Bulletin No. 369 - Phosphorus Placement for Sugar Beets

University of Wyoming Agricultural Experiment Station

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Publication Information
Phosphorus Placement for Sugar Beets

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by J. R. Partridge

There are several ways to apply dry fertilizers for crop use. Available equipment, crop to be grown, and your personal opinion or experience may determine the method to use.

Unlike most nitrogen fertilizer, phosphate stays close to the spot where you placed it—whether the soil is irrigated or not. So placement seems to be a more important factor in applying phosphate than in applying nitrogen fertilizers.

In this day of high machinery cost, along with use of more and more fertilizers, insecticides, and herbicides, it is becoming more important to use these production aids wisely and judiciously. If one method of fertilizer placement results in more efficient use of applied nutrients than any other, it seems only wise to use this method.

Not all crops respond alike to a particular fertilizer placement. Alfalfa responds very well to surface-applied phosphate, while many other crops do not.

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Acknowledgment is made to L. I. Painter, Hugh Hough, Paul Singleton, and Robert Benzel of the Plant Science Division (Soils), University of Wyoming, Laramie, Wyoming.
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Which placement is best?

The Agricultural Substation at Powell since 1956 has conducted field trials to study the influence of phosphorus placement on the yield of sugar beets. The table shows a summary of results from the field trials.

The differences obtained each year between placement methods were not great enough to be statistically significant, except for 1956. The mean yield for the four years’ results, as shown in the table, shows the trend of the four-year test. Every year the side-dressed phosphate appeared to be less effective, in terms of measured yield, than when it was either disced in or plowed under. The phosphate, plowed under, produced an apparently greater yield of beets than either of the other two placement methods—except for the 1957 test. This exception may be at least partially accounted for by the rather heavy application (140 lbs. of P₂O₅ per acre) of phosphate. This rate apparently provided adequate available phosphorus by discing into the surface as well as by plowing under, thus overshadowing any placement effect.

Why is phosphate sometimes more effective when plowed under than if disced in or side-dressed?

Placement seems to be a more important factor in the West than in some other areas because this is a naturally arid region where surface soils, even under irrigation, dry out rapidly. Phosphate placed close to the surface can be partially unavailable to the root system.

### Effect of Phosphorus Placement on Sugar Beets

<table>
<thead>
<tr>
<th>Year</th>
<th>P₂O₅ Soil Test</th>
<th>Plowed under</th>
<th>Disced in</th>
<th>Side-dress</th>
<th>Check</th>
<th>L.S.D. 5%</th>
<th>L.S.D. 1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1956</td>
<td>14.7</td>
<td>21.76</td>
<td>21.08</td>
<td>20.57</td>
<td>19.55</td>
<td>1.19</td>
<td>1.70</td>
</tr>
<tr>
<td>1957</td>
<td>14.7</td>
<td>20.70</td>
<td>21.10</td>
<td>19.70</td>
<td>17.80</td>
<td>2.90</td>
<td>3.60</td>
</tr>
<tr>
<td>1959</td>
<td>11.0</td>
<td>16.10</td>
<td>15.50</td>
<td>15.30</td>
<td>14.48</td>
<td>1.22</td>
<td>1.70</td>
</tr>
<tr>
<td>Mean yield</td>
<td></td>
<td>19.48</td>
<td>18.99</td>
<td>18.43</td>
<td>17.20</td>
<td>1.15</td>
<td>1.47</td>
</tr>
</tbody>
</table>

1. Sufficient phosphate added to obtain 95% maximum yield.
2. Available P₂O₅ as extracted from soil with 0.5 N NaHCO₃ (lbs. per acre).
3. Mean of 4 years.
growing plant first, because the growth of the roots into a relatively dry surface soil is inhibited, and secondly, because of insufficient moisture to dissolve the fertilizer material so that it may be readily absorbed by the plant roots.

**SUMMARY**

Differences in sugar-beet yields due to phosphorus placement were not always great enough to be statistically significant. If there was any real advantage of one placement over another, the advantage would be in favor of plowing phosphate under rather than discing it into the surface or side-dressing it. The trend shown here would further indicate that side-dressing phosphate is the least effective method of application.

Practical application of these data could be made especially in regard to the side-dressing of mixed fertilizer, which is done by some sugar-beet growers of the area. It would seem wise to apply all phosphates before planting, only nitrogen being side-dressed.