EFFECT OF DRIFT RETARDANTS/DEPOSITION AIDS AND HERBICIDES ON INSECTICIDE CANOPY PENETRATION IN COTTON

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Abstract

Although glyphosate resistance has become more prevalent across much of the southern U.S., glyphosate is still commonly utilized to control non-resistant weed species. In 2010, almost 100 % of the cotton planted in the U.S. was treated at least once with glyphosate (NASS, 2014). However, due to glyphosate resistance, glufosinate tolerant crops are becoming more common. Glufosinate has been observed to increase control of glyphosate resistant Palmer amaranth from 9 to 19% when compared to glyphosate (Whitaker et al., 2011). Two POST applications of glufosinate has been shown to provide up to 96 percent control of Palmer amaranth 2 WAT. A single application of glufosinate applied at 0.6 kg ai/ha has been observed to provide 82 to 94 % control of Palmer amaranth 3 WAT (Ahmed et al. 2012).

Several studies have been conducted evaluating drift retardant/deposition aid effects on drift (Guler et al., 2006, Hewitt, 2003, SDTF 1997, Wolf et al., 2002, 2003, 2005). Most of these studies were conducted with ground application systems or the use of a wind tunnel. Studies focused primarily on different polymer formulations. Very little to no information exists comparing tank mix combinations of insecticides with herbicides or deposition aids and the effect of these tank mixes on crop canopy penetration. With new technologies such as Enlist® or Xtend® under development, data is needed regarding herbicide and insecticide tank mixed with deposition aids and the resultant effects on crop canopy penetration.

Experiments were conducted in 2014 at the R.R. Foil Plant Science Research Center located in Starkville, MS. Deltapine 1321 B2RF was planted during early May for this experiment. All applications were made using a Bowman Mudmaster calibrated to deliver 140 L/ha at 4.8 kph. It was equipped with a 4 row multi-boom equipped with 110015 AIXR nozzles spaced 48 cm apart. Applications were made 46 cm above the crop canopy. Insecticides included acephate 97 (SP) @ 0.84 kg ai/ha and lamba-cyhaolthrin (EC) at a rate of 0.05kg ai/ha. Insecticides were applied alone or in combination with glufosinate @ 0.6 kg ai/ha, glyphosate @ 0.9 kg ae/ha, HM 9733 (guargum) applied @ 30 g per 38 L of water; HM 1428 (polymer) applied @ 0.5 % v/v; and HM 9679A (oil) applied @ 1.0% v/v. A red tracer was added to each treatment at a rate of 0.2% v/v. Metal stands 61 cm in height were utilized for this experiment. Card holders were spaced equidistantly from one another spiraling up the stand. Once the crop met the pre-determined height requirement, stands were placed in rows 2 and 3 with stand in row 2 being labeled as the front stand and the lower most position running parallel with the row. The stand in row 3 was labeled as the back stand and was placed with the lowest most positon located perpendicular to the row in an attempt to cover all penetration angles. Once stands were in place, 10 cm x 10 cm mylar cards were placed at the end of each card holder on the stand using clean latex gloves. Approximately 90 -120 seconds after application, cards were removed using another pair of clean latex gloves. Cards were then immediately placed in a dark container due to the dye's high level of photo degradability. Penetration of each treatment at each position was determined using a fluorimeter and reflectance analysis. Treatments

were compared to applications receiving no herbicide or deposition aids in tank combinations. All data were analyzed using the PROC MIXED procedure in SAS 9.4 and means were separated using Fischer's Protected LSD. Stands were analyzed separately due to changes in penetration angles.

When averaged across insecticides and position in the canopy for the back stand, treatments containing a polymer deposition aid provided 34 percent greater deposition than treatments not receiving a deposition aid. In addition, treatments with a polymer deposition aid had significantly greater penetration into the crop canopy than treatments containing the oil, glyphosate, or glufosinate with all three having a negative impact on total deposition in the canopy. However, when analyzing the front stand, treatments containing glyphosate, regardless of insecticide or position had 65 percent greater deposition than treatments receiving no additive. These treatments had significantly greater deposition than all other herbicides and deposition aids used in testing. A three way interaction was present for insecticide, deposition aid/herbicide, and position in the canopy. However, this was only present for deposition at the lowermost position in the canopy. For the back stand, treatments containing acephate + polymer deposition aid had significantly greater deposition than all other insecticide and deposition aid/herbicide combinations. On average, this treatment provided 296 percent greater deposition than acephate with no additive. However, when analyzing the same interaction for the front stand treatments containing acephate + glyphosate had significantly greater deposition compared to all other treatments with deposition being 525 percent greater than that of treatments containing only acephate. Data suggest that glyphosate could be minimizing droplet size allowing for further canopy penetration at position 4 due to less surface area per droplet.