AVAIL® Treated Phosphorus Rate Effects as a function of Erosion Severity on Dryland Winter Wheat in a Calcareous Soil

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Background

- Dryland winter wheat growers in the area face the challenge of meeting crop needs with adequate phosphorus before it is fixed via adsorption or precipitation.
- AVAIL®: A polymer purposed to increase P availability. Shown to increase yield when applied with ½ recommended rate of P fertilizer.
- Two Experiments: Broadcast Exp. 2017 (WE_17) and Banded Exp. 2018 (WE_18)
- Godfrey Farm, Clarkston, UT:

Objective

- To find what effects AVAIL® has with MAP when applied as a mid-season broadcast fertilizer, or incorporated with the seed at planting, on dryland winter wheat in a calcareous soil over four levels of erosional severity.

Materials and Methods

- Soil: Silt Loam and Silty Clay Loam. Precip= 21 in., MAT= 47 °F (Utah Climate Center). CaCO3: 0 - 1.5% to 1ft. Location: Godfrey Farm, Clarkston, UT.
- Seed used for WE_17: Lucin Clearfield, WE_18: Magic Clearfield. Seed for both experiments were planted perpendicular to slope to mitigate erosion.
- Fertilizer: granular Monoammonium Phosphate (MAP): 11-52-0
- Full Rate: 60 lbs P2O5/acre, Half Rate: 30 lbs P2O5/acre
- AVAIL®: additive sprayed onto granular MAP via cement mixer.

Broadcast Experiment (WE_17) Results

- No significance between treatments within any slope segment.

Discussion

- Spring broadcast applied fertilizer may have some effect on yield, but the lack of significance between the four fertilizer treatments means a grower can save roughly $18.85/acre by applying 30 lbs/acre of MAP without AVAIL® as a spring broadcast rather than the recommended rate of MAP with AVAIL® for dryland small grain.
- If grower experienced similar yield results to this experiment, they could supplement 30 lbs/acre of MAP with AVAIL® for comparable or better yields and still save $16.38/acre.
- Having CaCO3 and Organic Matter ranges for each level of erosional severity may give us a correlation of their impact on yield. If they do have statistical effect on yield, we can make improved fertilizer recommendations to growers based on more than just plant needs.

Conclusions

- AVAIL® and Erosion (P<0.0001) have statistically significant effects on yield.
- There is no significance between treatments within erosional severity segments on yield or protein content.
- ½ rate with AVAIL® had higher yields than ½ rate without AVAIL® across all segments. This trend does not hold for the full rate treatments.
- While ¾ rate of MAP with AVAIL® had comparable or better yield and profit results with the full rate of MAP without AVAIL®, and was not economically advantageous only in the slightly eroded slope segment.

Resources


Acknowledgements

- I would like to thank Dr. Grant Cardon, Dr. David Hole and staff, and Bailey Shaffer for their continued support with this ongoing study.

Table 1. Treatment assignment.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Color</th>
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<tbody>
<tr>
<td>MAP 80 lbs/acre</td>
<td>Green</td>
</tr>
<tr>
<td>MAP 30 lbs/acre</td>
<td>Red</td>
</tr>
<tr>
<td>MAP 60 lbs/acre w/AVAIL®</td>
<td>Blue</td>
</tr>
<tr>
<td>MAP 80 lbs/acre w/AVAIL®</td>
<td>Red</td>
</tr>
</tbody>
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Figures:

- Fig. 1: Godfrey Farm research site
- Fig. 2: Soil P levels to 1 foot in MAP 2015 (ppm).
- Fig. 3: Spring broadcast treatments were applied parallel to slope to mitigate treatment interaction from runoff.
- Fig. 4: Treatments incorporated with seed at planting.
- Fig. 5a: Broadcast experiment treatments were planted perpendicular to slope to mitigate erosion. The red line between the SHOULDER and FLAT segments is the peak of the catena.
- Fig. 5b: Full Rate: Ongoing. Planted SEP 2017. Incorporated treatments with seed at planting. Randomized Complete Block Design. Treatments replicated three times Measurements Made for both Experiments.
- Fig. 6: Bailey harvesting with a hand sickle within 2’ x 2’ square (1 replication).
- Fig. 7: P-values for effects of soil P, erosional severity, fertilizer rate (Full or Half), and AVAIL® (with or without), on yield.
- Fig. 8: Profit between treatments grouped by slope segment. Calculated using USU Extension’s Costs and Returns template (2).