Efficacy of Early-Season Applications of Acetochlor and Pethoxamid in Rice

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Limited options for controlling herbicide-resistant weedy rice and barnyard grass in Arkansas rice has led to the exploration of alternative herbicide sites of action (SOA). Very long-chain fatty acid (VLCFA)-inhibiting herbicides have been used successfully in US row crops and Asian rice production for control of annual grasses and small-seeded broadleaves but are not labeled for use in US rice. Preliminary experiments have indicated adequate rice tolerance to acetochlor and pethoxamid; however, limited weed control information in rice systems is available. Field experiments were conducted in 2016 and 2017 to evaluate weed control with early-season applications of

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Statistical analysis

Yield data were found to be normally distributed, via a non-significant Shapiro-Wilk Test; however, all other parameters were analyzed assuming beta distribution [28]. All data were analyzed as a two-factor factorial randomized complete block using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). The first factor being application timing: delayed preemergence (DPRE), spiking, 1-2 leaf, and 1-2 leaf rice; the other being herbicide rate: low and high. A weedy check plot was included in both experiments for comparison. Due to inconsistency of weed species between experimental locations, barnyardgrass, broadleaf signalgrass (*Urochloa platyphylla* (Nash) R.D. Webster), and large crabgrass (*Digitaria sanguinalis* (L.) Scop.) control was reported for 2016, while weedy rice control was reported for 2017. For these reasons, rice injury and rough rice yield were analyzed and reported separately by year. Weedy rice counts m^{-2} were converted to proportions of the average of the nontreated for each experiment and year, respectively, and presented as a percent reduction relative to the non-treated check. Analysis of variance indicated no significant interactions between factors in any experiment and therefore only main effects are presented. All means were separated using Fisher's protected LSD (α=0.05).

Results and Discussion

Rice injury and weed control using acetochlor

In both years, a main effect of application timing influenced rice injury 2 WAT (p=0.0015, 0.0040). As also reported in similar studies [24], rice injury to acetochlor, averaged over rate, generally decreased as application timing was delayed although no treatment caused more than 10% injury (Table 1). The increased injury from earlier application timings was that rice was probably absorbing higher concentrations of herbicide in the soil solution during germination, resulting in more growth inhibition relative to 1 to 4 leaf applications when plants were established prior to herbicide application.

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translocation to shoots and resulting reduced eẌcacy of VLCFA-inhibitors when absorbed through roots could explain why 1-2 l dw̿CFA-

Timing	DPRE	20[a]	16[a]	63[a]	58[a]	55	68
	Spiking	-	8[b]	63[a]	58[a]	47	67
	1-2 LF	9[b]	5[bc]	56[b]	53[a]	26	57
	3-4 LF	3[c]	2[c]	53[b]	44[b]	24	45

Timing	DPRE	93^{a}	78^{a}	81^{a}	65^{a}	6900^{a}	7900^{a}
	Spiking	-	-	-	-	-	7900^{a}
	1-2 LF	83^{b}	72^{b}	69^{b}	51^{b}	6900^{a}	7300^{b}
	3-4 LF	66^{c}	48^{c}	55^{c}	47^{b}	5900^{b}	6600^{c}
Rate	420 g ai ha^{-1}	78	63^{b}	66	48^{b}	6100^{b}	7100^{b}
	840 g ai ha^{-1}	83	69^{a}	70	61^{a}	7000^{a}	7800^{a}
Timing		<0.0001*	<0.0001*	<0.0001*	<0.0001*	0.0013*	<0.0001*
Rate		0.0552	0.0461*	0.094	<0.0001*	0.0004*	0.0002*
Timing × Rate		0.2763	0.4961	0.1165	0.2915	0.9397	0.0788

16. Krausz RF, Young BG, Kapusta G, Matthews JL (2000) Application timing determines giant foxtail (Setaria faberi) and barnyardgrass (Echinochloa crus-galli) control in no-till corn (Zea mays). Weed Technology 14: 161-166.
17. Zemolin CR, de Avila LA, Agostinetto D, Cassol GV, Bastiani M, et al.