Evaluating Accuracy and Distribution Uniformity of Gypsum Application with a Spinner-Disc Spreader

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Gypsum application in Peanut

- Increases soil calcium levels and more soluble than lime
- Applied at early bloom (app. 30-45 days after planting)
- Adequate calcium in the pegging zone is needed to reduce the likelihood of “pops”, pod rot,
- Calcium is critical for germination of peanut seed saved for next year

Source: Glen Harris, UGA Extension Soil Fertility Specialist
SPINNER-DISC BROADCAST SPREADERS

- Common application equipment to broadcast apply dry granular fertilizer, lime and gypsum
  - Application issues are very common
  - Material properties influence application rate and uniformity
OBJECTIVE

To assess the application accuracy and distribution uniformity for gypsum applied using a spinner-disc spreader.
METHODS

Location and Equipment:

- Southwest Research and Education Center, Plains, GA
- Newton Crouch Pull-behind Spinner-disc spreader
- Gypsum source – land plaster
- Target Application Rate – 900 lbs/ac
- Spread width – 36 ft
- Flow divider position – 1”, 4” and 7”
- Each divider setting replicated three times in the field
Data Collection & Analysis:

- Collection pans (14.5” x 10.5”) were placed 6 ft apart along the swath at three transects (200 ft).
- Material from each pan was weighed and used to determine actual application rate (lbs/ac) and uniformity.
- All statistical analysis was performed using JMP Pro using alpha = 0.10.
RESULTS

Application Accuracy & Uniformity within the swath

Divider Setting 1”

Divider Setting 4”

Divider Setting 7”

[Graphs showing application accuracy and uniformity with different divider settings.

- Graphs depict Actual Rate (lbs/ac) against Spread width (ft.)
- Mean Rate is represented by a blue line.
- Target Rate is represented by a black dashed line.
]
RESULTS

Application Accuracy

<table>
<thead>
<tr>
<th>Setting</th>
<th>Mean Rate (lbs/ac)</th>
<th>Std. Dev. (lbs/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divider Position 1”</td>
<td>540 a</td>
<td>226</td>
</tr>
<tr>
<td>Divider Position 4”</td>
<td>564 a</td>
<td>240</td>
</tr>
<tr>
<td>Divider Position 7”</td>
<td>495 a</td>
<td>154</td>
</tr>
</tbody>
</table>

CV represents the uniformity of distribution within the swath (A CV value of zero means perfectly uniform distribution).
Application Accuracy & Uniformity along the Spreader Pass

Divider Setting - 1”

Divider Setting - 4”

Divider Setting - 7”

Rate (lbs/ac)

Spread width (ft.)

0 200 400 600 800 1000 1200 1400

-18 -12 -6 0 6 12 18

Transect 1 Transect 2 Transect 3 Target Rate

-18 -12 -6 0 6 12 18

-18 -12 -6 0 6 12 18
<table>
<thead>
<tr>
<th>Setting</th>
<th>Transect</th>
<th>Mean Rate (lbs/ac)</th>
<th>Std. Dev. (lbs/ac)</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divider Position 1”</td>
<td>1</td>
<td>463</td>
<td>302</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>590</td>
<td>209</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>567</td>
<td>229</td>
<td>40</td>
</tr>
<tr>
<td>Divider Position 4”</td>
<td>1</td>
<td>479</td>
<td>149</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>644</td>
<td>313</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>571</td>
<td>357</td>
<td>63</td>
</tr>
<tr>
<td>Divider Position 7”</td>
<td>1</td>
<td>354</td>
<td>77</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>485</td>
<td>144</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>646</td>
<td>327</td>
<td>51</td>
</tr>
</tbody>
</table>
CONCLUSIONS

- High application rate errors (50-75%) and highly non-uniform distribution (CV = 30–65%) were observed across all spreader settings.

- The gypsum application variability can lead to varying calcium levels (pod filling and germination) within the field.

- Both material properties and equipment settings influence spreader settings. It is important for growers to properly calibrate spinner-spreaders to verify application rate and uniformity.

**Future Work:** Assessing application accuracy for high-clearance broadcast spreaders and influence of material gypsum properties.
Thanks!

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