The Response Of Two Soybean Varieties To Fe Fertilization In An Fe-Deficiency Prone Soil In South-Central Saskatchewan

Ryan Hangs and Jeff Schoenau

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

INTRODUCTION

- Iron (Fe) is an essential nutrient involved in oxidation-reduction reactions associated with photosynthesis and respiration.
- As the amount of soybean acres increase in western Canada, so do the reports of iron deficiency chlorosis (IDC), which can reduce soybean yield.
- Despite having abundant soil Fe, a number of edaphic factors can decrease Fe availability to plants, including excessive carbonates, nitrate, alkalinity, salinity, and moisture (Kaiser et al., 2011).

OBJECTIVE

- Examine the ability of different Fe fertilizer rates, forms, and application methods to alleviate IDC in two soybean varieties, differing in their sensitivity to IDC, in an IDC prone soil.

MATERIALS & METHODS

- The 2016 study was located within a shallow depressional zone of a farm field near Central Butte, SK (Solonetzic Brown Chernozem, Kettlehut Assn); with E.C. 2.5 mS/cm, pH 8.0, 39 mg/kg NO_3^--N, and 10 mg/kg DTPA-extractable Fe. Occasionally flooded during June.
- A split-plot experimental design was used. Whole plots: IDC tolerant (McLeod) and susceptible (Moosomin) soybean varieties. Split-plots: control + six Fe fertilizer treatments varying in rate (0.1, 0.25, and 5 kg Fe/ha), form (salt and chelated), and application method (seed-placed and foliar applied at the V2-V3 growth stage).
- Fertilizer N, P, K, and S applied to prevent any deficiencies.
- Variables: soil Fe supply rate (PRS™-probe); grain and straw yield.

RESULTS & DISCUSSION

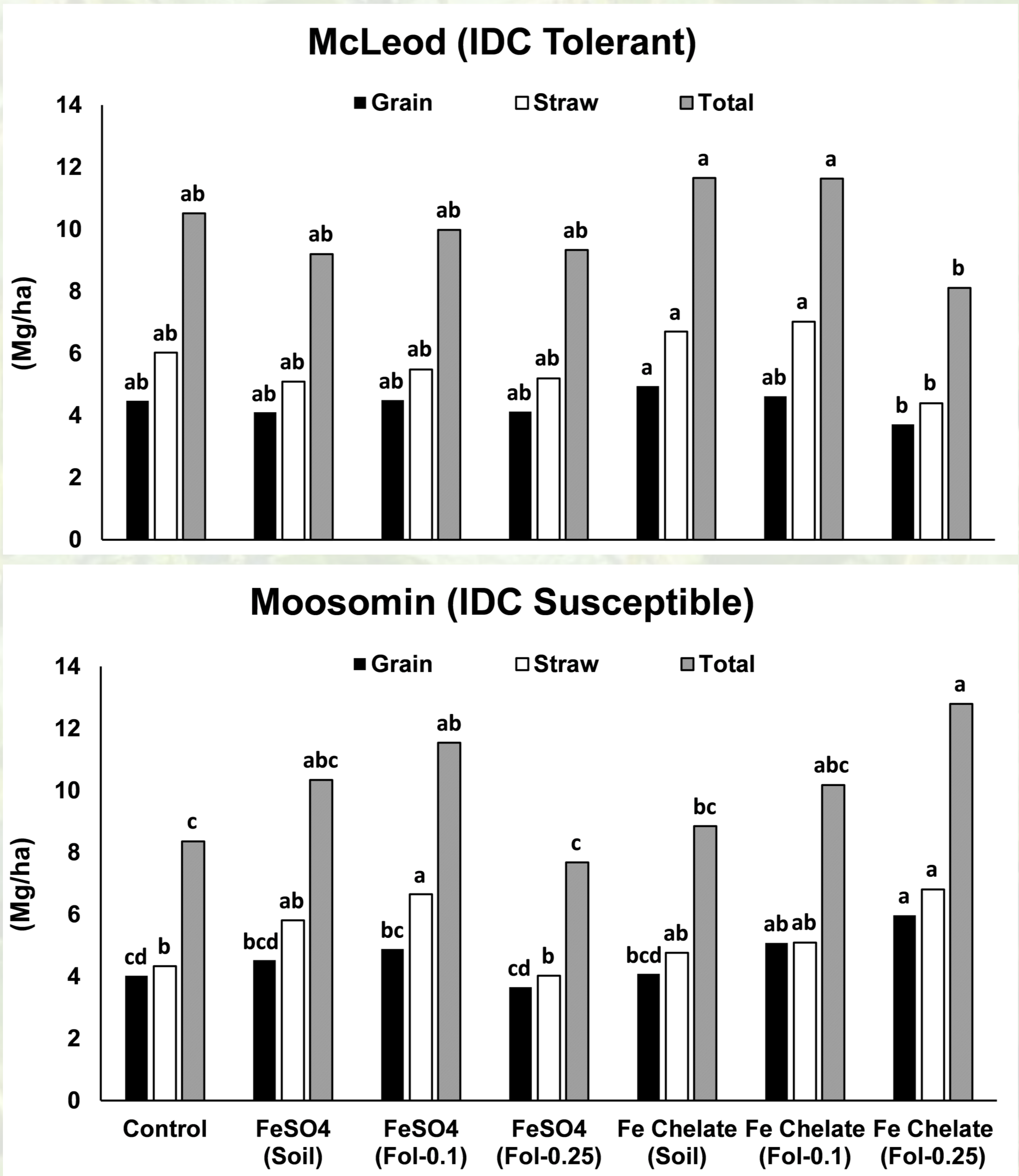

Figure 1. The effect of varying the rate, form, and application method of Fe fertilizer on the growth of two soybean varieties, differing in IDC sensitivity, in a field area prone to IDC. The Fe fertilizer treatments included seed-placed Fe sulphate or chelated-Fe (5 and 0.25 kg Fe/ha, respectively) or foliar application of Fe sulfate and chelated-Fe at two different rates (0.1 kg and 0.25 kg Fe/ha). For each variety and variable, columns with the same letter are not significantly different (P >0.05) using LSD.

- The yields of McLeod (IDC tolerant) and Moosomin (IDC susceptible) in 2016 were similar (approximately 4.5, 5.5, and 10 Mg/ha grain, straw, and total biomass, respectively; Figure 1).
- The foliar Fe applications (0.1 and 0.25 kg Fe/ha) increased the seed yield of Moosomin (IDC susceptible) only; possibly reflecting differences in growth habit, maturity, and root morphology between the two varieties.
- Foliar applied Fe increased the soil Fe supply rate (data not shown), which may reflect the root exudation of assimilated Fe and/or leaching of soluble Fe from the leaves into the soil.

CONCLUSION

- This two-year field trial illustrates the importance of growing season conditions (i.e., soil moisture) on potential soybean growth response to Fe fertilization. Specifically, the wetter spring conditions and increased June rainfall in 2016 help to explain the response to Fe fertilizer amendments, which were absent in 2015.
- The best option for managing IDC risk on prone soils may be to seed a relatively IDC tolerant soybean variety or apply foliar Fe fertilizer to problem areas (i.e., where IDC symptoms appear at the V1-V3 stage) as a rescue strategy, which is more cost-effective than a soil application made at seeding to the entire field area.

ACKNOWLEDGEMENTS

- We are grateful to ADF for the funding, along with the logistical support provided by B. Barlow, R. de Freitas, C. Fatteicher, S. Froese, K. Gudkova, R. and R. Hangs, N. Howse, R. Kar, L. Schoenau, B. Swerhone, R. Vinueza, J. Weins, and Western Ag.