Petiole Nutrient (N, P and K) Recommendations for Russet Burbank Potatoes Grown in Southern Alberta (2007)

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Background

- Precise fertilizer application rates are critical for optimal potato production. Sufficient nutrients are necessary to maximize tuber yield, quality and uniformity, while issues of economy and environment make excess fertilizer undesirable.
- The analysis of potato petioles has been used to monitor nutrient status throughout the growing season; a useful and timely technique for monitoring mid-season nutrient deficiencies.
- Currently recommended petiole nutrient concentrations are from research conducted in the northwest United States, where longer growing seasons and different soil and climate conditions prevail.
- Results from previous studies in southern Alberta indicated that the current recommendations may be high for K and somewhat high for P, especially early in the growing season. Results also indicated that recommended NO_3-N concentrations may need fine-tuning to suit southern Alberta growing conditions.

Objectives

In 2004, a 3-year study was initiated. The objectives are to

- determine the optimal petiole nutrient concentrations for Russet Burbank potatoes, specific to southern Alberta
- determine the relationship, if any, between potato petiole nutrient concentrations and tuber specific gravity
- compare these relationships to those found in field-scale petiole data.

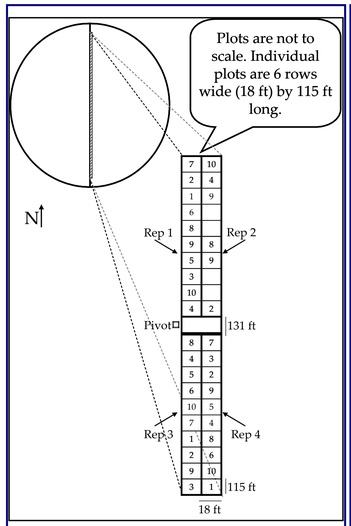

Figure 1. Plot layout 2007.

Table 1. Fertilizer rates 2007.

Treatment		Experiment Applied Apr 17/07 (lb/ac)		
		N	P_2O_5	K_2O
a) Nitrogen	1	24	101	75
	2	151	101	75
	3	200	101	75
	4	250	101	75
b)Phosphorus	5	200	0	75
	3	200	101	75
	6	201	151	75
	7	200	201	75
c) Potassium	8	200	101	0
	3	200	101	75
	9	200	101	152
	10	200	101	206

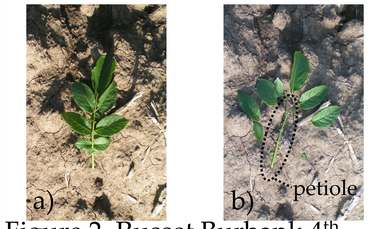

Figure 2. Russet Burbank 4th leaf stem before (a) and after (b) removal of leaves.

Figure 3. Hail damage Aug 2007.

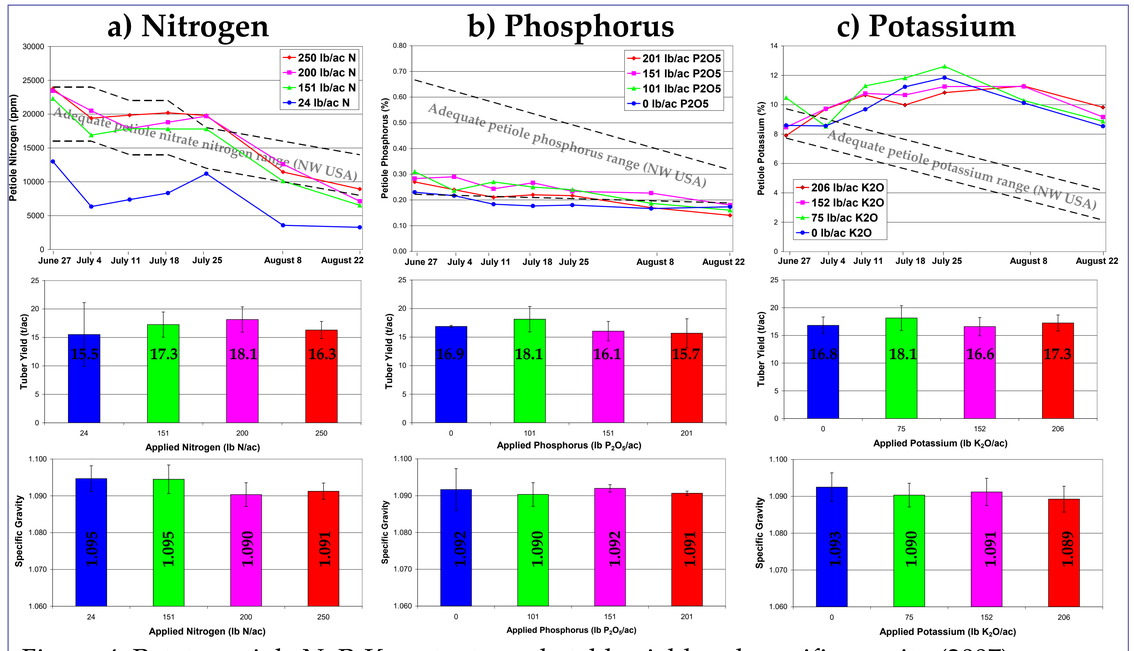

Figure 4. Potato petiole N, P, K content, marketable yield and specific gravity (2007).

Project Treatments and Layout

Ten rates (Table 1) of N, P and K fertilizer were applied (April 17/07) to strips in a small portion of a field of grower-managed Russet Burbank potatoes, near Coaldale, Alberta. Each plot was 6 rows wide (18 ft) by 115 ft long (Figure 1) and there were 4 replicates. Due to an error in the application rate of K on several plots in Rep 2, data from 4 plots was not used in results calculations. Petiole samples (Figure 2) were collected and analyzed for each plot 7 times throughout the 2007 growing season. Tuber samples (2x25 ft strips) were collected (September 13-14/07), graded for marketable yield and analyzed for specific gravity.

The crop was planted April 22/07 and it had begun flowering by July 11/07. Grower fertilizer and fertigation amounts and dates have not yet been provided, however the plot area was avoided by the grower during the spring fertilizer application. The field was affected by a hail storm on August 10, 2007 (Figure 3). Crop damage was more extensive on the north half of the field.

Acknowledgements

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Full reports of the 2004 and 2005 results are available on the PGA web site and a final report, consisting of the 2004-2007 results will be made available to the PGA in January 2008.

Results Summary

Nitrogen: There was an increasing concentration of petiole N with increasing fertilizer N and this was seen in all three years of the study. All but the lowest N fertilizer treatment fell within the USA standards. The highest three N treatments had very similar petiole N concentrations, despite representing a range in fertilizer N. There was no significant yield difference between treatments, however there was a trend to increasing yield with increased fertilizer, with a decreased yield at the highest rate of N. There was a slight trend to decreasing specific gravity with increased fertilizer N. A similar trend was also seen in 2005 but the opposite was seen in 2004.

Phosphorus: All petiole P results were in the low range, within and slightly below the USA standards, similar to both previous years. There was no relationship between fertilizer P and petiole P.

Potassium: Similar to previous years, petiole K results were above the USA adequate range and there was no relationship between fertilizer K and petiole K. There was no statistically significant trend in specific gravity with increasing fertilizer K.

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