Langbeinite as a partial replacement for traditional potash applications in corn, soybean, and cotton

Introduction

- Increasing yields in corn, soybean, and cotton production systems have placed a bigger demand on soil to provide balanced crop nutrition.
- Muriate of Potash [MOP: 0-0-60] is a common source of potassium (K) fertilizer applied to these cropping systems.
- Continuous and high use rates of MOP can lead to an imbalance of nutrients; especially magnesium (Mg), resulting in reduced yield potential.
- Mg containing fertilizer can be difficult to source and/or are slow to become plant available.
- Langbeinite is a potassium magnesium sulfate mineral with the chemical formula $K_2Mg_2(SO_4)_3$.
- International Minerals Carlsbad manufacturers this mineral (langbeinite) as a fertilizer under the tradename of K-Mag® Premium with an analysis of 0-0-21.5-10.5Mg-21S.

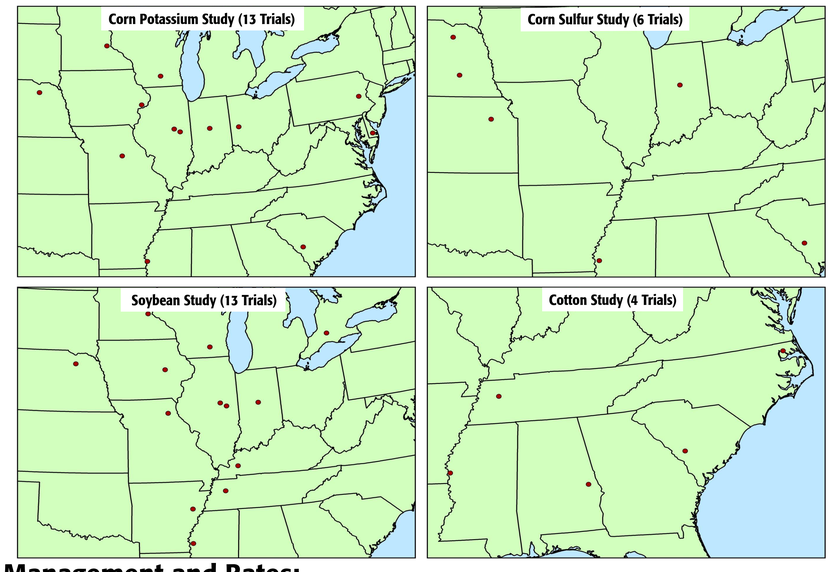
Objective

- Evaluate the yield response of corn, soybean, and cotton to a common rate of MOP and an MOP + K -Mag blend where 17 -33% of the MOP (on a K_2O basis) is replaced with langbeinite.

Materials and Methods

Crops and Locations:

- Crops: Corn (Zea mays); Soybean (Glycine max); Cotton (Gossypium hirsutum).
- Year: 2018
- Experiment Type: Corn -Two trial types (K focus vs. S focus); Soybean -One trial type (K focus); Cotton -One trial type (K focus).
- Locations:



Management and Rates:

- Research conducted by third -party and university contractors.
- Nitrogen rates were balanced across all treatments.
- Phosphorus Rates: Corn (89.7 kg P_2O_5 ha^{-1}) ; Soybean (44.8 kg P_2O_5 ha^{-1}) ; Cotton – As recommended by soil test
- Potassium Rates: Corn (67.3 kg K_2O ha^{-1}) ; Soybean (67.3 kg K_2O ha^{-1}) ; Cotton (134.5 kg K_2O ha^{-1}).
- Treatments were applied preplant and broadcast incorporated.

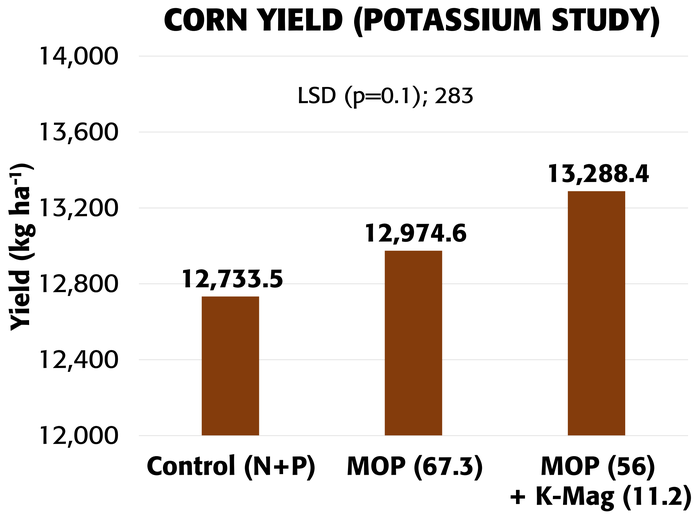
Experimental Design:

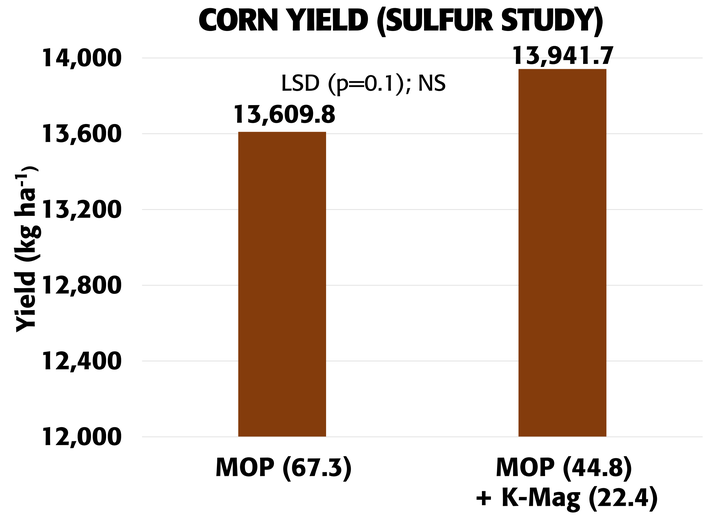
- RCBD with four replications

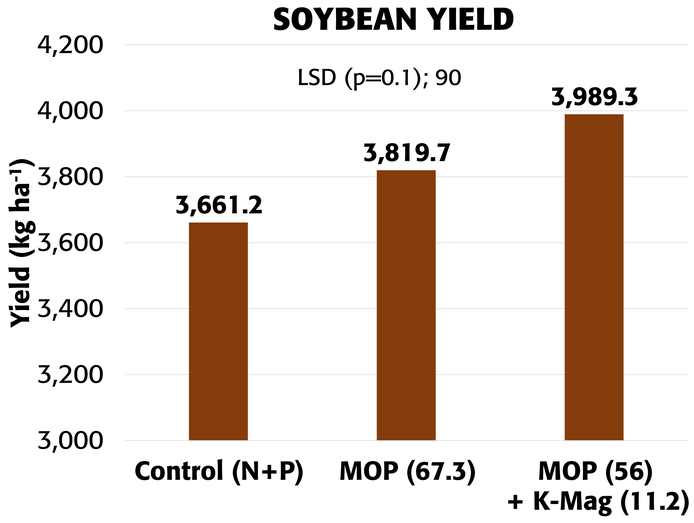
Parameters Measured and Analysis:

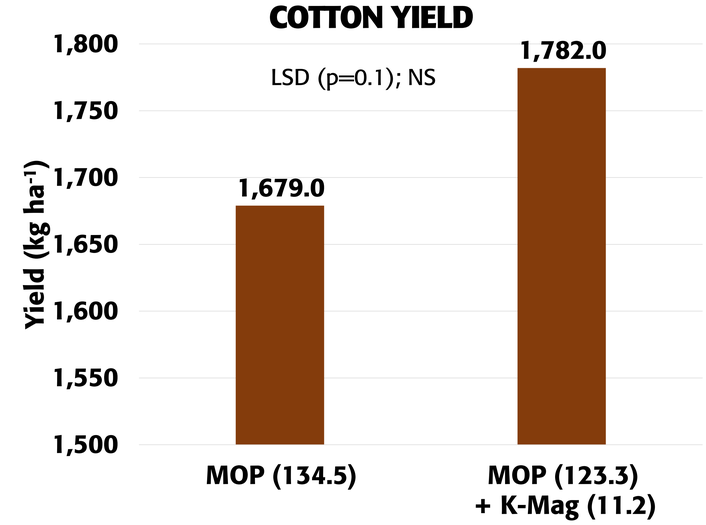
- Grain yield was measured across all treatments
- Statistical analysis was performed in SAS using PROC MIXED.

Results









Corn

- The potassium study showed a yield increase of 241.1 kg ha^{-1} with the MOP treatment when compared to the Control, and a significant yield increase of 313.8 kg ha^{-1} with the addition of MOP+K-Mag over the MOP treatment.
- Averaged across 6 trials (sulfur study), the MOP+K-Mag blend increased yield by 331.9 kg ha^{-1}.

Soybean

- There was a significant K response from the MOP treatment with an additional yield of 158.5 kg ha^{-1}.
- Additionally, the MOP+K-Mag blend provided a significant yield increase of 169.6 kg ha^{-1}.

Cotton

- The addition of MOP+K-Mag resulted in a yield increase of 103 kg ha^{-1}.

Summary

- The corn potassium study showed a significant yield increase when 11.2 kg ha^{-1} of MOP was replaced with K-Mag.
- Replacing MOP with K-Mag at higher rates (22.4 kg ha^{-1}) in the corn sulfur study resulted in yield increases, but were not significant.
- Averaged across 13 soybean trials, a significant yield increase occurred with the addition of the MOP+K-Mag blend.
- Cotton yields increased with the partial replacement of MOP with K-Mag.
- Replacing a small amount of MOP (17 -33% on a K_2O basis) with K-Mag provides better balanced crop nutrition and increased yields across corn, soybean, and cotton cropping systems.

Source: Curt Woolfolk, Kiran Mann, Ross Bender, Kyle Freeman, The Mosaic Company