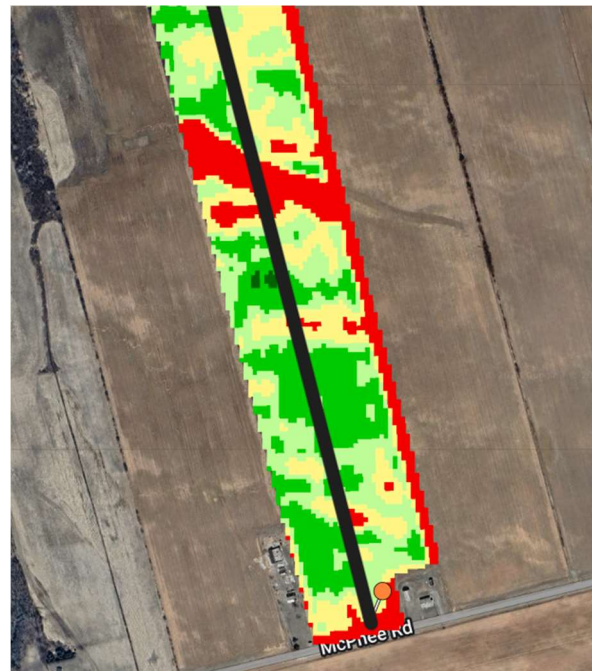
This photo from Farm B – Russet Burbank 2 was taken on July 29th. No visual difference in foliar colour or development was observed. The orange flag denotes the split between the control (right) and the treated area (left)

Farm A: Mountain Gem
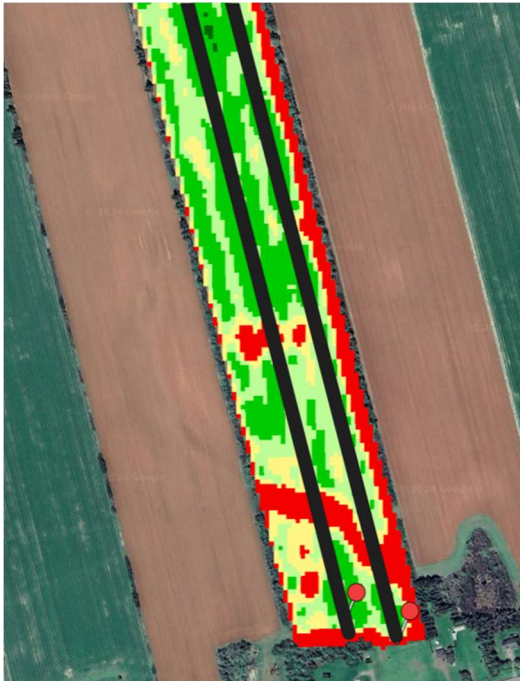
Farm B: Prospect

Both of these satellite images are from August 8th (after 2nd application) at the two Farm A fields. No obvious trend in NDVI is evident between treatment and control in either field. In the Mountain Gem field, the product treated area is between the two black lines. In the Prospect field, the product treated area is to the east (right) of the black line. Large red areas are erosion control structures and/or field boundaries.

Yield and Quality:

Farm A: Mountain Gem

Treatment	Total Yield	Smalls	>10 oz.	Total Defect	M. Yield	Payout
	cwt/ac		%		cwt/ac	$/ac
Megafol	397	4.2	22.7	1.7	377.8	6795.79
Check	377	3.8	18.0	0.3	361.1	6449.98
Difference	20	0.4	4.7	1.4	16.7	345.81
p value	0.4	0.8	0.41	0.07	0.46	0.42

No statistical differences were observed between the Megafol and control treatments for yield and quality. While there is a small numerical difference in total and marketable yield as well as associated payout, it is not statistically significant at p=0.1.

Farm A: Prospect

Treatment	Total Yield	Smalls	>10 oz.	Total Defect	M. Yield	Payout
	cwt/ac		%		cwt/ac	$/ac
Megafol	248	12	1.8	1.3	217.8	3831.8
Check	244	11.7	2.8	0.5	218.2	3834.1
Difference	4	0.3	-1.0	0.8	-0.4	-2.3
p value	0.89	0.92	0.62	0.32	0.99	1.0

Similarly, there was no significant difference in yield or quality between the Megafol treated area and the control in this field. It should be noted that overall yields were uncharacteristically low for this variety. The project team observed that that plants in this field never truly reached a full canopy to "close the rows" and plants were largely one or two stems per plant. It is not known why this field struggled in this manner, as there was nothing obvious from petiole samples, seed quality or soil tests according to the grower. However, this trend was similar across the whole field.

Combined:

Treatment	Total Yield	Smalls	>10 oz.	Total Defect	M. Yield	Payout
	cwt/ac		%		cwt/ac	$/ac
Megafol	322.4	7.9	12.2	1.5	297.8	5313.82
Check	310.7	7.9	10.4	0.4	289.6	5142.05
Difference	11.7	0	1.8	1.1	8.2	171.8
p value	0.74	1	0.7	0.04	0.83	0.80

When combining results across the two fields at Farm A, there continues to be no significant difference in total yield, marketable yield or payout between the two treatments. There is a significant difference observed for the percentage of total defects in favour of the control; however, total defect percentage is quite low for both control and Megafol treatment and may be impacted by the majority of observations being recorded as zero.

Key Findings:

- No obvious differences were observed in petiole samples for nutrient concentrations following application of Megafol compared with the non-treated control.
- No obvious differences in NDVI were observed in the four trial fields post-treatment.
- No significant differences in yield and quality were observed at Farm A, except for a small difference in percent total defects in favour of the control treatment.

Acknowledgements: