



Bio-efficacy of post-emergence herbicides in transplanted rice

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Pre-emergence herbicides with high application rates are commonly used for the management of weeds in transplanted rice. However, recent trend in chemical weed management in rice is the use of low dose high efficacy herbicides, which will not only reduce the dose but also make the application easier and economical to the farmer. With this back ground, the present investigation was undertaken to assess the bio efficacy of two new generation post-emergence herbicides, viz. fenoxaprop-p-ethyl and carfentrazone-ethyl in transplanted rice.

A field investigation was conducted in farmer's field in Kanjirathady Padashekaram in Kalliyoor panchayat of Nemom block of Thiruvananthapuram district of Kerala. The soil was sandy clay loam in texture, slightly acidic in reaction, medium in available N and K and high in available P and organic carbon content. The experiment was conducted during third crop season from December 2011 to April 2012 in randomized block design with eight treatments and three replications. The treatments comprised of fenoxaprop-p-ethyl 60 and 90 g/ha, carfentrazone-ethyl 20 and 25 g/ha, fenoxaprop-p-ethyl 60 g/ha + carfentrazone-ethyl 20 g/ha, bispyribac-sodium 30 g/ha, hand weeding twice at 20 and 40 DAT and weedy check. The gross plot size was 20 m² (5 x 4 m) and the net plot area was 4.2 x 3.6 m. Medium duration rice variety 'Uma (MO 16)' was used as the test crop. Eighteen days old seedlings were transplanted in the main field two to three seedlings per hill with a spacing of 20 x 10 cm. The fertilizer recommendation adopted was 90:45:45 kg N, P and K/ha. The tested herbicides were applied at 20 DAT using knapsack sprayer fitted with flat nozzle. The quantity of spray fluid used for the study was 500 l/ha.

Observation on weed density was recorded by placing a quadrat of size 0.5 m x 0.5 m at 40 and 60, and total weed dry weight was recorded by uprooting the weeds in the same area where weed density was recorded at 60 DAT. Weed control efficiency and weed index were worked out by standard procedures. The data on weed density and weed dry weight were transformed using square root transformation. Productive tillers/m² was recorded

by placing a quadrat of size 0.5 x 0.5 m randomly at two spots in the net plot area and the mean values were worked out. Grain (1000) weight from each plot was also recorded. The grain yield from the net plot area of each treatment was recorded at 14% moisture level and expressed in kg/ha. The data were statistically analyzed using Analysis of Variance technique (ANOVA).

Weed flora

The major weed flora present in the experimental area were *Echinochloa colona* (L.) Link (jungle rice) among the grasses, *Cyperus difformis* L. (slender sedge) and *Scirpus grossus* L.f. (Greater club rush) among the sedges and *Limnocharis flava* (L.) Buchenau (water cabbage), *Ludwigia parviflora* Roxb. (water primrose), *Ipomoea aquatica* Forsk. (water spinach), *Lindernia rotundifolia* blanc vert (Baby tears), *Salvinia molesta* D.S.Mitch. (Kariba weed), *Marsilia quadrifolia* Linn. (Airy pepper wort) and *Pistia stratiotes* L. Royale (water lettuce) among the broad-leaf weeds.

Effect of weed density

The weed control treatments significantly influenced the total density of weeds at 40 and 60 DAT (Table 1). At 40 DAT, the lowest weed density was recorded by carfentrazone-ethyl 25 g/ha, which was at par with bispyribac-sodium 30 g/ha and carfentrazone-ethyl 20 g/ha. At 60 DAT, the lowest total density of weeds was recorded by carfentrazone-ethyl 20 g/ha, which was at par with its higher dose 25 g/ha and bispyribac-sodium 30 g/ha. Among the weed control treatments, the highest total weed dry weight and the lowest weed control efficiency were recorded by fenoxaprop-p-ethyl 60 g/ha. The highest total weed density, weed dry weight and the lowest weed control efficiency recorded in fenoxaprop-p-ethyl 60 and 90 g/ha might be due its lesser efficacy in controlling sedges and broad-leaf weeds, the predominant group of weed flora present in the experimental field. The effectiveness of carfentrazone-ethyl for weed control in transplanted rice was also reported by Glomski and Getsinger 2006). Yadav *et al.* (2009) reported the effectiveness of bispyribac-sodium against weeds in transplanted

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Table 1. Effect of weed control treatments on total weed density and dry weight, weed control efficiency, weed index, yield attributes, grain yield and B:C ratio

Treatment	Total weed density (no./m ²)		Total weed dry weight (g/m ²)	WCE (%)	Weed index	Panicles /m ²	1000 grain weight (g)	Grain yield (t/ha)	B: C ratio
	40 DAT	60 DAT							
Fenoxaprop-p-ethyl 160 g/ha	7.54 (56)	9.62 (92)	8.28 (68)	42.58	28.54	388	20.97	4.96	1.50
Fenoxaprop-p-ethyl 190 g/ha	6.62(43)	9.65(93)	7.94(62)	47.53	19.27	417	21.23	5.60	1.65
Carfentrazone ethyl 20 g/ha	4.06(16)	5.46(29)	4.64(21)	82.32	6.03	515	21.99	6.68	2.00
Carfentrazone ethyl 25 g/ha	3.39(11)	5.58(30)	4.75 (22)	81.53	0.00	537	22.12	6.79	2.03
Fenoxaprop-p-ethyl 160 g/ha + carfentrazone-ethyl 20 g/ha	5.70(32)	6.57(43)	5.56(30)	74.57	16.61	449	21.27	5.79	1.72
Bispyribac sodium 30 g/ha	3.44(11)	5.84(34)	5.05(25)	79.03	7.79	477	21.56	6.40	1.86
Hand weeding twice at 20 and 40 DAT	8.24(67)	7.27(52)	6.84(45)	61.80	11.98	463	21.40	6.11	1.46
Weedy check	12.09(146)	12.72(161)	10.95(119)	-	42.66	376	20.72	3.98	1.27
LSD (P=0.05)	0.274	0.236	0.297	9.107	3.966	45.07	0.854	0.36	0.09

DAT- Days after transplanting, WCE- Weed control efficiency, Data on weed count and dry weight subjected to $\sqrt{x+0.5}$ transformation and values in parentheses are original values

rice. The weedy check recorded the highest total weed density at 40 and 60 DAT and total weed dry weight at 60 DAT. Similar observations were made by Subramanian *et al.* (2006) and Dixit and Varshney (2008).

Yield attributes and yield

The yield attributes were also significantly influenced by the weed control treatments. Carfentrazone-ethyl 25 g/ha recorded the highest value of panicles/m² and 1000-grain weight, which was at par with its lower dose (20 g/ha) and bispyribac-sodium 30 g/ha. The better expression of yield attributes in the above treatments was mainly due to the broad spectrum control of weeds resulting in comparatively low competition from weeds. The competition free environment might have allowed the crop to express its full genetic potential.

The highest grain yield (6.79 t/ha) was recorded by carfentrazone-ethyl 25 g/ha, which was statistically at par with its lower dose (20 g/ha) and bispyribac-sodium 30 g/ha. The percentage increase in grain yield in carfentrazone-ethyl 25 and 20 g/ha and bispyribac-sodium 30 g/ha over weedy check were 70.33, 67.70 and 60.79, respectively. Hand weeding treatment recorded a grain yield of 6.11 t/ha which was at par with bispyribac-sodium 30 g/ha. In rice, grain yield is the function of productive tillers per m², number of grains per panicle, percentage filled grains and thousand grain weight. The higher values for these yield attributes registered in the treatments, carfentrazone-ethyl at 25 and 20 g/ha and bispyribac-sodium 30 g/ha might have contributed to higher grain yield in these treatments.

Weed index gives a measure of yield loss due to weeds. Among the weed control treatments, the highest weed index was recorded by fenoxaprop-p-ethyl 60 g/ha and the lowest in carfentrazone-ethyl 25

and 20 g/ha. Season long weed infestation in weedy check caused a yield reduction of 42.66%. Weed control treatments significantly influenced the B: C ratio also. The highest B:C ratio (2.03) was recorded in carfentrazone-ethyl at 25 g/ha and it was at par with its lower dose (20 g/ha). Similar results were also reported by Raj and Syriac (2015).

SUMMARY

A field experiment was conducted to assess the bio efficacy of two new generation post emergence herbicides, *viz.* fenoxaprop-p-ethyl and carfentrazone ethyl in transplanted rice along with bispyribac-sodium, hand weeding twice and weedy check. The weed flora was dominated by broad-leaf weeds, followed by sedges and grasses. The lowest total weed density and weed dry weight, the highest weed control efficiency, net returns and B: C ratio, were recorded in carfentrazone-ethyl 25 g/ha, which was at par with its lower dose (20 g/ha).

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