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Two By Two Starter Superior In Grain Sorghum Trials

Surface dribble applications greatly improved yields over no-starter check but were not as effective as two by two placement in Kansas minimum-/no-till experiments.

Summary: In both no-till and minimum-till grain sorghum yields were maximized by application of 2 x 2 starter fertilizer containing either 30 or 45 lbs/A of N with 30 lbs/A of P₂O₅. Starters containing 30 lbs/A of N and 30 lbs/A of P₂O₅ decreased the number of days from emergence to mid-bloom by nine days compared to the no-starter check. Although surface dribble applications greatly improved yields over the no-starter check, they were not quite as effective as the subsurface 2 x 2 starter placement. Results of this research should make conservation tillage a more attractive option to producers.

Reduced tillage systems have been proven to be effective in maintaining crop residues, reducing soil erosion losses, and conserving water. The amount of surface residue maintained with reduced or no-till systems is critical as it can lower the seed zone temperature, causing problems with nutrient availability and uptake. Success with conservation tillage systems depends in part on fertilizer management. Tillage influences the physical properties of soil and these can change the soil nutrient status and ability of crops to access nutrients. Poor seedling growth resulting from low nutrient availability in cool soils can occur irrespective of residual fertility levels.

Starter fertilizer can be applied to place nutrients within the rooting zone of young plants for better availability. Many producers prefer to surface-apply fertilizer either before or at planting

because of the cost and weight of specialized equipment needed to subsurface band fertilizer at planting, and the potential plugging problems that may arise when fertilizer is knife-applied in heavy residue.

Some producers are aware of the benefit of starter fertilizer in strictly no-till systems but are hesitant to use starter

systems that include some tillage because they feel the response may not be great enough to justify the expense.

The objective of this research has been to investigate the effects of N-P starter combinations applied either subsurface or dribbled at different rates on the soil surface in two tillage systems. Because the 2000 growing

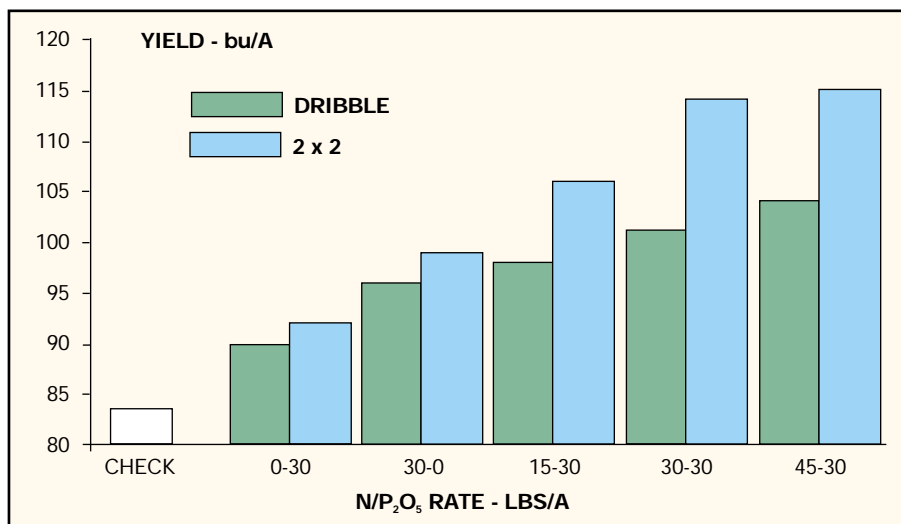


Figure 1. Minimum-till, starter placement, and composition effects on grain sorghum yield at Belleville, Gordon, et al., 1999-2000.

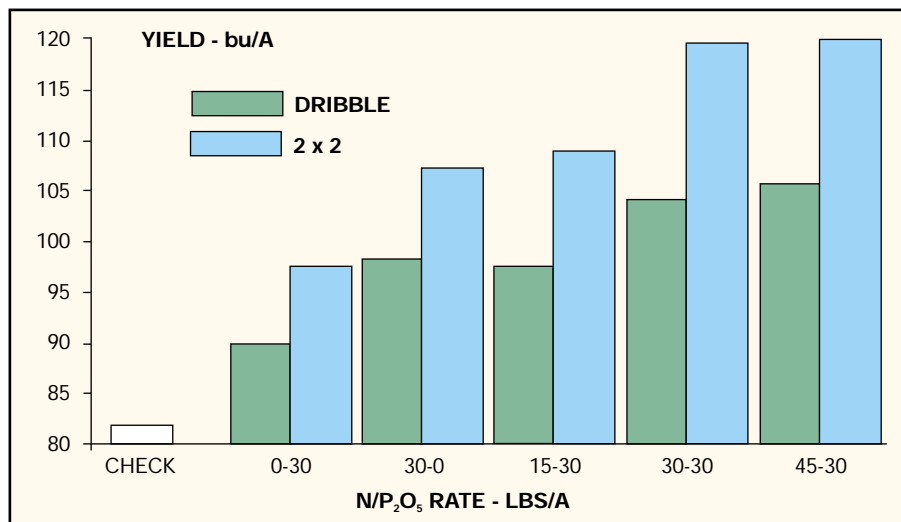


Figure 2. No-till, starter placement, and composition effects on grain sorghum yield at Belleville, Gordon, et al., 1999-2000.

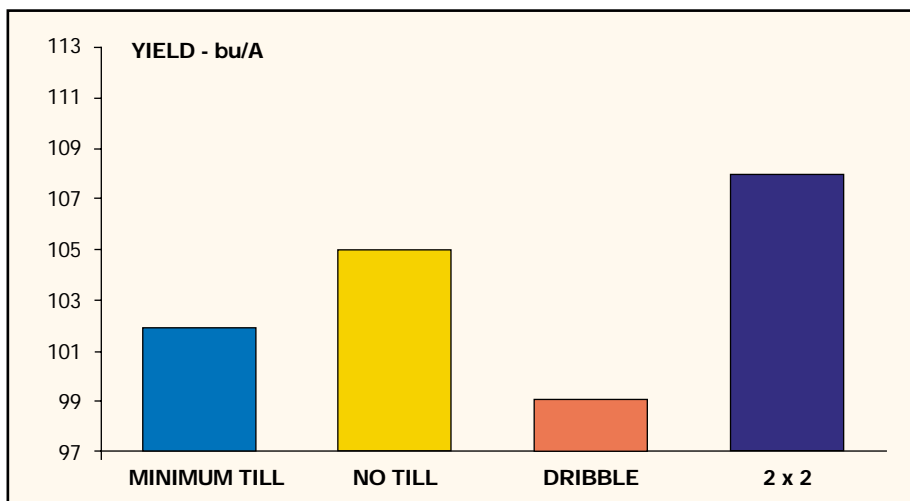


Figure 3. Means for grain yield as affected by tillage and fertilizer placement at Belleville, Gordon, et al., 1999-2000.

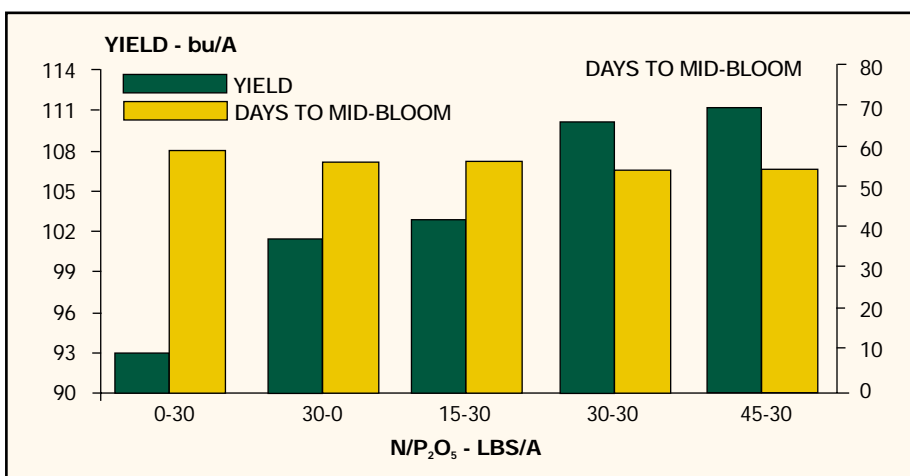


Figure 4. Means for grain yield and days to mid-bloom as affected by starter composition at Belleville, Gordon, et al., 1999-2000.

season was the warmest and driest since 1934, yields were much below the long-term average.

Dribble vs 2 x 2

Although surface dribble-applied starter fertilizer increased grain yield over the no-starter check, yields were greater when fertilizer was placed 2 x 2 (Figures 1 and 2).

When averaged over tillage and starter combinations, yields were 9 bu/A greater when starter was placed subsurface as compared to surface dribble (Figure 3). However, when averaged over two years of the experiment, 90 percent of maximum yield was achieved with dribble-applied starters. At the V6 stage, whole-plant concentrations of N and P were greater when fertilizer was placed 2 x 2 rather than

dribbled on the soil surface. Early-season differences in nutrient uptake between starter application methods were still present at later growth stages. Leaf tissue concentrations of N and P at early bloom were greater when starter fertilizer was applied 2 x 2 compared to surface dribble applications.

Minimum vs no-till

While grain yields, days from emergence to mid-bloom, and plant tissue nutrient concentrations were not affected by tillage system, the use of starters did increase yields in either system. The greatest yields occurred with 2 x 2 applications of starter fertilizer containing either 30 or 45 lbs/A of N in combination with P (Figures 1 and 2). The higher N starters were also the most efficient in reducing the number of days

from emergence to mid-bloom (Figure 4). Early-season dry matter yield was the one tillage exception, being greater in the minimum-till system than the no-till system.

Solo vs combo

The N-alone or P-alone treatments did not yield as well as starters that contained both N and P. The treatment containing only 15 lbs/A of N with 30 lbs/A of P₂O₅ was not as effective as starters containing more N.

Methodology

Location. The experiment was conducted at the North Central Kansas Experiment Field.

Soil was a Crete silt loam with an initial pH of 6.2, organic matter at 2.2 percent, Bray-I P at 42 ppm, and exchangeable K at 320 ppm in the top 6 inches of soil.

Cultivation. The minimum-till system was disked and harrowed once in the spring three weeks prior to planting.

Fertilizer. Starter combinations were made by using liquid ammonium polyphosphate (10-34-0) and 28 percent UAN. The treatment receiving 30 lbs/A of P₂O₅ applied alone was made by using laboratory grade phosphoric acid.

Placement. At planting, starter was placed either 2 inches to the side and 2 inches below the seed or dribbled in a band on the soil 2 inches to the side of the seed row.

Application rate. Starters consisting of N and P₂O₅ combinations were applied at the rate of 15, 30 or 45 lbs/A of N with 30 lbs/A of P₂O₅. Also included were treatments consisting of either 30 lbs/A of N or 30 lbs/A of P₂O₅ applied alone, and a no-starter check. After planting but before emergence, knife applications of 28 percent UAN were made to bring N applied to each plot to a total of 140 lbs/A.

Seeding. Grain sorghum (NC+7R83) was planted at the rate of 60,000 seeds/A on May 17, 2000.

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