

TILLAGE SYSTEMS AND N FERTILIZER PRACTICES EFFECT ON CORN YIELDS IN THE TEXAS BLACKLAND PRAIRIE

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ABSTRACT

In the Blackland Prairie of Texas conservation tillage systems are needed to reduce erosion losses and to improve agricultural sustainability. Fertilizer N practices with conservation tillage systems in this region have not been well developed. In 1994, an experiment was established to determine plant response to N fertilizer rate and timing within three different tillage systems. A split plot experiment with 4 replications was established on a Houston Black clay (Fine, smectitic, thermic Udic Haplusterts) soil. The main plots were a chisel tillage system without beds (conventional for the area), a chisel tillage system with raised wide beds, and a no tillage system with raised wide beds. The subplots were seven soil fertility treatments, consisting of ¹¹ four fertility rates (0, 56, 112, and 168 kg N ha⁻¹) applied at planting and three fertilizer application timing treatments (fall, at planting, and split between at planting and 30 d later). The crop rotation was wheat (*Triticum aestivum* L.) followed by corn (*Zea mays* L.) which was followed by grain sorghum (*Sorghum bicolor* L.). The experimental treatments were imposed on corn each year for four years. Plant samples were collected for grain yield, biomass production, and N uptake. The results from this study indicate that corn yields in the Texas Blackland Prairie may respond positively to planting corn rows on beds and particularly to a change to a conservation tillage system. Large differences were observed between years due to soil moisture conditions during the growing season, with two years of low rainfall conditions and two years of high rainfall conditions during the growing season. The highest yields were observed with the no tillage system, with large differences observed between no tillage and the other tillage systems in low rainfall years. In wet years, grain yields and N uptake increased with N application up to 168 kg N ha⁻¹, while little effect to fertilizer N application was observed in the dry years. There was no indication of N limitations in the no-till system compared to the other tillage systems, indicating that there was no need to increase N application rates when using well established conservation tillage systems. While no benefit was realized from split application of fertilizer N after planting, large reductions in corn yields were observed with fall application of fertilizer N in wet years. Fall application of N reduced yields 30% when compared with fertilizer application at planting. In this study, the highest yields were observed with the no-till system indicating that a conservation tillage system may be the most reliable tillage system in these Vertisol soils.