ABSTRACT

Broadleaf weed control on rice levees is an emerging problem faced by growers and consultants in Arkansas. Field experiments were conducted at Lonoke and Stuttgart, Ark., in 2007 and 2008 to evaluate the effectiveness of various postemergence herbicides applied alone or in tank mixture with propanil or quinclorac for large-sized broadleaf weed control on rice levees. Rice injury was minimal (≤5%) from all herbicides at 2 wk after treatment (WAT), and no injury was observed at 4 WAT. Prickly sida and Palmer amaranth were the most difficult-to-control weeds on levees. Herbicides applied in combination with propanil or quinclorac improved the efficacy and spectrum of broadleaf weed control over individual herbicides alone. An application of 2,4-D at 1.25 lb ai/acre alone or with quinclorac at 0.5 lb ai/acre provided consistent control of most broadleaf weeds. Propanil at 4 lb ai/acre antagonized activity of triclopyr on Pennsylvania smartweed.

INTRODUCTION

Until recently, weed control on rice levees has not been a component of weed-management research programs in rice. However, weed management on levees is critical to many rice farmers, especially for those whose levees comprise a large percentage of the overall field and ultimately of rice yield. Weeds continually emerge on levees due to season-long moist conditions. Late-season weeds on levees are often larger than those in bays and are difficult to control with an individual herbicide application. Because weed control recommendations in rice bays are based on small-sized weeds followed by a permanent flood, there is an important research need for weed control on rice levees.
in Arkansas (Baldwin and Slaton, 2001; Norsworthy et al., 2007). We hypothesize that herbicide combinations will increase the efficacy and spectrum of control of large-size broadleaf weeds on rice levees. The objective of this research was to develop effective late-season management programs for broadleaf weeds on rice levees.

**PROCEDURES**

Field experiments were conducted in a randomized complete block design replicated four times at Lonoke and Stuttgart, Ark., in 2007 and 2008. Rice levees 50 ft long and 2 ft high were constructed using standard practices and were broadcast seeded with ‘Wells’ rice and various broadleaf weed species. Propanil (Stam) at 4 lb ai/acre, triclopyr (Grandstand) at 0.25 lb ai/acre, 2,4-D (Weedar) at 1.25 lb ai/acre, acifluorfen (Ultra Blazer) at 0.25 lb ai/acre, carfentrazone (Aim) at 0.02 lb ai/acre, penoxsulam (Grasp) at 0.03 lb ai/acre, quinclorac (Facet) at 0.5 lb ai/acre, halosulfuron (Permit) at 0.06 lb ai/acre, bentazon (Basagran) at 0.75 lb ai/acre, and bispyribac (Regiment) at 0.02 lb ai/acre were evaluated alone and in combination with propanil or quinclorac. All herbicides were applied postemergence at labeled rates at 10 gal/acre, and the combinations that resulted in double the labeled rates for propanil or quinclorac were excluded. A nontreated control was also included. Applications were made when most weeds were 18 to 24 in. tall or had 18- to 24-in. runners. Hemp sesbania (*Sesbania herbacea*) and prickly sida (*Sida spinosa*) were evaluated at both locations, whereas palmleaf morningglory (*Ipomoea wrightii*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and Palmer amaranth (*Amaranthus palmeri*) were evaluated at a single site for at least one year. Visual ratings for rice injury and weed control were recorded at 2 and 4 wk after treatment application (WAT) on a scale of 0 to 100%, with 0 equal to no weed control or rice injury and 100 equal to complete control or rice death. All data were subjected to analysis of variance, and means were separated using Fisher’s protected Least Significant Difference test at 5% level of significance.

**RESULTS AND DISCUSSION**

No rice injury was observed from herbicide treatments except 2,4-D applied alone or with propanil or quinclorac, which caused ≤5% injury at 2 WAT at Stuttgart in 2007 (data not shown). Symptoms depicted typical phenoxy herbicide injury, in the form of reduced rice tillering. However, injury was transient, and rice plants recovered by 4 WAT.

Propanil, triclopyr, 2,4-D, acifluorfen, and carfentrazone applied alone, and all herbicides in combination with propanil and quinclorac, controlled hemp sesbania >90% through 4 WAT at both locations (Fig. 1). Prickly sida was selectively responsive to 2,4-D and was controlled 83 to 85% when applied alone or with quinclorac at 4 WAT at Stuttgart and Lonoke (Fig. 2). Palmleaf morningglory was more sensitive than entireleaf morningglory to herbicides. Triclopyr and 2,4-D, alone or mixed with quinclorac or
propanil, generally provided excellent (>90%) palmleaf morningglory control (data not shown). Entireleaf morningglory was controlled 85 to 89% with 2,4-D alone, propanil combined with 2,4-D and quinclorac, and quinclorac combined with all herbicides, except bentazon and halosulfuron (data not shown).

Pennsylvania smartweed was controlled >90% by 2,4-D, acifluorfen, and carfentrazone applied alone or in combination with propanil or quinclorac at 4 WAT (Fig. 3). Additionally, halosulfuron with propanil and penoxsulam with quinclorac were effective on Pennsylvania smartweed. However, the addition of propanil reduced the efficacy of triclopyr against Pennsylvania smartweed, which represents an antagonistic interaction between these herbicides. Lowering the rate of propanil may reduce the burn (rapid necrosis) caused by this herbicide, in turn alleviating the observed antagonism.

Palmer amaranth was the weed most difficult to control, with a maximum of 78 and 73% control achieved with 2,4-D and acifluorfen applied with propanil at 4 WAT (Fig. 4). Overall, considering the diverse weed flora, including all of the above broadleaf weed species, 2,4-D alone or in combination with quinclorac, is the best option for rice levee weed control.

**SIGNIFICANCE OF FINDINGS**

As a result of this research, “weed control on rice levees” has been added to the rice section of the MP-44 (Recommended Chemicals For Weed and Brush Control). Application of 2,4-D alone or with quinclorac provided effective late-season control of most large-size broadleaf weeds. However, current restrictions in Arkansas prohibit the use of 2,4-D at certain times of the year (Slaton and Norman, 2001), meaning that other herbicides or herbicide mixtures must be used during the restricted period, with these providing less effective control of a broad spectrum of broadleaf weeds. Although propanil is commonly applied to rice levees in combination with other herbicides, it was observed that antagonism can occur when a full rate of propanil is applied with systemic herbicides. Future research efforts will include focusing on additional broadleaf weeds such as Northern jointvetch, eclipta, and cutleaf groundcherry and evaluating control options for late-season grass control on levees.

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**LITERATURE CITED**


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Fig. 1. Hemp sesbania control at Stuttgart and Lonoke at 4 wk after application as influenced by herbicide treatments.
Fig. 2. Prickly sida control at Stuttgart and Lonoke at 4 wk after application as influenced by herbicide treatments.

Fig. 3. Pennsylvania smartweed control at Stuttgart and Lonoke at 4 wk after application as influenced by herbicide treatments.
Fig. 4. Palmer amaranth control at Stuttgart and Lonoke at 4 wk after application as influenced by herbicide treatments.