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Effect of Some New Generation Herbicides in Rainfed Upland Rice (*Oryza sativa)*

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ABSTRACT

Field experiments were conducted at Naira for three consecutive *kharif* seasons from 2004 to 2006 to study the efficacy of new generation herbicides on rainfed upland rice. Grain yield reduction due to uncontrolled weed growth was 59.8% over weed free check. Results indicated that pre-emergence application of oxadiargyl @ 80 g *a.i.*/ ha + working with star weeder at 40 DAS resulted in improved weed control and higher grain and straw yield and proved economically remunerative over butachlor and pretilachlor plots . Though per-emergence application of metsulfuron methyl 10% + chlorimuron ethyl 10% @ 8 g *a.i.*/ ha resulted in superior weed control but the enhanced efficacy could not be translated to better yield due to its phytotoxicity on rice crop

Key words : Grain yield, New generation herbicides, Pre-emergence application, Rainfed upland rice

Upland rice constitutes 17% area in India. and is cultivated in zones receiving an annual rainfall of 700 – 1100 mm. However, its contribution to rice production is a meagre 10% (Sinha *et al,* 1996). Productivity of rainfed upland rice is low due to soil moisture stress, heavy weed infestation, low spread of improved varieties, pest and disease incidence. Among these, weeds are a greater menace to rainfed rice culture and the yield loss of rainfed upland rice culture is estimated from 15 to 50 %. The initial growth and vigour of rice receives a severe set back owing to early and rampant weed growth. Keeping this in view the present investigation was conducted to develop weed management strategies to keep the weeds under check and infuse an early lead to the crop growth.

MATERIAL AND METHODS

Field experiments were conducted for three consecutive *kharif* seasons from 2004 to 2006 in the upland block of Agricultural College Farm, Naira of Acharya N.G. Ranga Agricultural University having a pH of 7.2, organic Carbon 0.35 %, available Phosphorus 13.10 kg ha^{-1} and available Potassium (382.2 kg ha^{-1}). The test variety *'Pushkala'* (105 days duration) was sown directly in rows 20 cm apart at 90 kg ha^{-1} in the first fortnight of July in all the three years. The crop received 60 kg N, 40 kg P_2O_5, 30 kg K_2O and 50 kg Zn SO_4 per ha. The crop received 545, 981 and 714 mm rainfall in 31,45 and 41 rainy days resepectivbely during 2004, 2005 and 2006. The experiment was laid out in randomized block design with three replications and comprised 9 treatments *viz.*, weed free check, weedy check, pre emergence application of pretilachlor @ 1.0 kg *a.i.* ha^{-1}, butachlor @1.25 kg *a.i.* ha^{-1}, metsulfuron methyl 10% + chlorimuron ethyl 10%(MMCE) @ 8 g *a.i.* ha^{-1}, oxadiargyl @ 80 g *a.i.* ha^{-1} and working with star weeder at 20&40 DAS, pretilachlor + working with star weeder at 40 DAS, butachlor + working with star weeder at 40 DAS, MMCE + working with star weeder at 40 DAS, oxadiargyl + working with star weeder at 40 DAS. The herbicides were applied with knapsack sprayer fitted with flat fan nozzle using spray volume of 500 l ha^{-1}.

The density and dry weight of weeds were taken at 20 and 40 days after sowing using a quadrate of 0.25 m^2 from four places in each plot. In the treatments where weeding with star weeder was integrated with herbicides, weeding was done after the data on weed parameters was recorded. The data on weed counts and weed dry weight were subjected to square root transformation.

RESULTS AND DISCUSSION

Effect on weeds

During the three years of experimentation the field was infested with predominant weeds like *Echinochloa* spp. *Cynodon dactylon*, *Laptochloa chinensis*, *Dactyloctenium aegyptium* and *Digitaria sanguinalis* among grasses; and *Cyperus rotundus*, *Fimbristlis miliaceae* and *Cyperus iria* among

Table 1. Effect of weed control treatments on weed and crop parameters and economics of rainfed upland rice (Pooled data of 3 years)

Treatments	Total weed density /m^2		Total dry weight (g /m^2)		Grain Yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Net returns (Rs.)	Benefit: Cost ratio
	20 DAS	40 DAS	20 DAS	40 DAS				
Weed free check	2.27 (5.16)	2.05 (4.20)	1.40 (1.96)	2.49 (6.20)	2510	4705	1722	1.12
Weedy Check	3.93 (15.44)	4.26 (18.15)	7.29 (53.14)	12.74 (162.31)	1008	3189	-3995	0.64
Pretilachlor	3.01 (9.06)	2.83 (8.01)	4.80 (23.04)	5.22 (27.25)	2048	3972	1880	1.16
Butachlor	3.09 (9.54)	2.94 (8.64)	5.38 (28.94)	5.18 (26.83)	2056	4001	2053	1.18
MMCE	2.74 (7.51)	2.61 (6.81)	3.56 (12.67)	3.90 (15.21)	1616	3278	-696	0.94
Oxdiargyl	2.83 (8.01)	2.78 (7.73)	4.32 (18.66)	4.81 (23.14)	2164	4280	2788	1.23
Star weeding twice	3.93 (15.44)	2.86 (8.18)	5.59 (31.25)	3.95 (15.60)	2223	4337	1239	1.09
Pretilachlor+star weeding	3.07 (9.42)	2.48 (6.15)	4.71 (22.18)	3.49 (12.18)	2278	4341	2170	1.17
Butachlor+star weeding	3.14 (9.86)	2.59 (6.71)	5.10 (26.01)	3.50 (12.25)	2213	4245	1872	1.15
MMCE+star weeding	2.50 (6.25)	2.44 (5.95)	3.57 (12.74)	3.11 (9.67)	1933	3801	163	1.01
Oxadiargyl+star weeding	2.75 (7.56)	2.43 (5.90)	3.93 (15.44)	3.21 (10.30)	2325	4521	2626	1.21
CD (P =0.05)	0.57	0.57	1.31	0.95	145	249		

* Data were subjected to square root transformation. Figures in the parenthesis are the means of original values.

sedges; and *Celosia argentea*, *Trianthema portulacastrum* and *Boerhavia diffusa* among broadleaf weeds. Pooled analysis data revealed that all the weed control techniques significantly reduced the total weed density at 20 and 40 DAS except the treatment involving working of star weeder twice. Significantly the lowest weed density was observed with MMCE+ star weeding which was however, on par with all other integrated treatments and alone application of MMCE, oxadiargyl ,thus exhibiting its superiority over the conventional herbicides (Table1).

Dry matter of weeds:

Dry matter production of weeds was significantly affected by different weed control treatments (Table. 1). MMCE and oxadiargyl manifested a drastic 76% and 71% reduction of weed dry matter over weedy check, which were however statistically on par with one another. While, the reduction in weed dry weight was 58 % with pretilachlor and 51% with butachlor, clearly indicating the superior performance of new generation herbicides at relatively lower doses over the previously recommended herbicides when applied independently. The practices involving MMCE and oxadiargyl integrated with star weeding at 40 DAS gave the lowest dry matter of weeds, i.e. 94% with MMCE and 93.7% with oxadiargyl. However the efficacy of the conventionally recommended pretilachlor and butachlor also exhibited similar trend (92.5% reduction) when integrated with star weeding ,which was statistically on par with new generation herbicides but superior to the application of the respective herbicides independently (Table 1). Singh *et al* (2005) also reported better weed control efficiency when the preemergence application of herbicides was supplemented with physical measures at 40 DAS.

Effect on crop

Grain and straw yield:

All the weed control treatments recorded significantly higher grain yield over weedy check. The increase in grain yield under weed free check was 149% over weedy check, which recorded the lowest grain yield (Table 1). Among herbicidal treatments, oxadiargyl + star weeding registered the lowest grain yield (2325 kg ha^{-1}) which in turn was on par with pretilachlor+ star weeding and star weeding twice besides weed free check and

significantly superior to rest of the herbicide treatments, exemplifying the importance of integration of preemergence herbicides with mechanical methods for superior performance over individual applications. Despite satisfactory weed control, MMCE application recorded significantly lower grain yield than any other herbicidal treatment due to its phytotoxicity on rice crop. The reduction in plant height under the influence of MMCE at 20 and 40 DAS, indicated that the crop did not recover totally from the phytotoxic effect. Significantly the highest straw yield was assoicated with weed free check, which was however comparable with oxadiargyl + star weeding.

Oxadiargyl + star weeding registered superior performance over butachlor and pretilachlor, which can be attributed to effective suppression of weeds during early stages by herbicidal application and by star weeding at later stages of crop growth as reflected in reduced weed growth, which enabled the rice crop to manifest its yield potential. The effectiveness of MMCE in terms of better weed control could not be translated in to increased grain and straw yield due to its phytotoxicity on crop. The results are in agreement with those reported by Sanjoy Saha (2006).

Economics:

The economic anlysis carried out based on three years of investigation revelaed that the highest net returns were obtained with preemergence application of oxadiargyl 80 g a.i ha^{-1} followed by star weeding at 40 DAS while, the benefit: cost ratio was slightly high (1.24) with preemergence application of oxadiargyl alone @ 80 g a.i ha^{-1} over preemergence application of oxadiargyl 80 g a.i ha^{-1} followed by star weeding at 40 DAS (1.21) owing to the involvement of manual labour for star weeding operation (Table 1). Despite the highest grain yield recorded with weed free check, it was proved economically not rewarding due to escalating labour cost while net negative returns were recorded with weedy check due to higher cost of cultivation than gross returns. Parmeet Singh and Singh (2006) also observed similiar findings.

It was concluded that for achieving higher yields with reduced weed growth under rainfed upland rice preemergence application of oxdiargyl 80 a.i ha^{-1} followed by star weeding at 40 DAS should be adopted.

LITERATURE CITED

Parmeet Singh and S S Singh 2006 Effect of establishment methods, fertility level and weed - management practices on aromatic rice (*Oryza sativa*). Indian Journal of Agronomy 51 (4): 288-292

Sanjoy Saha 2006 Comparative study on efficacy of sulfonylurea herbicides and traditional recommended herbicides in transplanted rice (*Oryza sativa*). Indian Journal of Agronomy 51(4): 304-306.

Singh G, Singh R G, Singh O P, Kumar T, Mehta R K, Kumar V and Singh P P 2005. Effect of weed-management practices on direct seeded rice (*Oryza sativa*) under puddle lowlands. Indian Journal of Agronomy 50 (1): 35-37

Sinha P K, Singh C V, Singh R K, Mishra G N, Maiti D, Shukla D V and Variar M 1996 Rainfed upland rice-Future strategies. Indian Farming 46(9): 25-28.

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