Phosphorus (P) is important for producing the large potato tubers desired for processing. Recent research in Prince Edward Island (PEI) has confirmed the high P needs of Russet Burbank, the most important processing variety, and has indicated that potato P needs may be variety-specific.

### TABLE 1

Yield responses to applied P in 1992 and 1993 (mean of two years). Soil test P was 123 and 106 ppm.

<table>
<thead>
<tr>
<th>P$_2$O$_5$ applied, lb/A</th>
<th>Marketable yield, cwt/A Shepody</th>
<th>Russet Burbank</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>243</td>
<td>209</td>
</tr>
<tr>
<td>135</td>
<td>248</td>
<td>236</td>
</tr>
<tr>
<td>difference</td>
<td>6</td>
<td>27</td>
</tr>
</tbody>
</table>

The most popular variety for processing has been Russet Burbank, but it is a challenge to grow since it often requires a longer growing season than the PEI climate provides. In recent years the earlier maturing variety Shepody has become more popular. While it does not maintain its processing qualities in storage for as long a time as Russet Burbank, almost half of the processing crop is currently the Shepody variety.

To address the above questions, research on P needs was conducted from 1992 through 1994 and in 1997. The studies differed from year to year in the number of rates applied, but used similar production practices.

The most detailed study was conducted at two sites in 1997. Site A had clay loam soil with a relatively high pH of 6.0 to 6.2 and a Mehlich-III soil test level of 171 parts per million (ppm) P. Site B, located 10 miles away, had sandy loam soil at a lower pH of 5.5 to 5.7 with...
a soil test level of 138 ppm P. Both sites followed a typical 3-year rotation (potatoes, barley, mixed hay).

At each site, four rates of $P_2O_5$ were applied (0, 65, 240, and 500 lb/A) to the two varieties, on limed (1 ton/A) and non-limed plots. All fertilizer was banded at planting. The sole source of P at the 65 and 240 lb rate was diammonium phosphate (DAP). A mixture of DAP and triple superphosphate (TSP) was used for the 500 lb rate. Nitrogen (N) rate was 150 lb/A, and potassium (K) rate was 240 lb/A $K_2O$. Ammonium nitrate $\left(\text{NH}_4\text{NO}_3\right)$ was used to supplement N requirements from DAP. All K was provided from potassium chloride ($KCl$).

Results in 1992 and 1993 indicated that the Shepody variety was less responsive to applied P than Russet Burbank (Table 1). This was confirmed in 1994 (Figure 1), though both responded to some extent at the highest two rates.

In 1997, there was a surprising response to lime in both the lower and higher pH sites. In fact, results from the two sites were so similar that they were averaged together, as shown in Figure 2. Again, Russet Burbank responded more to P than did Shepody. Applying lime appeared to slightly enhance the P response for Russet Burbank, but it diminished the small response that Shepody showed in the non-limed treatment. On the low pH site, at about 75 days after planting, the pH within the hill had declined to 4.5 where no lime was added and to 4.8 even where lime was added. The pH dynamics may have influenced the availability of applied P.

Lime and P had no effect on specific gravity, the incidence of scab nor fry color when fried in mid November and mid February. Shepody tubers contained higher levels of P than Russet Burbank, 0.27 percent versus 0.22 percent, but lower levels of calcium (Ca), 164 ppm versus 222 ppm. Lime applications did not alter Ca levels in the low pH field, but increased Ca by 42 ppm in the high pH field.

Although soil test interpretations have changed over time, these soils were generally in the range considered to be medium to high in P. These experiments have confirmed the high P requirement of Russet Burbank grown on such soils. In addition, the lesser response of Shepody indicates that P needs for the potato crop may be variety dependent. For this reason, further research on potato P needs is important, and we are optimistic that a better crop can be produced using variety specific nutrient management.

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