

Effect of Pyrazosulfuron-ethyl on Weeds and Productivity of Transplanted Rice during Rainy Season

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ABSTRACT

Uncontrolled weeds caused 31% reduction in grain yield of rice. Pyrazosulfuron-ethyl at 20, 25 or 30 g ha⁻¹ was as effective as butachlor at 1250 g ha⁻¹ but superior to hand weeding and rotary paddy weeder in reducing weed growth and increasing grain yield of rice. The yield obtained from hand weeding was comparable to rotary weeder.

INTRODUCTION

Rice is the major crop of Assam cultivated in an area of 2.4 m ha. The productivity of the crop is often limited by heavy weed infestation due to alternate wetting and drying conditions prevailed under rainfed conditions. The weed flora under transplanted conditions is very much diverse and consists of grasses, sedges and broad-leaved weeds causing yield reduction upto 76% (Singh *et al.*, 2004). Although a number of pre-emergence herbicides like butachlor, pretilachlor and anilofos provide effective control of grassy weeds, but due to continuous use of such herbicides, a shift in weed flora from grassy to non-grassy and annual sedges is being observed. Therefore, evaluation of new herbicides for control of wide spectrum of weed flora is imperative. In cognizance of the above facts, the present study was undertaken.

MATERIALES AND METHODS

A field experiment was conducted at Instructional-cum-Research Farm of the University, Jorhat, during rainy seasons of 2003 and 2004. The soil of the experimental area was sandy loam, acidic (pH 5.2) and had 265, 7.1 and 98 kg ha⁻¹ of N, P and K, respectively. Seven treatments (weedy, hand weeding 20 and 40 DAT, butachlor at 1.25 kg ha⁻¹, pyrazosulfuron-ethyl at 20, 25 and 30 g ha⁻¹ and

rotary paddy weeder at 20 and 40 DAT) were laid out in randomized block design with three replications. All the herbicides were applied three days after transplanting using knapsack sprayer fitted with flat fan nozzle at spray volume of 500 l ha⁻¹. Twenty days old seedlings of rice variety Ranjit were transplanted at a spacing of 20 x 15 cm. Recommended dose of 40 : 20 : 20 kg ha⁻¹ of N, P₂O₅ and K₂O was applied uniformly. Half of the nitrogen and whole of phosphate and potash were applied at the time of final puddling and the remaining quantity of nitrogen was applied at panicle initiation stage.

RESULTS AND DISCUSSION

Effect on Weeds

The major weed flora observed in the experimental field during 2003 were : *Panicum repens* (45%), *Monochoria vaginalis* (13.9%), *Ceratophyllum-Utricularia* complex (12%), *Hymenoclea acutigluma* (7.41%), *Sacciolepis interrupta* (6.5%), *Scirpus juncooides* (6.5%) and others – *Cyperus pilosus* (2.98%), *C. halpan* (0.93%) and *Fissendocarpa linifolia* (0.93%). During 2004, the major weed flora observed was : *Leersia hexandra* (25.6%), *Sacciolepis interrupta* (20.5%), *Eleocharis dulcis* (20.5%), *Isachne himalaica* (12.8%), *Monochoria vaginalis* (5.1%) and others–

Table 1. Effect of treatments on density (No. m⁻²) of major weed species at 60 DAT

Treatment	Dose (g ha ⁻¹)	<i>P. repens</i>	<i>M. vaginalis</i>	<i>Ceratophyllum -Utricularia</i> complex	<i>H. acutigluma</i>	<i>S. interrupta</i>	<i>S. juncoides</i>	<i>C. pilosus</i>
2003								
Weedy	-	49	15	13	8	7	7	4
Hand weeding	-	36	0	0	0	7	3	4
Butachlor	1250	63	0	0	0	1	0	0
Pyrazosulfuron-ethyl	20	43	0	0	4	0	1	0
Pyrazosulfuron-ethyl	25	22	0	0	7	4	0	4
Pyrazosulfuron-ethyl	30	11	0	1	5	8	1	0
Paddy weeder	-	60	0	1	0	13	0	1
2004								
Weedy	-	13	8	8	8	5	2	2
Hand weeding	-	0	12	0	0	0	0	0
Butachlor	1250	0	9	0	0	5	0	0
Pyrazosulfuron-ethyl	20	0	8	0	0	0	0	0
Pyrazosulfuron-ethyl	25	0	12	0	0	0	0	0
Pyrazosulfuron-ethyl	30	0	3	0	0	0	0	0
Paddy weeder	-	0	9	0	0	0	0	0

Table 2. Effect of treatment on weeds and yield of rice

Treatment	Dose (g ha ⁻¹)	Total weed density (No. m ⁻²)						Total weed dry weight (g m ⁻²)						Grain yield (t ha ⁻¹)			Straw yield (t ha ⁻¹)				
		2003		2004		2003		2004		2003		2004		2003		2004		2003		2004	
		30	60	30	60	30	60	30	60	30	60	30	60	2003	2004	2003	2004	2003	2004	2003	2004
Weedy	-	101	37	108	39	51	11	56	28	2.5	4.1	3.3	5.5	9.4							
Hand weeding	-	59	7	79	12	49	6	46	16	3.8	5.2	4.5	5.9	8.6							
Butachlor	1250	32	11	67	17	41	6	36	18	4.2	5.4	4.8	6.8	8.6							
Pyrazosulfuron-ethyl	20	23	13	42	8	25	4	45	17	3.9	5.5	4.2	6.3	9.6							
Pyrazosulfuron-ethyl	25	23	12	48	16	28	5	30	15	4.7	4.9	4.8	7.7	8.0							
Pyrazosulfuron-ethyl	30	27	21	53	13	36	4	41	14	4.1	5.3	4.7	7.8	8.5							
Rotary paddy weeder	-	65	16	92	14	36	6	53	22	3.7	4.4	4.1	6.5	7.9							
LSD (P=0.05)	-	24	2	16	2	9	1	12	4	0.8	0.7	-	0.9	NS							

NS-Not Significant.

Panicum repens (2.6%), *Cyperus iria* (2.5%), *Fissendocarpa linifolia* (2.6%) and *Fimbristylis littoralis* (2.5%). The emergence pattern of the weeds during 2003 showed that *P. repens*, *Ceratophyllum-Utricularia* complex and *F. littoralis* were the early emerged species and *M. vaginalis*, *H. acutigluma*, *S. interrupta*, *S. juncooides*, *C. pilosus* and *C. halpan* were the late emerged species. During 2004, *S. interrupta*, *L. hexandra*, *O. rufipogon* and *Isacne himalaica* were the early emerged weed, while *M. vaginalis*, *E. dulcis*, *F. linifolia* and *C. iria* were the late emerged species. The weed density was comparatively higher during 2003 than 2004. All the weed control treatments significantly lowered the weed density over weedy check (Table 1). Pyrozosulfuron-ethyl at 20, 25 or 30 g ha⁻¹ was as effective as butachlor at 1.25 kg ha⁻¹ but significantly superior to hand weeding twice and rotary weeder used at 20 and 40 DAT in reducing weed density. Similar trend was also observed in weed dry matter accumulation (Table 2). Higher efficacy of pyrozosulfuron-ethyl in reducing weed population and dry matter accumulation in transplanted rice was also reported by Saha (2005).

Effect on Yield

On an average, there was 31% reduction in grain yield of rice due to competition with weeds in weedy plots (Table 2). All the weed control treatments resulted in significantly higher grain yield over unweeded control. Pyrozosulfuron-ethyl at 20, 25 or 30 g ha⁻¹ showed similar yield and was at par with butachlor at 1.25 kg ha⁻¹ during both the years of study and recorded 45% increase in grain yield of rice over weedy check. The effective control of weeds starting from the early crop growth stage might have resulted in better growth and yield of rice. Shekhar *et al.* (2004) also found higher efficacy of pyrozosulfuron-ethyl in transplanted rice.

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