Vegetable Section


Optimizing Gypsum Rate for Commercial Potato Production in Northeast Florida

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Calcium (Ca) is essential for potato production. Gypsum (1,000 to 2,000 lb/acre) is usually used as a calcium fertilizer source in the Hastings production area. Based on calcium requirement of potato plants, the gypsum application rate seems too high. To optimize gypsum application rate and enhance phosphorus (P) use efficiency, a gypsum trial was conducted with potato (var. ‘Red LaSoda’) on private farm land in Spring 2013. There were four treatments: 0, 500, 1,000, and 2,000 lbs/acre of gypsum with four replicates using a randomized complete-block (RCB) design. The marketable tuber yields ranged from 31,519 to 34,056 lbs/acre, with no significant differences due to gypsum application rate. The specific gravity averaged 1.051 and there were no internal quality defects for any treatments. These data showed that there was not any significant difference in tuber yield or tuber internal quality between the treatments in this single-season study. Therefore, there is a great potential to decrease gypsum application rate without sacrificing tuber yield and quality. This decrease of gypsum application may increase P use efficiency and improve the profitability and sustainability of commercial potato production in the Hastings production area.

Materials and Methods:

This trial was conducted with ‘Red LaSoda’ on private farm land in Spring 2013. A randomized complete-block design was used with four replications. Plot size was 533 ft² (40-ft long, four rows, with 40-inch spacing). The field practices were all the same as the IFAS recommendations for potato production (Zotarelli et al., 2013) except gypsum application rates, which were 0, 500, 1000, and 2000 lb/acre gypsum (0, 163, 326, and 652 lb/acre calcium oxide). Potato tubers were harvested on 29 May 2013. Total yield was determined for each plot, and then tubers were sorted for marketable and unmarketable quality. Specific gravity was determined on 20 tubers randomly sampled from each plot, which were then sliced into quarters for determination of internal tuber defects. These defects were categorized for the presence of hollow heart (HH), brown rot (BR), corky ringspot (CRS), internal heat necrosis (IHN) and rated for brown center (low, medium, or high).

Results and Discussion

Total tuber yields of potato ranged from 35,447 to 38,272 lb/acre. The control treatment (no gypsum fertilization) had the highest total yield, 38,272 lb/acre. The treatment with 1,000 lb gypsum per acre had the lowest total yield, 35,447 lb/acre. Marketable yields were 33,971, 32,138, 31,519 and 34,056 lb/acre for 0, 500, 1000, and 2000 lb/acre gypsum, respectively. There was no significant difference between any of the treatments, indicating that there was no significantly negative impact of gypsum application on tuber yields. This result may be attributed to the high phosphorus soil background and yearly phosphate fertilizer application. For every 100 lb/acre P2O5 that is applied, the soil P2O5 level is accordingly increased by approximately 50 ppm (21.8 ppm elemental P). This high P background plus yearly phosphate fertilization keeps the soil rich in P, and may offset the effect of the high application rates of gypsum. Tuber specific gravity was not significant, ranging from 1.050 to 1.052 for all application rates (0 to 2,000 lb/acre) (Table 1).
No internal defects were found in tubers from any treatments. The data from this single-season study show that there were no significant differences in tuber yields, tuber specific gravity, marketability or internal tuber quality for the tested variety, 'Red LaSoda' due to application, or not, of gypsum. The results of this trial indicate that no gypsum application may be needed for 'Red LaSoda' grown on the soil in the Hastings production area, Florida. However, different varieties may respond differently. More research is needed to make solid conclusions.

Table 1. Tuber yield (lb/acre) and specific gravity of potato grown with different gypsum application rates.

<table>
<thead>
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<th>Gypsum rate</th>
<th>0</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
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<tr>
<td>Total yield</td>
<td>38,272</td>
<td>36,787</td>
<td>35,447</td>
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<td>Marketable yield</td>
<td>33,971</td>
<td>32,138</td>
<td>31,519</td>
<td>34,056</td>
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<td>Significance</td>
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<td>ns</td>
<td>ns</td>
<td>ns</td>
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<tr>
<td>Nonmarketable yield</td>
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<td>4,650</td>
<td>3,928</td>
<td>3,545</td>
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<tr>
<td>Specific gravity</td>
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<td>1.051</td>
<td>1.051</td>
<td>1.052</td>
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<tr>
<td>Significance</td>
<td>ns</td>
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Literature Cited