

Drs. W.B. Gordon and D.A. Whitney

Starters Bump Grain Sorghum Yields

Kansas experiments were conducted on both minimum-till and no-till systems, using 2 x 2 and dribble methods of placement.

Summary: All starter treatments increased grain sorghum yield over the no-starter check plots. In both tillage systems, yields were maximized by application of starter fertilizer containing either 30 or 45 lbs/A of nitrogen (N) with 30 lbs/A of P_2O_5 . In 2001, there were no differences between 2 x 2 and band-dribbled starter fertilizer. In previous years, subsurface placed starter had proven to be more efficient than placing fertilizer in a surface band. When averaged over tillage treatments, starters containing 30 lbs/A of N and 30 lbs/A of P_2O_5 decreased the number of days from emergence to mid-bloom by over 13 days, compared to the no-starter checks.

Conservation tillage production systems are being used by an increasing number of producers in the central Great Plains because of several inherent advantages. These include reduction of soil erosion losses, increased soil water-use efficiency, and improved soil quality. However, early-season plant growth can be poorer in reduced tillage systems than in conventional systems. The large amount of surface residue present in a no-till system can reduce seed zone temperatures. Lower than optimum soil temperature can reduce the rate of root growth and P uptake by plants. Starter fertilizers can be applied to place nutrient elements within the rooting zone of young seedlings for better availability, which will hasten maturity and avoid late-season damage by low temperatures.

Some experiments that have evaluated crop response to N and P starters have demonstrated improved early growth as well as increased yields, and attributed those responses to the P component of the combination. Other studies have indicated that nitrogen (N) is the most critical element in the NP starter on soils not low in P. Many producers do not favor 2 x 2

placement of starters due to the high initial cost of application equipment and problems associated with knife applications in high residue situations.

This research is aimed at minimizing fertility problems that arise with reduced tillage systems, thus making conservation-till more attractive to producers.

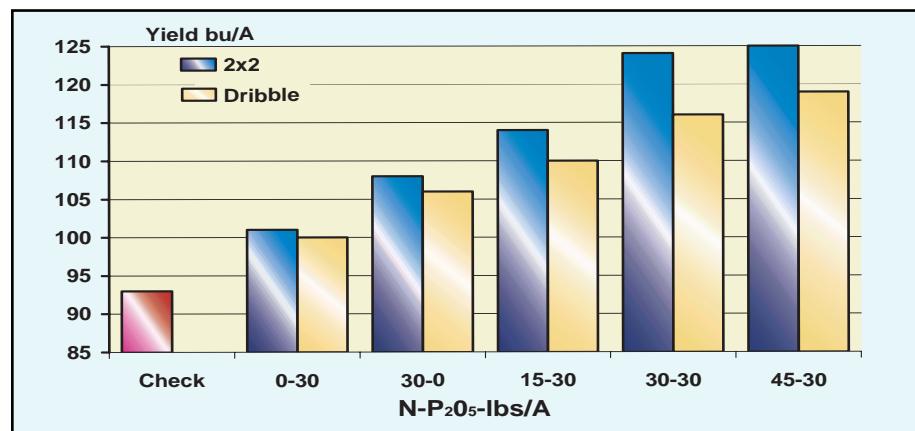


Figure 1. NP starter fertilizer placement and composition effects on grain sorghum yield in a reduced-till system, Gordon and Whitney, Belleville, 1999-2001.

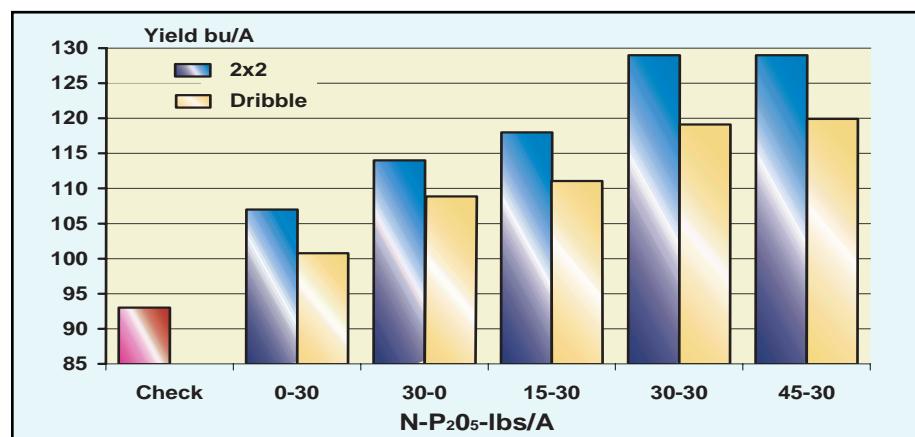


Figure 2. NP starter fertilizer placement and composition effects on grain sorghum yield in a no-till system, Gordon and Whitney, Belleville, 1999-2001.

Responses to variables

Placement. Although surface dribble-applied starters had not been as effective as 2 x 2 placed starters the previous two years of the experiment, there was no difference in starter placement methods in 2001. A very wet spring probably increased the efficiency of the surface-banded starter. Grain sorghum tissue nutrient concentrations were not affected by starter application method.

When averaged over the period 1999-2001, yield of 2 x 2 placed starters was only 6 bu/A greater than the surface-dribble treatment (Figures 1 and 2).

Fertilizer. The greatest yields occurred with applications of starters containing either 30 or 45 lbs/A of N with 30 lbs/A of P₂O₅. Higher N starters were the most efficient in reducing the number of days from emergence to mid-bloom. N alone or P alone did not yield as well as starters that contained both N and P. Treatments containing only 15 lbs/A of N with 30 lbs/A of P₂O₅ also were not as effective as starters containing more N. The starters containing either 30 or 45 lbs/A of N with 30 lbs/A of P₂O₅ resulted in the greatest V-6 stage whole plant dry matter accumulation. Tissue P concentrations increased with increasing amounts of N in the starter.

Starter vs. check. All starter treatments increased grain sorghum yield over the no-starter check plots. All starter treatments increased V-6 stage whole plant dry matter over the no-starter check. Grain moisture in the 30-30 starter treatment was lower at all sample dates compared to the no-starter

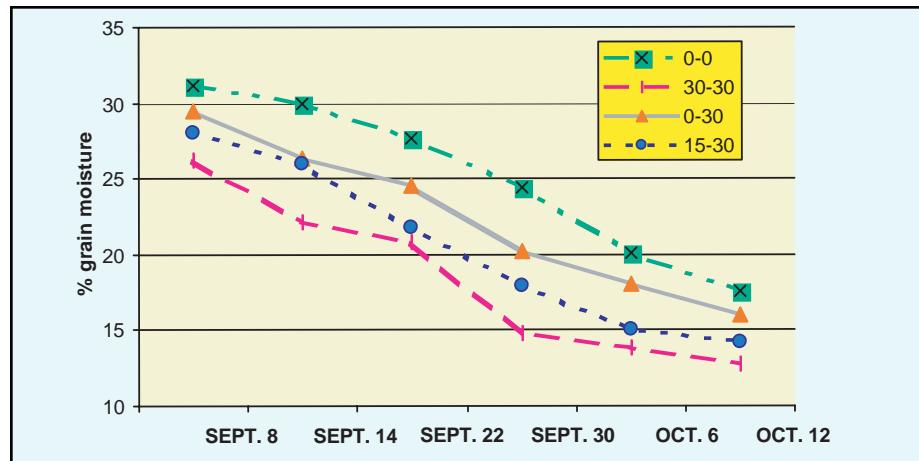


Figure 3. Effect of NP starter fertilizer composition on grain moisture dry-down for a 2 x 2 placement (values averaged over tillage system), Gordon & Whitney, Belleville, 2001.

check, as well as the P alone treatment, or the one that included only 15 lbs/A of N (Figure 3).

Tillage. Use of starters resulted in greater yields in both tillage systems. Grain yield, days from emergence to mid-bloom, and V-6 stage whole plant dry matter were not affected by tillage system. Grain sorghum tissue nutrient concentrations were not affected by tillage.

Methodology

Soil. The experiment was conducted at the North Central Kansas Experiment Field on a Crete silt loam soil. Analysis by the KSU Soil Testing Lab showed that initial soil pH was 6.2, organic matter was 2.2 percent, Bray P-1 was 45 ppm, and exchangeable K was 320 ppm in the top 6 inches of soil.

Tillage systems were minimum- and no-till. The minimum-till system received one disking and harrowing operation in the spring, three weeks prior to planting.

Placement. Starters were placed at planting either 2 inches to the side and 2 inches below the seed or dribbled in a band on the soil surface 2 inches beside the seed.

Fertilizers. Starters consisted of N and P₂O₅ combinations giving 15, 30, or 45 lbs/A of N with 30 lbs/A of P₂O₅. Also included were treatments consisting of 1) either 30 lbs/A of N or 30 lbs/A of P₂O₅ applied alone, and 2) a no-starter check. Starter combinations were made by using 10-34-0 and 28% UAN. After planting, knife applications of 28% UAN were made to bring N applied on each plot to a total of 140 lbs/A.

Planting. Grain sorghum (NC+7R83) was planted at the rate of 60,000 seeds/A on May 22, 2001.

Harvest. Plots were harvested on October 12, 2001.

Dr. Gordon is professor and Dr. Whitney is professor in the Department of Agronomy at Kansas State University.