Interaction effect of phosphorus and micronutrient fertilization on crop production in rotation  
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INTRODUCTION

- Copper (Cu) deficiency is the most common micronutrient deficiency on the prairies. Lack of zinc (Zn) can also be a factor in certain soils. Growers may consider applying both Cu and Zn in crop rotations (Kruger et al., 1985; Singh et al., 1987).
- Balancing Cu and Zn is important in soils that are deficient in both of these nutrient elements (Alloway, 2008).
- It is purported that insoluble precipitates [Zn₂(P₂O₅)₃] can form in soils with high P that can induce Zn deficiency (Loneragan and Webb, 1993).

HYPOTHESIS

- The response of grain yield in a wheat-pea rotation to the addition of Cu and Zn fertilizers will be related to soil phosphorus status.

OBJECTIVE

- To evaluate wheat and pea yield response to Cu and Zn fertilization in a highly phosphorus (P) deficient (< 3 ppm Olsen P) Saskatchewan soil, without and with P fertilizer added.

MATERIALS AND METHODS

Experimental set-up and management

- The experiment was conducted in the college phytotron facility using trays of soil in which treatments were applied (Photo 1).
- The soil used in this study was Tisdale Association Orthic Dark Gray Chernozem (Cu≈0.9; and Zn= 1.4 mg kg⁻¹).
- Micronutrient fertilizer solution (copper or zinc sulfate dissolved in water) was applied as a subsurface band.
- Wheat (HRSW var Waskada) was grown to maturity followed by yellow pea (var Meadow).

RESULTS AND DISCUSSION

- Fig. 1. Effect of phosphorus and micronutrient fertilization on grain yield of wheat (A) and the following pea (B). For each crop, bars with the same letter are not significantly different (p > 0.05).
- Fig. 2. Influence of micronutrient fertilization on P supply rate measured by 24 hour burial of PRS³₁ probes in a P deficient Tisdale soil with no P fertilizer added (control ).
- Fig. 3. Effect of phosphorus and micronutrient fertilization on P uptake by wheat grain. Bars with the same letter are not significantly different (p > 0.05).

CONCLUSION

- As expected, significantly higher grain yield of wheat was obtained with P fertilizer addition on the P deficient soil (Fig. 1A). Yield of pea following wheat (Fig. 1B) was not significantly affected by any of the treatments made at the beginning of the rotation. A large positive effect of Cu and Zn on yield was not expected as soil levels were above critical values.
- Interestingly, a strong antagonistic effect on the growth and yield of wheat (Fig. 1 A; Photo 2) was observed from the addition of both Cu and Zn when no P fertilizer was added on this P deficient soil.
- The soil P supply rate (Fig. 2) was negatively affected by micronutrient addition, especially for combination of Cu and Zn after three weeks, suggesting some interference of the combination with soil P availability and/or plant uptake.

REFERENCES


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