Effects of Phosphorus, Potassium or the Combination on Soybean Yield and Profit

Eric Richer, Ohio State University Extension Educator, Fulton County

Objective
To determine the effects of applications of phosphorus, potassium or the combination on soybean yield.

Background
Crop Year: 2014
Location: Metamora, OH
County: Fulton
Soil Type: Hoytville
Drainage: Systematic
Previous Crop: Corn
Tillage: No-till
Soil Test: pH 6.5, P 10 ppm*, K 116 ppm
Planting Date: May 8, 2014
Seeding Rate: 165,000 seeds/ac
Harvest Date: October 30, 2014
*Reported as Bray P1

Methods
This research trial included four treatments replicated four times in a randomized complete block design. Plots were approximately 1,200 feet long by 50 feet wide. Soybean variety was Asgrow 3034. Fertilizer treatments were broadcast in spring prior to planting with a 50 foot spreader using RTK autosteer technology. Soybeans were then planted with the same seeding rate and pesticide treatments across all treatments. Plot centers were harvested with a 35 foot header on a JD 9660 combine. Yield and moisture data was collected with a calibrated yield monitor and adjusted to 13% moisture content. Weather data was obtained from weather.com.

Treatments:
1. No fertilizer
2. 75 lbs/ac Mono-Ammonium Phosphate (MAP) 11-52-0
3. 150 lbs/ac Potash 0-0-60
4. 75 lbs/ac MAP and 150 lbs/ac Potash

Results
Table 1. Soybean Yield (bu/ac) Response to Phosphorus and Potassium

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Moisture</th>
<th>Dry Yield (per acre)</th>
<th>Gross Revenue (per acre)</th>
<th>Fertilizer Cost (per acre)</th>
<th>Net Return (per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No fertilizer</td>
<td>12.7%</td>
<td>59.5 b</td>
<td>$595</td>
<td>$0</td>
<td>$595</td>
</tr>
<tr>
<td>2. 75 lbs/ac MAP</td>
<td>12.6%</td>
<td>62.0 a</td>
<td>$620</td>
<td>$30.30</td>
<td>$590</td>
</tr>
<tr>
<td>3. 150 lbs/ac Potash</td>
<td>12.8%</td>
<td>59.4 b</td>
<td>$595</td>
<td>$40.65</td>
<td>$554</td>
</tr>
<tr>
<td>4. 75 lbs/ac MAP &amp;</td>
<td>12.8%</td>
<td>59.0 b</td>
<td>$590</td>
<td>$62.40</td>
<td>$528</td>
</tr>
<tr>
<td>150 lbs/ac Potash</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LSD 2.55 (p<.05), CV 2.66 – Yes significant difference between treatments

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**Economics:** Gross income = yield x $10.00/bu; 
MAP costs = $0.32/lb (source: OFR collaborator)  
Potash costs = $0.23/lb (source: OFR collaborator)  
Combined fertilizer = $0.25/lb (source: OFR collaborator)  
Application cost = $6.15/ac (source: 2014 OSUE Custom Farm Rental Rates)

**Discussion:**
The only treatment that showed a statistically significant difference in yield was Treatment 2 (75 lbs/ac of MAP), showing at least a +2.5 bushel per acre advantage over all other treatments. However, Treatment 4 also contained 75 lbs/ac of MAP but did not have a similar yield increase. Further data in the form of multi-year replications will add to the validity of these results.

**Acknowledgement**
The author expresses appreciation to on-farm collaborator Keith Truckor for the planting and harvesting of this plot. Thanks to Crop Production Services (Morenci) for applying the fertilizer treatments. Thanks to student worker Emily Herring for assistance with data collection. This projected was supported by the Ohio Soybean Council Research and Education Fund.

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For more information, contact: 
Eric Richer  
OSU Extension –Fulton County  
8770 State Route 108  
Wauseon, Ohio 43567  
Richer.5@osu.edu