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EFFECTS OF SIMULATED DRIFT OF GLYPHOSATE, PROPANIL, AND 2,4-D ON COTTON

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Abstract

Herbicide drift to non-target crops has been a problem in Arkansas. Drift from rice herbicides is probably the greatest concern. Although the occurrence of this problem cannot be predicted, widespread areas in Central and Northeast Arkansas are often affected. It is not apparent that certain varieties are more sensitive to herbicides such as 2,4-D unless drift occurs in a field containing multiple varieties. Varying degrees of susceptibility have been observed in variety demonstrations located in Woodruff and St. Francis counties to suspected 2,4-D drift. Is also not clear if sub-lethal concentrations of these herbicides that often result in a significant visual response impact yield. The objective of this study was to determine the sensitivity of ten commercial varieties of various backgrounds and technologies to simulated drift applications of 2,4-D, propanil, or glyphosate. Three studies were conducted at the Cotton Branch Experiment Station near Marianna, AR in 2002. Ten varieties planted with Temik (3.5 lb pr/A) in-furrow in two row plots 16 foot in length were treated at the fourth true leaf (4lf) stage on June 16 and at full bloom (FB) stage on July 25, 2002. Three rates of 0.0X, 0.01X and 0.1X rates of 2-4,D (1qt/A Amine), glyphosate (1qt/A Roundup Ultra), and propanil (4qt/A Stam) were applied with a 16 foot CO_2 propelled sprayer equipped with TT 110015-VP tips calibrated to deliver 8.0 gallons per minute. Visual responses were not detected to simulated drift of glyphosate. Yield from treated plots did not differ statistically from the untreated check at the four-leaf stage. However, yields differed statistically at the full bloom stage to both drift rates from the untreated but not from one another. Visual responses consisting of primarily necrosis were observed at the fourth true leaf stage while chlorosis was observed at the full bloom simulated drift treatment. FM 958 exhibited the greatest visual response while ST 4892BR exhibited the least visual response at the four-leaf treatment at the high rate. Little if any differences were observed with the 0.01X rate. Slight chlorosis was observed in the 0.01X treated plots, compared to the untreated plots at the full bloom treatment. No differences were observed between varieties at the 0.1X rate, which exhibited greater levels of chlorosis. A rate response to drift rates of propanil was observed. Simulated drift at full bloom impacted yields greater than did the four-leaf treatments. Yield reductions in FM 958, which showed greatest visual responses, were essentially identical to reductions in yield by simulated drift to ST 4892BR, which showed the least visual responses. Visual responses to simulated drift of 2,4-D were drastic and appeared to worsen as time progressed unlike that of propanil. It was difficult to distinguish varietal differences at the high rate of 0.1X due to severe stem twisting and leaf strapping. Plant responses to simulated drift rates of 0.01X appear to be more intense than symptomology commonly seen in drift situations where buffer distances are observed. Greatest visual responses were observed with PM 1218BG/RR while the least visual response was observed with DP 33B. Simulated drift at full bloom was slower to express itself as little vegetative growth was occurring in the plots. Fruiting structures appeared to be most sensitive at this timing. Yield reductions to simulated drift were greatest in this study. A rate as well as timing response was observed. Yields were reduced approximately 14% at the 0.01X rate at the 4 leaf timing with three varieties out yielding the untreated plot. Yields were reduced approximately 50% at the low rate (0.01X) when simulated drift occurred at full bloom. Although visual responses differed greatest numerically between PM 1218BG/RR and DP33B, the changes in yield were very similar to one another. In summary, visual responses were a poor indicator in predicting the impact of simulated drift from glyphosate, propanil, or 2,4-D on cotton in this the first year of a three-year study.