COMPARISON OF SOIL AND FOLIAR APPLIED POTASSIUM FERTILIZER IN COTTON

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Abstract

Potassium (K^+) uptake by cotton (*Gossypium hirsutum* L.) can be insufficient due to soil reactions reducing K^+ availability following soil application. Foliar K^+ application can supplement soil fertilization due to rapid and efficient absorption and translocation into the plant (Alexander & Schroeder, 1987). Foliar applications have been reported to correct mid to late season K^+ deficiencies during fruiting (Abaye, 2009). In this experiment the effect of irrigation, application methods, K^+ sources and rates of K^+ on lint yield were investigated during 2017 and 2018 in New Deal, TX at the Texas Tech Farm. Our objective was to determine the impact of pre-plant, in-furrow and foliar applied K^+ fertilizer on cotton growth, yield and quality. Potassium was applied as solution muriate of potash, KCl (0-0-15), potassium thiosulfate, KTS (0-0-25-17S), and NACHURS K-Fuel, potassium acetate (0-0-24) using three application methods of pre-plant knife injected (KCl, KTS, and K-Fuel), in-furrow (K-Fuel), and foliar (KTS and K-Fuel). Foliar K^+ was applied at late pinhead square, 5-7 days after 1st bloom and at peak bloom.

Soil K^+ levels ranged from 605 mg kg^{-1} at the shallowest depth (0-6") to 370 mg kg^{-1} at the deepest depth (12-24") in 2017 and from 508 mg kg-1 at the shallowest depth (0-6") to 258 mg kg-1 at the deepest depth (12-24") in 2018. Under high irrigation in 2017, cotton lint yield was significantly increased across all treatments with 120 lb K^+ $acre^{-1}$ as KCl and 26 lb K^+ $acre^{-1}$ of injected K-Fuel yielding 200 lb $acre^{-1}$ more than the check (0 lb K^+ $acre^{-1}$). When water is not limited, increasing K^+ levels generally increased cotton yields up to 120 lb K^+ $acre^{-1}$ with KCl (injected) and 26 lb K^+ $acre^{-1}$ as K-Fuel (injected). In 2017 under low irrigation cotton lint yield was not significantly impacted by K^+ rate and K^+ application method, however K-Fuel applied at 11 lb K^+ $acre^{-1}$ (injection) increased yields by 200 lb $acre^{-1}$ compared to the check. In 2018 there were no significant differences amongst treatments for both high and low irrigation levels. Potassium use efficiency (KUE) of the highest yielding treatment applied at 42 lb K $acre^{-1}$ (injection) was less than most other treatments. It can be concluded from this experiment that under high irrigation cotton lint yield was greater in 120 lb K^+ $acre^{-1}$ applied as KCl and 26 lb K^+ $acre^{-1}$ as K-Fuel, while under low irrigation there was no significant difference in K^+ compared to the check in 2017. In 2018 KUE of K-Fuel applied in-furrow (48.9 lb lint lb K^{-1}) was significantly greater than all treatments and the check under high irrigation. Potassium source, application method and rate are important production management decisions due to different yield responses under varying irrigation levels and environmental conditions.

References

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