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WEED MANAGEMENT IN TRANSPLANTED RICE (*Oryza sativa* L.)

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ABSTRACT

A field experiment was conducted to evaluate the performance of three herbicides alone or in combination on weed growth, yield and yield attributes of rice crop. Among different treatments, combined application of pretilachlor 750 g a.i./ha, without water stagnation in field upto 1 week fb bispyribac-Na 20 g a.i./ha applied as post-emergence provided broad spectrum control over the density and dry matter of weeds that leads to higher crop yield due to reduced crop-weed competition. The yield parameters were also significantly improved with this treatment. Thus, this approach can be an effective way to manage the weeds in transplanted rice.

Key words : *Weed management, transplanted rice, grain and straw yield.*

Rice (*Oryza sativa* L.) is one of the most important food crop of India contributing about 40 per cent of the total food grain production. Out of the total 43 mha area under rice cultivation, puddled rice culture occupies 56 per cent (1). Rice grain production in our country has been reported to suffer a loss of 15 mt annually due to weed competition (2). Weeds compete with crop for nutrient, moisture, light and space. Heavy infestation of weeds comprising of grasses, broad-leaf weeds and sedges pose a big challenge in transplanted rice cultivation and cause yield reduction to the tune of about 50 per cent (3). Thus, timely and effective management of weeds is pivotal to augment the productivity of rice. Manual weeding is although effective but scarcity and high wages of labour makes this method uneconomic. Further, mechanical method of weed management is also time consuming, cost intensive and tedious. In contrast to these, chemical control is effective, time saving and widely practiced by farmers due to ease in application and less labour requirement. However, continuous use of same herbicide has to be restricted to avoid undesirable inter and intra-specific weed shift. Pre-emergence application of herbicide alone is not sufficient to control repeated flushes of weeds which necessitates a post-emergence application. Therefore, to resolve such issues, adoption of integrated weed management practice is a powerful tool for effective management of complex weed flora of transplanted rice. The complexity of these situations has necessitate to develop a holistic weed management approach throughout the cropping period, being sustainable in terms of enhancing productivity without eroding resource base.

Keeping these facts in view, the present experiment was undertaken to study various integrated approaches for controlling complex weed flora in transplanted rice.

MATERIALS AND METHODS

A field experiment was conducted during 2010 on transplanted rice variety “NDR-359” at Rice Research Station, Nagina. The soil of the experimental plot was Sandy loam, with organic carbon (0.46%), available nitrogen (226.2 kg/ha), medium in available phosphorus (19.8 kg/ha) and potassium (136 kg/ha) with a pH of 7.4. The experiment was laid out in Randomized Block Design with three replications and twelve treatments. The treatments consisted of three doses of penoxsulam @ 20, 22.5 and 25 g a.i./ha, bispyribac-Na 20 g a.i./ha, pretilachlor 750 ga.i./ha, pretilachlor 750 g a.i./ha + 1 H.W 45 DAT, penoxsulam 22.5 ga.i./ha + 1 H.W 45 DAT, one mechanical weeding through conoweeder 15 DAT + 1 H.W 45 DAT, Pretilachlor 750 g a.i./ha, without water stagnation in field upto 1 week, Pretilachlor 750 g a.i./ha, without water stagnation in field upto 1 week fb bispyribac-Na 20 g a.i./ha, twice hand weeding (20 and 40 DAT) and untreated (weedy check). The crop is fertilized with 60 kg N, 60 kg P, 40 kg K and 20 kg $ZnSO_4$ per hectare as uniform basal dose at the time of transplanting, remaining N was top dressed in two split doses one-fourth at active tillering and another one-fourth at panicle initiation stage of the crop. Soil was maintained near saturation by providing irrigation as and when required. Total weed density and dry matter were recorded at different crop growth stages from 1.0 m^2 area placing a quadrate of 50cm x 50cm randomly from

Table-1: Effect of different weed control treatments on total weed density at various crop growth stages.

Treatment	Application stage (DAT)	Dose (ga.i./ha)	Total weed density at harvest (no. /m^2)	Total weed dry matter at harvest (g /m^2)
Penoxsulam	20	20.0	3.8(44.0)	3.9(49.6)
Penoxsulam	20	22.5	3.4(29.3)	3.6(34.8)
Penoxsulam	20	25.0	2.7(13.3)	2.9(17.2)
Bispyribac-Na	14	20.0	2.3(9.3)	2.3(9.1)
Pretilachlor	3	750	3.7(41.3)	3.8(44.0)
Pretilachlor fb 1 H.W	3 fb 45	750	3.1(21.3)	3.0(19.8)
Penoxsulam fb 1 H.W	20 fb 45	22.5	3.0(18.7)	3.1(22.3)
Pretilachlor + without water stagnation in field upto one week	3	750	3.9(46.7)	3.9(46.6)
Pretilachlor + without water stagnation in field upto one week fb bispyribac-Na	3 fb 14	750 fb 20.0	1.8(5.3)	1.7(4.5)
One mechanical weeding through conoweeder fb 1 H.W	15 fb 45	-	3.5(32.0)	3.3(26.0)
Hand weeding twice	20 and 40	-	2.7(14.7)	2.5(11.7)
Untreated (weedy check)	-	-	4.7(104.0)	4.7(114.6)
SEm±	-	-	0.12	0.11
LSD (P=0.05)	-	-	0.36	0.34

Values in parenthesis were original and transformed to log (x+1) for analysis.

Table-2: Effect of different weed control treatments on yield and yield attributing characters of rice crop.

Treatment	Application stage (DAT)	Dose (ga.i./ha)	No. of panicles/ m^2	No of grains/ panicle	Grain yield (kg/ha)	Straw yield (kg/ha)
Penoxsulam	20	20.0	171	163.1	4896	7239
Penoxsulam	20	22.5	174	177.0	5156	7448
Penoxsulam	20	25.0	175	180.9	5260	7500
Bispyribac-Na	14	20.0	188	182.1	5625	7864
Pretilachlor	3	750	172	172.1	4843	6823
Pretilachlor fb 1 H.W	3 fb 45	750	167	179.7	5390	7506
Penoxsulam fb 1 H.W	20 fb 45	22.5	181	181.5	5364	7558
Pretilachlor + without water stagnation in field upto one week	3	750	167	166.5	4635	6499
Pretilachlor + without water stagnation in field upto one week fb bispyribac-Na	3 fb 14	750 fb 20.0	196	182.2	5729	8385
One mechanical weeding through cono weeder fb 1 H.W	15 fb 45	-	165	152.5	4479	6741
Hand weeding twice	20 and 40	-	185	180.5	5625	7760
Untreated (weedy check)	-	-	117	134.2	2291	3958
SEm±	-	-	7.7	6.4	239	415
LSD (P=0.05)	-	-	22.6	18.8	701	1216

the marked sampling area in each plot. Yield and yield attributing characters were recorded during the course of investigation.

RESULTS AND DISCUSSION

In experimental plots, the dominant weeds associated with transplanted rice were *Echinochloa colona, E. crus-galli, Leptochloa chinensis* and *Ischaemum rugosum* among the grasses and *Ammania baccifera, Caesulia axillaris* and *Alternanthra sessilis* among the broad leaf weeds and *Cyperus difformis* was the only species found among the sedges. In general, grassy and non-grassy weeds were pre-dominant throughout the growing period of the rice. All the herbicidal application either alone or supplemented with hand weeding were most effective in reducing the density and dry matter of weeds and found significantly superior over weedy check (Table-1). Pre-emergence application of pretilachlor 750 g a.i./ha without water stagnation in field upto 1 week fb post-emergence application of bispyribac-Na 20 g a.i./ha brought significant reduction in total weed density and dry matter over the other treatments. The better performance of this treatment could be ascribed to reduced crop-weed competition at initial stage by suppression of the late emerged weeds by the application of bispyribac-Na as post emergence.

Grain and straw yield remained at par with each other under all the treatments but significantly superior over the weedy check (Table-2). Pre-emergence application of pretilachlor 750 g a.i./ha + without water stagnation in field upto 1 week fb post-emergence application of bispyribac-Na 20 g a.i./ha was found superior than the rest of treatments and produced the maximum grain (5729 kg/ha) and straw yield (8385kg/ha). This treatment also recorded maximum number of panicles/m^2 and grains/panicle. This advantage may be attributed to reduction in crop-weed competition, obtained by post-emergence foliage application of bispyribac-Na. Application of bispyribac-Na 20 g a.i./ha alone as post emergence and treatment consisting hand weeding twice at 20 and 40 DAT were the next promising treatment as compared to the other treatments. Among the different doses of penoxsulam 25 g a.i./ha followed by its lower dose applied at 22.5 g a.i./ha recorded the maximum grain yield owing to enhanced number of panicles and grains/panicle. These findings are in line with the results of (4).

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