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EFFECTS OF SIMULATED 2,4-D DRIFT ON COTTON GROWTH, YIELD, AND FIBER QUALITY

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Abstract

Cotton production has expanded into the central and northern High Plains regions of Texas over the last 3 to 5 years. These areas have traditionally produced large acreages of wheat, corn and sorghum, and include large grassland areas where the use of 2,4-D is common. Cotton acreage in the Texas Panhandle and Northern High Plains has increased from 600,000 acres planted in 1998 to 920,000 acres in 2005, and this trend is continuing. These expanding cotton areas are at high risk of exposure to drift of 2,4-D. Cotton is highly susceptible to injury from 2,4-D, even at extremely low rates. Little information is available that clearly identifies the relationship between exposure level, crop injury, and cotton yield reductions following 2,4-D drift. The objectives of this study were to determine the effects of 2,4-D applied at varying rates and growth stages on cotton growth and yield, and to correlate cotton injury levels and effects on cotton lint yield and fiber quality.

This study was conducted at the Texas Agricultural Experiment Station in Halfway, TX in 2004 through 2006. Cotton (FM 960 BR) was planted in early May in all three years. Applications of 2,4-D were made at four growth stages including: cotyledon to 2 leaf, 4 to 5 leaf, pinhead square, and early bloom. Simulated drift rates of 2,4-D included: 0.25 (1/2X), 0.025 (1/20X), 0.0025 (1/200X), and 0.00025 lbs ai/A (1/2000X). All applications were made with a CO_2 backpack sprayer calibrated to deliver 10 gallons per acre (GPA). Visual injury was recorded at 14 days after treatments (14 DAT) and late-season. Cotton was harvested and ginned to determine lint yield and fiber quality.

Simulated drift rates as low as 0.025 (1/20X) caused visual injury from 12 to 70% and reduced yield in all three years regardless of growth stage. Injury from the 1/200X rate (0.0025 lbs ai/A) ranged from 5 to as much as 52%; however, yield was reduced only when applied at the pinhead square growth stage in two of three years. The lowest simulated drift rate (1/2000X) caused visual injury up to 22% across all timings, but yield was never affected. More visual injury was observed from applications made at earlier growth stages; however, visual injury over-estimated yield reduction. Greater yield reductions were observed from later applications, especially at the pinhead square growth stage, and visual injury under-estimated yield loss. 2,4-D applications had little effect on lint quality when applied at any growth stage. These results indicate that estimated visual injury is not a good predictor of yield loss.