Summary of Experiments: Glyphosate-Resistant Horseweed in Arkansas Cotton

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RESEARCH PROBLEM

Glyphosate-resistant horseweed (Conyza canadensis), also called marestail, was a significant problem for cotton producers in at least eight counties in Arkansas in 2004, and the resistant population is spreading. Without glyphosate to control horseweed populations and with the rapid spread of the resistant population, we need to develop reliable, economical options to control the weed. If economical alternatives for management of the resistant biotype are not quickly formulated, many farmers may move away from conservation-tillage practices, which will increase labor and machinery costs as well as jeopardize soil conservation efforts.

BACKGROUND INFORMATION

In conventional-tillage cotton, horseweed was controlled by tillage and was considered an insignificant weed. However, with over 60% of our cotton acreage being produced with conservation-tillage practices, preplant weed control is now necessary to start the cotton crop. As late as 2001, horseweed was still considered an insignificant weed problem because it was controlled with glyphosate, the primary burndown herbicide used in Arkansas. However, in 2002, producers noticed scattered populations of uncontrolled horseweed, and resistant populations were confirmed in 2003 (Matthews et al., 2004; McClelland et al. 2004; Smith et al. 2004). The extensive use of glyphosate as a burndown herbicide has apparently been the cause of selection for a resistant population. The widespread use of glyphosate-resistant cotton, soybean, and corn in Arkansas increases the potential for further selection of the resistant biotype.

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Ignite (glufosinate) was thought to be a good replacement for glyphosate for burndown within 30 days of planting. The primary problem with Ignite alone has been regrowth of horseweed from axillary buds shortly after application, although the problem has been erratic (Matthews et al., 2004; Smith et al. 2004). The advantage of Ignite is that, like glyphosate, it has no soil residual activity so can be applied until cotton emergence. However, if a hormone herbicide such as 2,4-D or dicamba (Clarity) is used as a tank-mix partner, plantback restrictions for those herbicides (21 to 28 days before planting) would apply. Therefore, efficacy of alternative tank-mix partners needs to be determined. There is also an interest in lowering the rates of the hormone herbicides in an attempt to shorten the plantback interval.

The objectives of the studies conducted in 2004 were to evaluate herbicides for weed management programs for glyphosate-resistant horseweed in cotton.

**RESEARCH DESCRIPTION**

In 2004, 17 experiments were conducted in fields in Blytheville (Mississippi County), Marianna (Lee County), and Fayetteville (Washington County), and at Lepanto and Pritchett Roads (Poinsett County) to evaluate herbicides for control of glyphosate-resistant horseweed. Except for Lee and Washington counties, which had only glyphosate-susceptible horseweed, experiments were conducted in areas of dense populations of glyphosate-resistant horseweed. Each experiment had two to four, 20- to 30-foot rows and four replications. Preplant burndown treatments were evaluated, with an emphasis on Ignite, Clarity (dicamba), 2,4-D, Valor (flumioxazin), Aim (carfentrazone), and Gramoxone (paraquat). A greenhouse study was conducted to evaluate residual activity of several herbicides for horseweed control. Herbicides were sprayed on the surface of soil placed in 6- by 12-in. flats. Horseweed seeds were planted in sections of the flats at 2-week intervals for 8 weeks to determine dissipation of residual activity of the herbicides.

Visual ratings for percent horseweed control were taken weekly. Data were subjected to analysis of variance, and means were separated with an LSD at P=0.05. [Specific procedures for these experiments and tables of data will be available online at www.uark.edu/depts/agripub/Publications/pubtitle.html and will be entitled “Managing Glyphosate-Resistant Horseweed in Arkansas Cotton.”]

**RESULTS AND DISCUSSION**

Horseweed control with glyphosate alone averaged 45% at 35 days after treatment (DAT). Ignite, thought to be a good replacement for glyphosate, was evaluated with Clarity and 2,4-D in six experiments at three locations. Horseweed control with Ignite alone was inconsistent across the six experiments. At Blytheville, control remained fairly good (>80%) at 30 days after treatment (DAT) with Ignite at 32 or 40 oz/acre alone. At Pritchett Road, control with Ignite alone was generally poor. In each case, poor control was due to regrowth of the horseweed plants from axillary buds. The 2,4-D, although effective in many tank mixtures with Ignite, was generally weaker than
Clarity on horseweed. Activity of both 2,4-D and Clarity was slow, although Clarity was more active than 2,4-D at 20 to 25 DAT. As with 2,4-D and Clarity alone, horseweed control tended to be better with Clarity + Ignite tank mixtures than with 2,4-D + Ignite mixtures over all the experiments. However, Ignite at 32 or 24 oz/acre + 2,4-D at 32 or 24 oz/acre consistently gave good control even late in the preplant period.

Valor has little postemergence activity on horseweed. As in other experiments in 2004, activity of 2,4-D and Clarity was slow, and optimal control of horseweed was noted at the ratings taken 33 to 37 DAT. Valor + Clarity or 2,4-D generally controlled horseweed at least 80%. Although postemergence activity of Valor is poor, Valor at 1 to 2 oz/acre may give residual control if applied early in the spring or in the fall.

Aim, evaluated at 0.5 oz/acre in experiments at Lepanto, Pritchett Road, and Blytheville, had no significant postemergence activity on horseweed. Treatments that gave adequate control (>85%) of horseweed at 35 DAT were Clarity alone, Aim + Clarity, and Aim + Distinct (dicamba + diflufenzapyr). Horseweed at Blytheville was also controlled by Aim + Ignite and by 2,4-D. Gramoxone was not evaluated alone, but control with Aim + Gramoxone was poor even a few days after application. In an experiment at Blytheville, Gramoxone mixed with Clarity had good initial burndown activity, suggesting that Aim may have antagonized activity of Gramoxone.

An experiment was conducted in Fayetteville to determine if 2,4-D and Clarity could be applied at low rates within the 28-day plantback period for the herbicides at labeled rates. Cotton was not injured by any of the herbicides or rates applied 28 and 21 days prior to planting (DPP). At 4 weeks after planting (17 June) slight injury (12%) occurred from applications made 14 DPP and increased with treatments applied 7 DPP (22%) and at planting (46%). Injury from dicamba, especially at 0.25 and 0.375 lb/acre (8 and 12 oz/acre) and dicamba + diflufenzapyr (Distinct) was generally higher than injury from 2,4-D. At 9 weeks after planting, injury from dicamba applied at planting was still noticeable. Injury from Valor at 0.064 lb/acre applied at planting was moderate (23 to 28%) for at least 4 weeks after planting, but had dissipated by 9 weeks after treatment. This experiment suggests that even low rates of dicamba could injure cotton if applied 7 DPP or at planting, and more work needs to be done on efficacy of horseweed control with the low rates.

In a greenhouse experiment, residual herbicides that gave excellent (97 to 100%) preemergence horseweed control at 4 weeks after the initial planting and herbicide application were Direx (diuron), Caparol (prometryn), Cotoran (fluometuron), Linex (linuron), Valor (flumioxazin), Goal (oxyfluorfen), and Zorial (norflurazon). Control with these herbicides was at least 88% at 6 weeks after treatment (WAT). Activity of Prowl (pendimethalin) and Staple (pyrithiobac) was poor. Control with metolachlor was unexplainably variable and will be reassessed. Activity of trifloxysulfuron increased from 70% at 4 WAT to 97% at 6 WAT. By 10 weeks after application, control with fluometuron was still 89%, control with oxyfluorfen was fair (77%), and trifloxysulfuron and norflurazon were still giving 100% control. Activity of other herbicides had dissipated. This study will be repeated, and field experiments with several of the compounds will be conducted in 2005.
PRACTICAL APPLICATION

Data from our 2004 experiments confirmed that Clarity and 2,4-D are the safest, most economical options for control of resistant horseweed and can be mixed with Ignite or glyphosate formulations to control other winter weeds. More work with residual herbicides and with Ignite and Gramoxone will increase our options for the future. [Data for these experiments will be available online at www.uark.edu/depts/agripub/Publications/pubtitle.html and will be entitled “Managing Glyphosate-Resistant Horseweed in Arkansas Cotton.”]

LITERATURE CITED

