IN-SEASON NITROGEN APPLICATION METHOD INFLUENCE ON GRAIN SORGHUM PERFORMANCE

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ABSTRACT

Grain sorghum production in the United States is concentrated in the Great Plains. This region is prone too harsh environments that may provide opportunities for extensive N losses when relying on pre-plant N application alone. This problem may be alleviated through moving N application later in the growing season to optimize N availability when plant N uptake is most required to prevent yield loss. However, fertilizer application equipment availability may be limited for many producers in the region that utilize wheat as their primary crop. This study compares multiple N application methods influence on visual injury symptomology, crop recovery and subsequent potential for yield loss. The study made use of urea (46-0-0) and UAN (28-0-0) across 3 locations in central Oklahoma. 9 fertilized treatments and one zero N in-season check tested the influence of N source, nozzle type, nozzle height and nozzle spacing on grain sorghum performance. A pre-plant N application of approximately 60 lb ac-1 was applied to all treatments followed by 60 lb ac-1 applied in season according to treatment method. The information provided by this experiment will empower grain sorghum producers to make informed decisions about their N application within the bounds of restraints such as equipment availability and source options to maximize profit opportunities.

INTRODUCTION

Grain Sorghum production continues to be an important component of many crop rotations on the great plains. However, production decisions such as N application timing continue to be restrained by equipment availability for many producers who focus on small grains production. Research into N application timing of several crops including grain sorghum exhibit several possible benefits to in-season N application over a traditional pre-plant application. This study looks to compare in-season N application methods in grain sorghum to provide sound agronomic information on potential yield response to sub-optimal N application methods.

MATERIALS AND METHODS

This experiment was located at 3 sites in central Oklahoma, Chickasha, Perkins, and Lake Carl Blackwell. The experiment consisted of 10 in-season N application treatments replicated 4 times. Plots were approximately 20’ long and 4 rows wide. Sorghum was planted on 30” row spacings. Treatment application methods are denoted in figures 1-3 using abbreviations; BC= broadcast, FF= flat fan nozzle, SJ3= Teejet SJ3 streamer, and T-Bar= Chafer Streamer Bar. All plots were applied N pre-plant using UAN (28-0-0). In-season applications were also made at a rate of 60 lbs. N ac^{-1}. Data analysis was completed using SAS 9.4.

RESULTS AND DISCUSSION

Nitrogen application significantly increased yield at 2 of 3 locations (Perkins and Lake Carl Blackwell). At the Perkins location (Figure 1) all differences between fertilized treatments were insignificant excluding the T-bar treatment. Similar results were observed at the Lake Carl Blackwell (Figure 2) with the T-bar application treatment yielding significantly lower than the other fertilized treatments. The Chickasha location did not respond to additional N application above the check. However, the T-bar treatment yielded significantly less than all other treatments including the check. The results observed across these three locations suggest that in-season applications made with sub-optimal equipment can provide similar performance. This excludes the T-Bar application which decreased yield across all locations. This is believed to be attributable to the large amount of damage to leaf material relative to the other treatments tested.

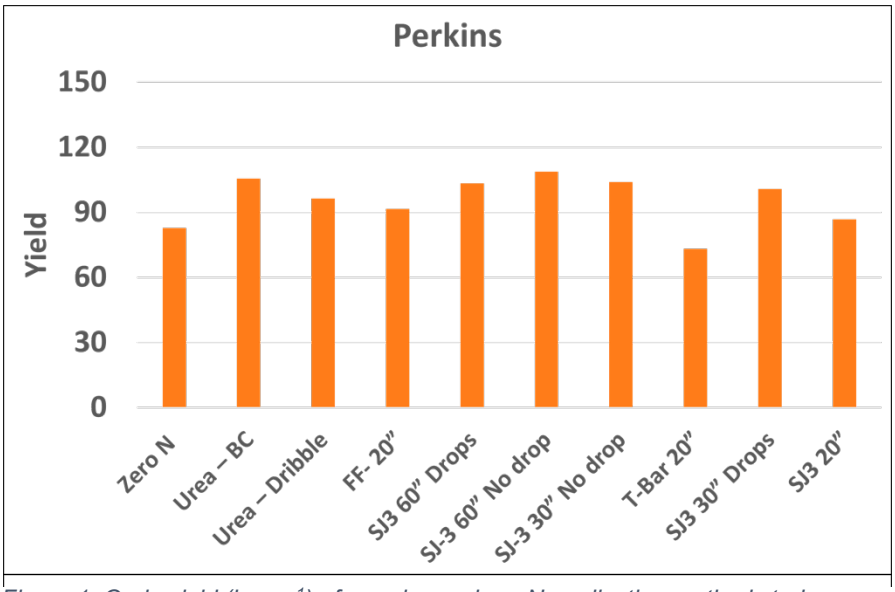

Figure 1. Grain yield (bu ac^{-1}) of a grain sorghum N application method study located at Perkins, OK in the 2021 growing season.

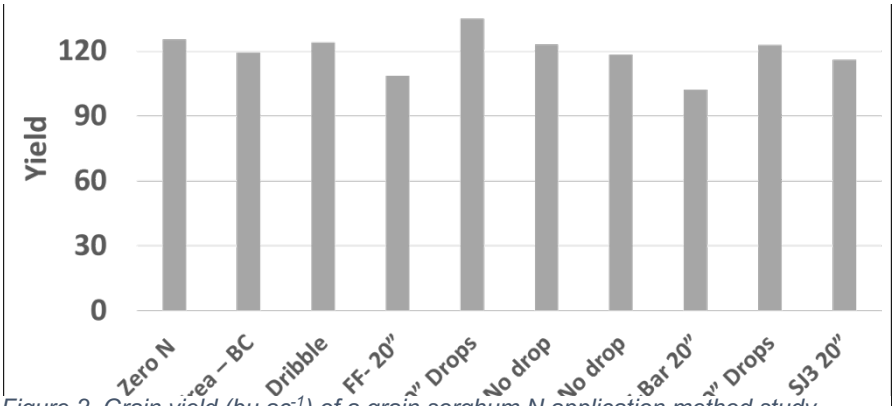

Figure 2. Grain yield (bu ac^{-1}) of a grain sorghum N application method study located at Chickasha, OK in the 2021 growing season.

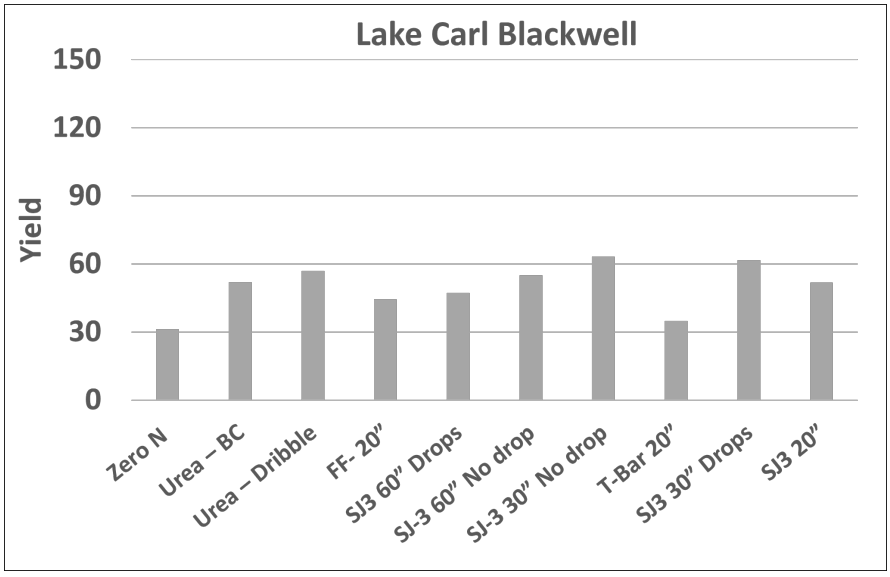

Figure 3 Grain yield (bu ac^{-1}) of a grain sorghum N application method study located at Lake Carl Blackwell near Stillwater, OK in the 2021 growing season.

SUMMARY

Nitrogen management in grain sorghum is an important component of many systems of the Great Plains. When considering the equipment limitations of many producers of the region, in-season applications with many of the technologies tested in this study may be a feasible alternative to purchasing new equipment/technologies. This study suggests that grain yield performance of grain sorghum is unlikely to be hindered when using most application methods. However, producers should be aware that excessive damage to grain sorghum leaf material such as that observed under the T-bar treatment can not only impair yield relative to other application methods but create a negative response to N application. Excessively stressful or beneficial environments may further influence performance of these application methods, as such this study will be continued to increase observations under different environmental conditions.