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Fluid Starters Boost Cotton Yields

Studies in Mississippi, Alabama, and North Carolina show that cotton reponds well to starters.

In the fall issue of the Fluid Journal, we took a look at the use of starters on corn and the impact the switch to conservation tillage is having on fertilizer placement. We will continue the study of responses to fluid starters, focusing on cotton in this second of a three-part series. Our report will cover research studies in Mississippi, Alabama, and North Carolina.

The underlying thread that should be kept in mind throughout this series is the key role fluid starters play in improving crop yields. They operate in cooler temperatures, offer both precise placement and higher efficiency, as well as reduce weed pressure, stratification and nutrient tie-up.

Funderburg (Mississippi Cooperative Extension service) defines starter fertilizers as "an amount of nitrogen/phosphate fertilizer banded near—but not on—the seed at time of planting." He stresses that large amounts of starter fertilizer should not be in direct contact with the seed and notes that fertilizer contact with the seed can result in severe stand reductions.

Cotton responsive

Cotton, like most other crops, produces a range of responses to starter fertilizers.

In the East, starters appear to enhance yields regardless of planting date. There is a greater probability of a yield increase on lighter-textured soils and where there are substantial legume residues. Using starter on cotton grown in legume residue may enhance seedling vigor. Placement beside and below the seed (2 by 2) appears to optimize yields. Soil conditions predict the efficacy of subsoiling. In addition, N and phosphate applied at 15 lbs/A has been the preferred nutrient ratio. Occasionally, small amounts of K_2O have increased yields.

In the South, NP starters have shown yield increases even when soil P levels are very high. There may be soil types where surface band applications outperform in-furrow placement, but more research is needed. Placement of NPK mixes has enhanced root growth and thought resistance. Finally, it is relatively easy to set up cotton planters for starters. The economics appear to favor a small amount of strategically placed starter to augment the regular fertilizer program.

Cotton is a deep tap-rooted species that responds well to nitrogen and side-banded phosphate. Recommended nitrogen rates vary from 50 to 100 lbs/A. The optimum range of nitrogen depends on soil texture, the preceding crop, and the amount and distribution of rainfall. Producers use split N applications to maximize nitrogen use efficiency when nitrogen loss potential is high.

One bale of lint will remove approximately 70 pounds of nitrogen, 14 pounds of phosphate, and 35 pounds of potassium. In spite of the relatively low amount of P taken up, phosphate fertilization is very important. Cotton soils tend to he low in phosphorus. Adequate phosphorus is essential for seedling vigor, drought stress, proper boll maturity, and seed development. Banded nutrients are generally more efficient than broadcast. Oklahoma State University recommends phosphate be placed where soil is likely to he moist and root contact is imminent. OSU does not recommend surface P applications because they are inefficient under Oklahoma conditions. The recommended placement is two inches beside and below the seed. However,

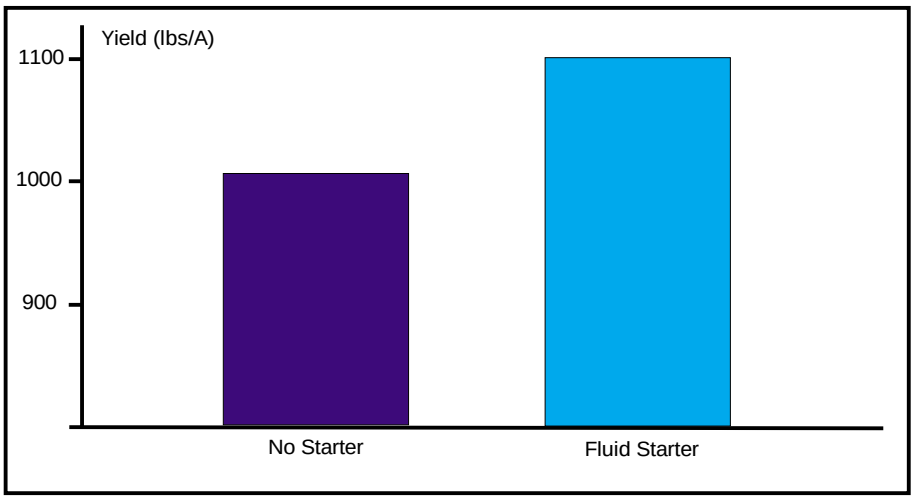

Figure 1. Average lint yield increases, showing cotton response to applications of fluid starters (10-34-0 or 11-37-0 at 12 gal/A), Funderburg, Louisiana State University, 1988.

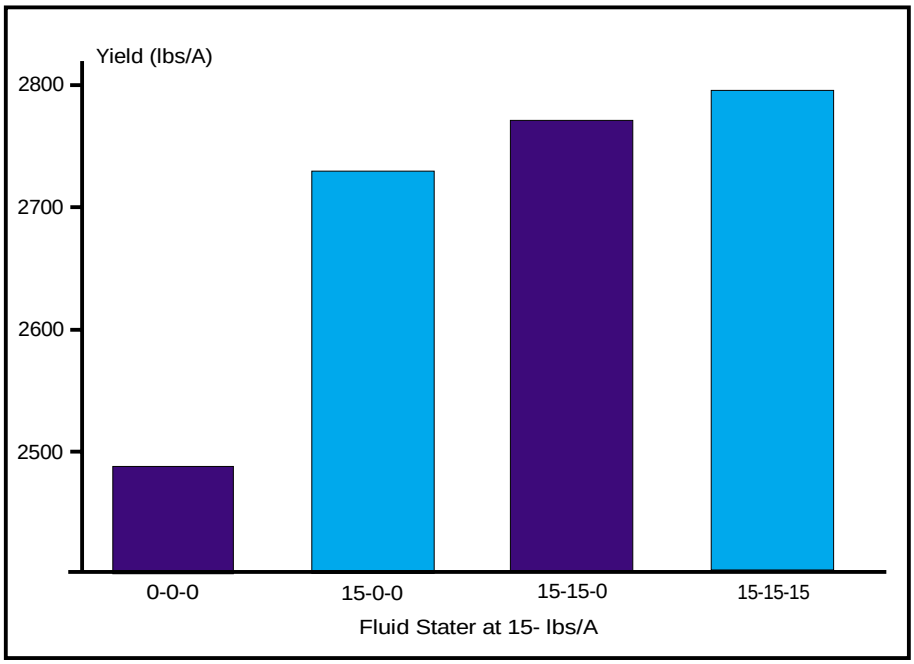

Figure 2. Average lint yield response to varying fluid starter combinations, 2 x 2 placement, Touchton, Auburn University, 1986.

hand place-ment becomes less critical if the soil test is rather high or phosphate application rate is high.

Cotton responses to fertilizer nutrients placed near the seed at planting have been studied since the '50s. Early studies showed that cotton had greater resistance to adverse environmental conditions, such as lack of moisture, if starter was used. Patrick, et al. showed in 1959 that 500 lbs of 12-12-12 improved yield and root development under thought conditions.

Studies limited on cotton

Although there is only a limited amount of research completed on starter effects on cotton, studies are in progress at several universities in the cotton-producing states where fertilizer rate recommendations are being formulated. Consequently, information that follows from these studies should serve as a guide -not a recommendation.

Mississippi. The average of 18 replicated trials by Funderburg at different locations (1985-1987) showed lint yields from plots receiving fluid starter (10-34-0 or 11-37-0 at 12 gal/A) were 1,093 lbs/A while treatments receiving no starter yielded only 1,000 lbs/A (Figure 1). Many of the increases were statistically significant at greater than the .05 level of probability. Funderburg observed that yield increases were more dramatic in higher yielding environments. He suggested that fields with a yield potential of about 850 lbs/A were more responsive to planter applied phosphate.

Since the fluid starter fertilizer contained both nitrogen and phosphate, Funderburg ran another study to determine whether yield response originated from nitrogen alone or from phosphorus in combination with nitrogen. Based on the trials, he concluded that the NP combination significantly increased yields over check plots while nitrogen alone had little or no effect on yield

Alabama. Touchton, et al. conducted studies (1985-87) on fluid starter combinations and placement for conventional and no-till cotton. Soils were silt loam and sandy loam. Tillage variables consisted of conventional till, no-till, and no-till plus in-row subsoiling Placement treatments consisted of deep fertilizer placement at 6 to 8 inches below the seed and 2 x 2 place-ment beside and below the seed, Fertilizer combinations were no starter, 15-0-0, 15-15-0 or 15-15-5 applied at 150 lbs/A.

Starters did not affect early season plant heights on the silt loam soil, but starters increased plant height each year on the sandy loam soil. In one year, N alone was adequate. But in the other two years, NP combinations resulted in greater plant heights as compared to N alone. The 2 x 2 fertilizers were generally more effective than deep-

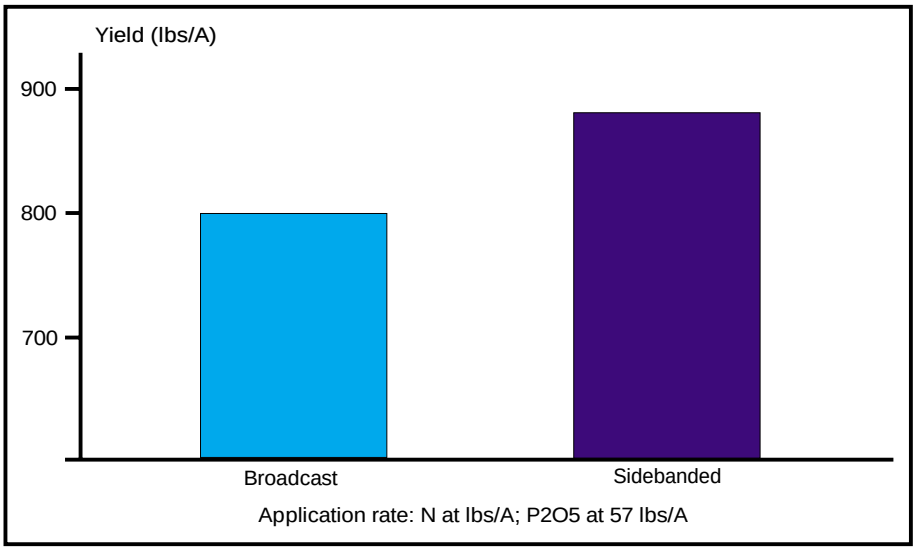

Figure 3. Effect of APP starter placement on cotton yields, Guthrie, North Carolina State University, 1991.

placed fertilizer.

Seed cotton did not correlate well with early season growth. Yield increases varied among soils, treatments, and over years. Fluid starters produced yield increases in two out of the three years on both soils. When comparing across the years, conventional and no-till were the optimum treatment combinations for the silt loam soil, being about equal with 2 x 2 placed NP or NPK+ In-row subsoil-ing produced mixed results. For sandy loam soil, the best treatment combina-tions were conventional or no-till, in-row subsoiling (regardless of tillage), and 2 x 2 or deep-placed NP and occa-sionally NPK. Averaging across tillagc systems for the two years in which yield responses occurred showed that 2 x 2 placement resulted in yields as shown in Figure 2.

North Carolina. ln 1991 experiments, Guthrie evaluated the effects of cotton planting date and sidehanded fluid starter fertilizer. Cotton was grown at four sites: two Norfolk loamy sands and two Craven fine sandy loams. Ammonium polyphosphate was applied either broadcast or sidehanded at a nitrogen rate of 17 lbs/A and phosphate rate of 57 lbs/A. Placement had minor effects on plant population. Sidebanding increased lint yield 73 lbs/A versus broadcast (Figure 3). Conclusion was sidebanding can benefit producers irre-spective of environmental conditions or planting date.

The yield increase was consistent with that reported by Funderburg in 1988. However, Guthrie's results do not agree with Funderburg's finding that yield responses to fluid starters were greatest where lint yields exceeded 850 lbs/A. In Guthrie's study, starters consistently improved yields, although overall yields declined with later planting dates. So data from this study suggest that response to sidebanded fluid starters does not depend on the presence of early season environmental stress.

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