EFFECT OF SPRAY TIP AND HERBICIDE PROGRAM ON EFFICACY, DROPLET SIZE, AND COVERAGE

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Abstract

Experiments were conducted in 2012 and 2013 at Dundee, MS and Robinsonville, MS to determine the effect of spray tip and herbicide program on glyphosate-resistant Palmer amaranth control. Experiments were initiated in grower fields with heavy natural infestations of glyphosate-resistant Palmer amaranth. Applications were initiated when Palmer amaranth plants were 10 to 15 cm in height. Applications were made with a CO_2 pressurized backpack sprayer with 324 kPa pressure and an application volume of 140 L/ha. Treatments utilized in these experiments included: dicamba at 0.6 kg ai/ha; glufosinate at 0.6 kg ai/ha; dicamba + glufosinate at 0.6 kg ai/ha; dicamba + glufosinate at 0.3 kg ai/ha each; and glyphosate + dicamba at 0.75 kg ae/ha and 0.6 kg ai/ha, respectively. All herbicide treatments were applied using each of the following spray tips: Extended Range Flat Fan, Greenleaf Asymmetric Dual Fan, Extended Range Air Induction, and Turbo Teejet Induction. All tips utilized in these studies delivered 0.06 liters per minute (0.015 GPM) at 276 kPa. At application, water sensitive spray cards were placed in plots to determine percent coverage from the spray solution. Visual estimates of weed control, the number of Palmer amaranth plants per square meter, and height of Palmer amaranth plants in each square meter were collected weekly following herbicide application. In addition, above ground plant biomass from a one square meter area in each plot was collected four weeks after application and dried in a forced air dryer for one week. Experiments were conducted using a factorial arrangement of treatments in a randomized complete block design with four replications. Visual estimates of weed control, number of plants per square meter, plant height, and plant biomass were subjected to analysis of variance and means were separated using Fisher's Protected LSD at $p = 0.05$.

Two weeks after application, dicamba + glufosinate at 0.6 kg ai/ha provided greater than 80% reduction in total plants compared to the untreated check. Glufosinate alone, glyphosate + dicamba, dicamba + glufosinate at 0.3 kg ai/ha, and dicamba alone provided 70, 56, 61, and 46% reduction in the total number of plants per square meter, respectively, two weeks after treatment. Dicamba + glufosinate at 0.6 kg/ai significantly reduced plant heights compared to all other treatments. Visual estimates of control indicated that dicamba + glufosinate at 0.6 kg ai/ha provided 90%control two weeks after application. Similar control was observed following application of glufosinate alone and glyphosate + dicamba two weeks after treatment. Four weeks after treatment, dicamba + glufosinate at 0.6 kg ai/ha reduced the total number of plants and plant height approximately 80% compared to the untreated check. In addition, glyphosate + dicamba reduced the total number of plants by 60%. Visual estimates of weed control and reduction in above ground biomass were similar in that dicamba + glufosinate at 0.6 kg ai/ha and glyphosate + dicamba each provided greater than 50 to 80% reductions compared to the untreated check.

While spray tip selection did not affect efficacy of herbicides, tip selection did affect coverage. Spray card data revealed that Extended Range Flat Fan had significantly higher percent coverage than the other tips. The Greenleaf Asymmetric Dual Fan, Extended Range Air Induction, and the Turbo Teejet Induction tips were all significantly different and provided 62, 53, and 34% coverage, respectively. Herbicide programs did not significantly affect the coverage from a given spray tip.

The Turbo Teejet Induction tip produced the largest spray droplets, regardless of herbicide. Less than 10% of the total droplets produced were less than 450 microns in size. Depending on herbicide, 40 to 60% of the total droplets

produced by the Turbo Teejet Induction spray tip were greater than 730 microns in size. However, approximately 50% of the total droplets produced by an extended range flat fan tip where less than 200 microns in size.

Spray tip selection did not impact efficacy of the herbicides tested on Palmer amaranth. The most consistent treatments were dicamba + glufosinate at 0.6 kg ai/ha and glyphosate + dicamba. However, no single treatment provided adequate control four weeks after application. A combination of herbicide applications and timings is recommended for season long control of glyphosate resistant Palmer amaranth.