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Effect of Dose and Stage of Application of Acetochlor in Transplanted Rice

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ABSTRACT

Bio-efficacy of acetochlor doses and stages of application were studied in transplanted rice. *Sacciolepsis interrupta, Leersia hexandra, Scirpus juncoides, Fissendocarpa linifolia* and *Monochoria vaginalis* were the dominant weeds. Application of acetochlor at 100 g ha^{-1} at three or eight days after transplanting resulted in significant reduction in weed density, weed dry matter accumulation and was at par with higher doses (125, 150 and 300 g ha^{-1}). The highest grain yield of rice was recorded with the application of acetochlor at 100 g ha^{-1} applied three days after transplanting.

INTRODUCTION

Rice is the major cereal crop of Assam occupying an area of 2.6 million hectares. The crop is mainly grown under rainfed conditions and thereby often experiences alternate wetting and drying conditions which encourage heavy weed growth resulting in reduction of 25 to 55% grain yield even under transplanted conditions (Gautam and Mishra, 1995). Hand weeding is expensive, time consuming, difficult and often limited by scarcity of labourers in time. On the other hand, herbicides offer economic and efficient weed control if applied at proper dose and stage. However, many of the commonly applied herbicides like butachlor, anilofos and pretilachlor provide narrow spectrum of weed control. Further, continuous use of the herbicide with same mode of action, associated with monoculture for a prolonged period may lead to the development of herbicide resistance in weeds (Moss and Rubin, 1993). In view of the above, the present study was undertaken.

MATERIALS AND METHODS

A field experiment was conducted at the Research Farm of the Assam Agricultural University, Jorhat during **kharif** seasons of 1999 and 2000. The soil of the experimental area was sandy loam, acidic (pH 5.3) with organic carbon 0.42%, available N, P_2O_5 and K_2O 214, 14.6 and 112 kg ha^{-1}, respectively. Twelve treatments consisting of five doses of acetochlor, butachlor and weedy were arranged in randomized block design replicated thrice (Table 1). Twenty-eight days old seedlings (cv. Ranjit) were transplanted at a spacing of 20 x 20 cm. A fertilizer dose of 40 : 20 : 20 kg ha^{-1} of N, N_2O_5 and K_2O was applied uniformly. The full dose of P and K and half of nitrogen was applied as basal and the remaining nitrogen was applied in two equal splits at maximum tillering and panicle initiation stages, respectively. Herbicides were applied using knapsack sprayer with 500 l water ha^{-1}.

RESULTS AND DISCUSSION

Effect on Weeds

The dominant weed flora observed in the experimental field consisted of grasses (51%)– *Sacciolepsis interrupta, Isachne himalaica, Leersia hexandra;* sedge (12%) – *Scirpus juncoides* and broad-leaved (37%) – *Fissendocarpa linifolia* and *Monochoria vaginalis* and *Sagitaria*

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Table 1. Effect of treatments on weeds 40 DAT (Mean of two seasons)

Treatment	Dose (g ha^{-1})	Stage of application (DAT)	*F. linifolia*	*M. vaginalis*	*L. hexandra*	*S. juncoides*	*I. himalaica*	*S. guyanensis*	*S. interrupta*	Total
Acetochlor	75	3	10.4	13.2	12.0	12.0	14.6	7.2	13.2	82.6
Acetochlor	100	3	7.2	12.6	7.2	8.0	11.2	6.6	7.2	60.0
Acetochlor	125	3	7.2	8.6	6.6	7.2	14.6	6.0	5.6	55.8
Acetochlor	150	3	3.2	8.6	4.6	4.6	10.0	3.2	6.1	40.3
Acetochlor	300	3	2.6	8.6	4.6	2.6	6.0	2.6	4.0	31.0
Acetochlor	75	8	9.2	18.0	10.6	8.6	14.6	10.0	14.6	85.6
Acetochlor	100	8	8.6	12.0	7.2	8.0	15.2	8.2	10.0	69.2
Acetochlor	125	8	6.0	12.0	9.2	10.0	10.6	3.2	10.0	61.0
Acetochlor	150	8	4.0	10.0	7.2	6.6	10.0	2.6	5.2	45.6
Acetochlor	300	8	4.6	5.2	6.6	6.6	2.6	2.6	5.2	33.4
Butachlor	1250	3	8.0	10.0	16.0	6.0	14.6	4.0	8.0	66.6
Weedy	-	-	26.0	28.0	48.0	24.0	30.0	22.0	30.0	208.0

Table 2. Effect of acetochlor on weed dry weight 40 DAT and yield of rice

Treatment	Dose (g ha^{-1})	Stage of application (DAT)	Weed dry weight (g m^{-2})		Panicles (No. m^{-2})		Grain yield (kg ha^{-1})		Straw yield (kg ha^{-1})	
			1999	2000	1999	2000	1999	2000	1999	2000
Acetochlor	75	3	3.2	3.7	331	437	2016	4333	3830	8687
Acetochlor	100	3	3.0	3.5	402	452	3533	4767	6288	9333
Acetochlor	125	3	3.0	3.4	366	368	3366	3750	6058	6333
Acetochlor	150	3	2.9	3.1	340	407	2900	4250	5191	9167
Acetochlor	300	3	2.8	3.2	337	451	3166	3583	6015	7267
Acetochlor	75	8	3.2	3.8	361	409	2033	4100	3862	8683
Acetochlor	100	8	3.2	3.8	349	391	2600	3167	5070	6167
Acetochlor	125	8	3.1	3.4	349	365	2133	2917	4166	5750
Acetochlor	150	8	2.9	3.5	307	443	2130	3500	4260	7083
Acetochlor	300	8	2.9	3.2	306	488	1883	3917	3671	8167
Butachlor	1250	3	2.9	3.0	337	435	2000	3833	3980	7333
Weedy	-	-	3.9	4.5	230	206	1800	2833	3564	6333
LSD (P=0.05)			0.2	0.7	75	46	13963	861	270	NS

NS–Not Significant.

guayanensis. All the weed control treatments significantly reduced the weed density and dry matter accumulation over weedy check (Tables 1 and 2). Acetochlor 100 g ha^{-1} applied at 3 or 8 DAT significantly reduced the weed dry matter accumulation and was at par with acetochlor at 125, 150 and 300 g ha^{-1}. Acetochlor at 300 g ha^{-1} showed slight yellowing of leaves in one season. Acetochlor at 100, 125, 150 and 300 g ha^{-1} applied at either 3 or 8 DAT was effective in reducing the population of *F. linifolia, M. vaginalis, L. hexandra, S. juncoides* and other grassy weeds. The populations of *M. vaginalis* and *l. himalaica* were lowest with acetochlor at 300 g ha^{-1}. The efficacy of acetochlor was poor at 75 g ha^{-1}. The efficacy of acetochlor was also substantially higher over butachlor in controlling broad-leaved and grassy weeds. Similar findings were also reported by Narwal *et al.* (2002).

Effect on Crop

Acetochlor at 100 g ha^{-1} at 3 DAT resulted in the highest grain yield of rice (Table 2) and was at par with acetochlor at 125, 150 and 300 g ha^{-1} at 3 DAT. The yield obtained from acetochlor applied 3 DAT was significantly higher from application at 8 DAT irrespective of doses. The per cent increase in yield ranged from 9-79. Acetochlor at 100 g ha^{-1} applied 3 DAT resulted in the highest per cent increase in yield. The lowest yield was recorded in unweeded control. Acetochlor was superior to butachlor in increasing the yield of rice. The increase in yield might be due to effective control of weeds which reduced the crop-weed competition and increased the different yield components. Straw yield followed the similar trend as grain yield during 1999, while no significant variation in straw yield was recorded during the second season.

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