EVALUATION OF 4R FERTILIZER STRATEGIES FOR POTATOES IN PRINCE EDWARD ISLAND

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BACKGROUND

- Prince Edward Island is the largest potato producing province in Canada.
- The PEI potato industry shares an intimate relationship with society - almost all potato fields share adjacent or nearby space with homeowners.
- The Island relies 100% on groundwater for all of its’ water needs.
- The potato industry shares responsibility in maintaining the quality of the provinces’ drinking water for future generations.
- At present, the majority of the crops’ N-P-K requirements are applied in a 2X2 band at planting using dry fertilizer components.
- Fertilizer Canada and several PEI stakeholders initiated the Farming 4R Island Initiative in PEI in 2012.
- 4R promotes the Right Rate of fertilizer applied at the Right Time in the Right Place using the Right Source.
- Objectives of the initiative include identification and field evaluation of techniques that may increase overall fertilizer efficiency while reducing the impact on the environment and maintaining/improving the economic return to the producer via improved yields and/or quality.
METHODOLOGY

• A total of 32 commercial fields were used for the study (5, 13 and 14 in 2013, 2014 and 2015, respectively). Growers selected a field at least 20 acres in size and split into two sections. One section was fertilized using grower standard practices; the other (at least 10 acres in size) using a 4R strategy based on several factors including current soil nutrient status, addition of organic amendments, variety to be planted and anticipated end use.

• Main strategies for 2013-15 activities included split N applications, reduced P2O5 rates, K2O rate adjustments based on crop removal and increased MgO applications.

• In season plant nutrient status was monitored via three bi-weekly leaf petiole samples.

• 6 X 15 ft strips were hand harvested from each treatment in each field prior to commercial harvest. The same number of plants were harvested from each strip within each field.

• All tubers were evaluated for overall yield, quality and economic value based on a real life processing contract at Cavendish Farms Central Grading in New Annan PEI.

• Net crop values were calculated for each sample based on yield, quality, defects, etc taking into account any potential differences in cost of fertilizer programs.

• Post harvest residual soil Nitrate levels were measured at 0-6”, 6-12” and 12-18” depths from each treatment in each field 10-20 days after harvest.
RESULTS

• Results of 2015 net economic values were not available at time of printing; other variables were tracking relatively consistent with previous years.
• Generally, 4R fertilized crops were indistinguishable from crops fertilized using GSP methods (Fig 1). Russet Burbank in particular, tended to produce vines with paler green color and less vine growth than GSP treated areas (Fig 2).
• No major differences were observed in plant petiole nutrient content. Some sites had slightly decreased levels of major plant nutrients in the 4R treatments; others had slightly increased levels.
• Although somewhat variable, total and marketable yields tended to be relatively similar across most sites. Net crop values however, showed a slight improvement trend in the 4R treated section at most sites (Fig 3).
• Improvements in tuber specific gravity values (Fig 4) and reduction in overall tuber grade defects were partially responsible for this change.
• With the exception of a small number of outliers on either end, residual soil Nitrate levels tended to be lower in most 4R treated sections (Fig 5).
Figure 1: 4R and GSP treated sections Shepody – site B 2013 PEI 4R Trials.

Figure 2: GSP and 4R treated sections Russet Burbank – site L 2014 PEI 4R Trials.
Figure 3: Changes in net crop value ($/acre) comparing 4R vs grower standard practice fertilizer treatments.
Figure 4: Effect of fertilizer program on tuber specific gravity in Russet Burbank potatoes (16 sites 2013-15).

Average GSP 1.083
Average 4R 1.086
Figure 5: Percent change in post harvest soil nitrate levels (0-18”) using 4R vs GSP fertilizer programs.
SUMMARY

In the majority of cases, implementation of 4R fertilizer strategies appear to provide value to PEI potato producers and society as a whole in the following ways:

• Maintaining or improving net crop value.
• Improvement of raw product quality to processor via improved tuber dry matter content.
• Reduced environmental footprint associated with PEI’s primary industry
• Increased efficiency to grower for fertilizer expenditure.

Note: 4R demonstration studies will continue for several more years. Subtle adjustments will be made to the 4R strategy in 2016. This research should be considered as a “work in progress” — the ultimate goal to achieve continuous improvement.
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