



Effect of Phosphorus Application on Wheat Yield and Phosphorus Uptake in a Brown Chernozem in Southern Saskatchewan

Jordan Wiens and Jeff Schoenau

Department of Soil Science, University of Saskatchewan, Saskatoon, SK

Introduction

- Interest in phosphorus application techniques has increased due to large farm sizes requiring higher efficiency to improve time management at peak seasons.
- Phosphorus immobility is known to affect early season availability and therefore vigor, so placement is a key aspect of phosphorus fertility when environmental conditions limit diffusion.

Objective

- To determine the response of wheat (*Triticum aestivum*) to a variety of P placement methods.

Materials and Methods

- The 2015 site was located near Central Butte, Saskatchewan on a loam textured Brown Chernozem canola stubble. Trials were set up on an upper slope and lower slope position. The pH of upper slope and lower slope was 7.2 and 6.5 respectively while MK extractable P was 15 and 16 mg P kg⁻¹ in the 0-15 cm depth.
- Phosphorus was applied as monoammonium phosphate (11-52-0). All plots received a blanket application of N at 100 kg N ha⁻¹.
- Treatments were control (No P), seed placed (SP), deep banded (DB), broadcast and incorporated (BI) at 20 kg P₂O₅ ha⁻¹ along with broadcast alone (B) at 20, 40 and 80 kg P₂O₅ ha⁻¹.
- Hard Red Spring Wheat (Waskeda) was seeded in the first week of May. Rainfall in May and June at the site was 10% of normal.

Results and Discussion

- Grain yield (Fig. 1) was not significantly affected by P treatment in the upper slope position (p>0.10). In the lower slope the P treatment effect was significant (p<0.10).
- Yield was significantly higher in the lower slope position.

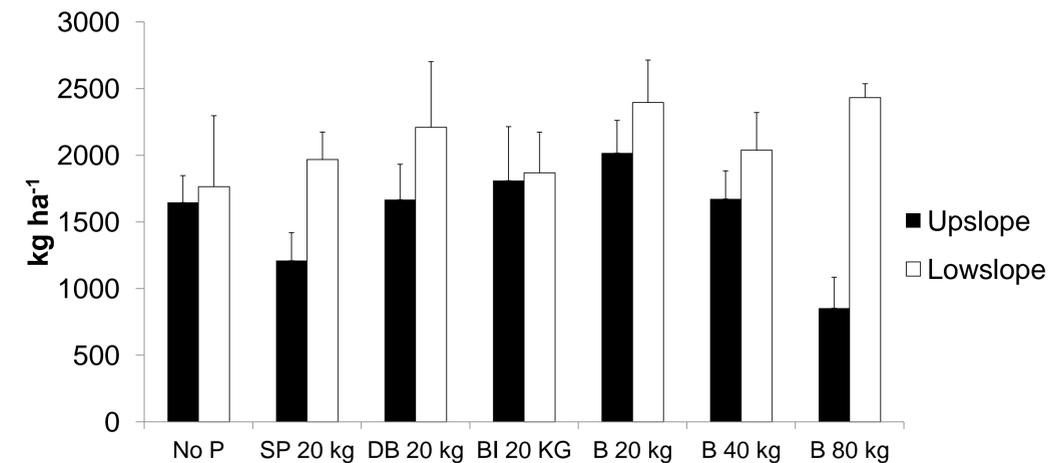


Figure 1. Grain yield at Central Butte site in 2015.. Treatment rates are kilogram P₂O₅ per hectare. Error bars are standard error. SP=seed placed, DB=Deep Band, BI=Broadcast and Incorporated, B=broadcast.

- Phosphorus uptake was not affected by slope position (p=0.1838) or treatment (p=0.4057) and was approximately 10 kg P ha⁻¹ across all treatments.



- Very dry conditions during May and June at the site likely contributed to limited response to added P, especially on the upslope position.
- No detectable differences were observed among P fertilizer application methods or rate. The broadcast P at the 80 kg ha⁻¹ rate did have a more severe kochia infestation, providing an explanation for the low mean yield in this treatment.
- The marginal soil available phosphorus level is consistent with lack of a large response to added P fertilizer at the site in 2015.

Conclusion

- Response to fertilizer P was limited at this site in 2015 as a consequence of sufficient soil P under the limited yield potential induced by spring and early summer drought.
- Landscape position had the greatest effect, with the lower slope position having higher yield and a positive grain yield response to added fertilizer P.

Acknowledgments

Financial support provided by Fertilizer Canada, AAFC Growing Forward, and Foundation for Agronomic Research.