PHOSPHORUS AND POTASSIUM EFFECTS ON COTTON LINT YIELD AND FIBER QUALITY Amee R. Bumguardner Katie L. Lewis Texas A&M AgriLife Research Lubbock, TX

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<u>Abstract</u>

There are an increasing number of subsurface drip irrigation (SDI) acres on the Southern High Plains of Texas. The SDI technology has increased yield potential of cotton mainly due to reduced episodic moisture stress compared to pivot irrigation. Subsurface drip irrigation can be used to improve management and use efficiency of fertilizers. Using conventional application methods of phosphorus (P) and potassium (K) can reduce availability and plant response within a growing season. When fertilizers are applied with SDI, they are placed in the seed furrow potentially increasing plant uptake and use efficiency. However, there are few P and K fertilizer sources labeled for application with SDI. In this experiment the effect of application methods and rates of P sources on lint yield and fiber quality were investigated during the 2017 through 2021 growing season in New Deal, TX at the Texas Tech Research Farm. More specifically, our objective was to evaluate P fertilizer rates and sources (with and without K) applied using SDI compared to a conventional knife-injection method of ammonium polyphosphate (10-34-0). Two commercially available P fertilizers, Intelliphos 45 (3-38-0) and 32 (0-24-8), were applied using SDI.

The pH of the soil averaged 7.8 at the 0-6" depth across all years. Soil nitrate (NO₃⁻-N), P and K levels decrease as depth increases. Soil P levels ranged from 27 to 3 ppm and soil K levels ranged from 591 (0-6") to 300 (12-24") ppm were very high for all years, according to the rating system of the Texas A&M AgriLife Extension Soil, Forage and Water testing lab. Micronutrients decreased from 2018 to 2021. The change in P was greater when Intelliphos 32 with K was applied compared to Intelliphos 45 without K. Intelliphos 45 had significantly less change in micronutrients (Fe, Zn, Mn). In 2018 lint yield was greater than the check with 0-24-8 fertilizer applied at a rate of 4 lb P acre⁻¹ and 3 lb K acre⁻¹. When 3-38-0 fertilizer was applied in 2018 at a rate of 13 lb P acre⁻¹ lint yield was greater than the check when the 0-24-8 fertilizer was applied at rates of 4 lb P acre⁻¹ plus 3 lb K acre⁻¹ and 7 lb P acre⁻¹ plus 4 lb K acre⁻¹. Phosphorus use efficiency (PUE) was greater with treatments that had the addition of K applied as 0-24-8 compared to treatments without the addition of K. When 4 lbs of P acre⁻¹ was applied as 3-38-0 (no K applied) PUE was negative and positive when K was applied. Fiber quality parameters were significantly affected by the application of the 3-38-0 and 0-24-8 fertilizers applied by SDI compared to the conventionally applied 10-34-0 fertilizer or the check. In summary, the 0-24-8 fertilizer applied using SDI resulted in more consistent positive effects on lint yield and PUE. Applying P and K fertilizer using SDI should provide more consistent positive responses than knife-injected fertilizers.