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Response of direct Seeded Rice (*Oryza sativa* L.) to Integrated Weed Management Practices

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ABSTRACT

A field experiment was conducted at Agricultural College Farm, Bapatla during *Kharif* 2016 to study the response of weeds indirect seeded rice to some new generation herbicides applied as alone or in sequence or in a integrated practice. Results of the experiment revealed that application of pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} as pre emergence at 1 to 2 DAS *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} as post emergence at 35 DAS (T_{10}) was found to be effective in controlling weeds and enhancing the yield of direct seeded rice without any crop injury and was on par with other integrated weed management practices and also with hand weeding.

Key words : *Direct seeded rice, integrated weed management, New generation herbicides*

Direct seeded rice is subjected to greater weed competition than transplanted rice because both weed and crop seeds emerge at the same time and compete with each other from germination. Weed growth in direct-seeded rice is severe and is one of the serious limiting factors in realising the yield potential of direct-seeded rice (Rao, *et al.,* 2007). The risk of crop yield loss due to competition from weeds in direct seeding methods is higher than that of transplanted rice because of synchronisation of growth stages of crop and weeds (Singh, *et al.,* 2007). The use of herbicides offers selective control of weeds right from the beginning, giving the crop an advantage of good start and competitive superiority over weeds (Saha, 2005). Moreover, herbicides presently used in rice are mainly pre-emergence and weeds coming at later stages of crop growth are not controlled as effectively as at emergence stage. This situation warranted for initiating research efforts to evaluate and identify suitable post emergence herbicides and a need to focus attention on integration of pre and post emergence herbicides with manual weeding to broaden the spectrum of weed control (Kalaiselvi, *et al.,*2009). As the evaluation of new herbicides is a continuous process under local conditions and in order to provide wider options to the farmers for broad spectrum control of weeds without any injury to crop plants, the present experiment was undertaken.

MATERIAL AND METHODS

An experiment was conducted at Agricultural College Farm, Bapatla during *Kharif* 2016. The soil of the experimental field was sandy loam in texture with a pH of 7.9. The soil was low in organic carbon (0.48%), available nitrogen (189.4 kg ha^{-1}), medium in available phosphorus (24 kg ha^{-1}) and high in available potassium (281.8 kg ha^{-1}). A total rainfall of 469.4 mm was received during crop growth period in 19 rainy days. The experiment was laid out in a randomized block design with twelve treatments (Table 1) and replicated thrice. Recommended dose of 120 kg N ha^{-1}, 60 kg P_2O_5 ha^{-1} and 40 kg K_2O ha^{-1} was applied through urea, single super phosphate and muriate of potash, respectively. Entire quantity of phosphorus and potassium and one third of nitrogen were applied as basal. At active tillering stage one third of the N was applied and the remaining one third of the N was applied at panicle initiation stage. Healthy seeds with good germination percent (94 per cent) of the test cultivar Samba Mahsuri (BPT 5204) were sown at a spacing of 20 cm x 10 cm. The pre emergence herbicides were applied at 2 DAS and post emergence herbicides at 25 and 35 DAS as per the treatments requirement through knap-sack sprayer using a spray volume of 500 l ha^{-1}. The data on weed density and dry weight were recorded at 30, 60 DAS and at harvest and were subjected to square root transformation $\sqrt{x + 0.5}$ before

Table 1. Weed density (no. m^{-2}) and weed dry weight (g m^{-2}) as influenced by different weed management practices in direct seeded rice.

Treatments	Weed density (no. m^{-2})			Weed dry weight (g m^{-2})		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T_1 : Weedy check	*11.5 (130.7)	14.1 (197.3)	12.8 (164.0)	*11.6 (134.4)	17.5 (307.0)	13.7 (186.6)
T_2 : Manual weeding twice at 20 and 40 DAS	4.0 (15.3)	6.7 (45.3)	5.9 (36.0)	4.0 (15.8)	7.1 (50.3)	6.0 (36.3)
T_3 : Pretilachlor + pyrazosulfuron ethyl @ 615 g a.i ha^{-1} (1 to 2 DAS)	9.2 (85.3)	11.6 (134.7)	10.3 (105.3)	8.6 (73.6)	13.1 (173.4)	11.3 (128.2)
T_4 : Pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} (1 to 2 DAS)	8.9 (78.7)	11.4 (130.7)	10.1 (101.3)	8.3 (68.8)	12.9 (167.7)	1.1 (123.8)
T_5 : T3 *fb* halosulfuron @ 35 g ha^{-1} as post emergence (25 DAS)	7.4 (54.7)	9.7 (94.7)	7.7 (58.7)	6.9 (47.0)	10.3 (106.5)	9.0 (81.7)
T_6 : T4 *fb* halosulfuron @ 35 g ha^{-1} as post emergence (25 DAS)	7.0 (49.3)	9.6 (91.3)	7.3 (52.7)	6.4 (41.4)	10.1 (102.5)	8.7 (75.1)
T_7 : T3 *fb* propanil @ 3.75 kg ha^{-1} as post emergence (25 DAS)	8.1 (65.3)	10.3 (106.7)	8.0 (64.7)	7.4 (55.6)	11.2 (119.7)	9.8 (95.7)
T_8 : T4 *fb* propanil @ 3.75 kg ha^{-1} as post emergence (25DAS)	7.9 (62.0)	10.1 (102.7)	7.8 (61.3)	7.3 (53.3)	11.1 (117.2)	9.6 (91.1)
T_9 : T3 *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} (35 DAS)	3.7 (13.3)	6.6 (43.3)	5.8 (34.0)	3.7 (13.2)	6. (46.9)	5.9 (34.3)
T_{10} : T4 *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} (35 DAS)	3.5 (12.0)	6.3 (40.0)	5.7 (32.0)	3.5 (12.4)	6.7 (45.3)	5.6 (32.1)
T_{11} : T3 *fb* manual weeding at 20 DAS *fb* propanil @ 3.75 kg ha^{-1} (35 DAS)	4.3 (18.0)	7.0 (48.7)	6.4 (40.7)	4.3 (18.1)	7.4 (54.9)	6.4 (40.2)
T_{12} : T4 *fb* manual weeding at 20 DAS *fb* propanil @3.75 kg ha^{-1} (35 DAS)	4.1 (16.7)	6.9 (47.3)	6.2 (38.3)	4.2 (17.1)	7.3 (53.4)	6.3 (39.7)
SEm±	0.30	0.41	0.44	0.38	0.41	0.38
CD (P=0.05)	0.9	1.2	1.3	1.1	1.2	1.1

*The data are $\sqrt{X + 0.5}$ transformed. The figures in parentheses are the original values.

Table 2. Crop growth and yield parameters as influenced by different weed management practices in direct seeded rice

Treatments	Plant height (cm)	Productive tillers m^{-2}	Grains $panicle^{-1}$	Test weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest Index (%)
T_1 : Weedy check	65.2	140.2	85	14.1	2159	3699	36.8
T_2 : Manual weeding twice at 20 and 40 DAS	95.8	298.9	147	15.3	5389	6618	44.9
T_3 : Pretilachlor + pyrazosulfuron ethyl @ 615 g a.i ha^{-1} (1 to 2 DAS)	75.9	173.0	100	14.4	2949	4339	40.6
T_4 : Pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} (1 to 2 DAS)	76.3	184.1	103	14.5	3014	4410	40.7
T_5 : T3 *fb* halosulfuron @ 35 g ha^{-1}as post emergence (25 DAS)	87.5	238.4	123	14.8	4041	5340	43.2
T_6 : T4 *fb* halosulfuron @ 35 g ha^{-1}as post emergence (25 DAS)	88.0	244.7	125	15.0	4186	5400	43.1
T_7 : T3 *fb* propanil @ 3.75 kg ha^{-1}as post emergence (25 DAS)	83.6	223.0	117	14.5	3781	5109	42.4
T_8 : T4 *fb* propanil @ 3.75 kg ha^{-1}as post emergence (25DAS)	85.0	230.7	120	14.7	3869	5244	42.3
T_9 : T3 *fb* manual weeding at 20 DAS*fb* halosulfuron @ 35 g ha^{-1} (35 DAS)	96.6	301.7	151	15.3	5425	6770	44.5
T_{10} : T4 *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} (35 DAS)	99.2	307.9	154	15.5	5557	6816	45.0
T_{11} : T3 *fb* manual weeding at 20 DAS *fb* propanil @ 3.75 kg ha^{-1} (35 DAS)	92.9	274.7	141	15.0	5089	6345	44.7
T_{12} : T4 *fb* manual weeding at 20 DAS *fb* propanil @3.75 kg ha^{-1} (35 DAS)	93.9	281.2	144	15.1	5188	6423	44.8
SEm±	3.6	11.4	5	0.5	252	301	2.0
CD (P=0.05)	10.6	33.4	16	NS	739	882	5.8

statistical analysis to normalize their distribution (Panse and Sukhatme, 1978). The growth and yield attributes were recorded at the time of maturity.

RESULTS AND DISCUSSION

The predominant weed flora identified in the experimental field was *Echinochloa colonum, Cynodon dactylon, Digitaria sanguinalis, Dactyloctenium aegyptium, Paspalum conjugatum, Leptochloa chinensis* and *Chloris barbata* among grasses; *Cyperus rotundus, Cyperus iria* and *Scirpus articulate or articulata* among sedges*; Eclipta alba, Euphorbia hirta* and *Bergia capensis* among broad leaved weeds.

The density and dry weight of weeds at 30, 60 DAS and at harvest was significantly reduced under all weed management practices than weedy check (Table 1). Among the herbicides tested, pre emergence application of pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} as post emergence (T_{10}) was found significantly superior in reducing weed density and dry weight of weeds at all the recorded crop growth stages. However it was comparable with other integrated weed management practices (T_9, T_{11} and T_{12}) and also with hand weeding (T_2). Application of both pre and post emergence herbicides (T_5 to T_8) in sequence and pre emergence herbicides only once (T_3 and T_4) were significantly inferior to T_{10}. The integration of herbicides with one hand weeding practice resulted in broad spectrum weed control over the other treatments due to the fact that pre emergence herbicides eliminated the early emerged weeds while the hand weeding practice and post emergence herbicides controlled the later germinated weeds thereby reduced weed population resulted in lowest weed dry weight. These results are in conformity with the findings of Singh *et al.* (2006) and Singh and Singh (2014).

Among different weed management practices, number of productive tillers m^{-2} (307.9), grains per panicle (154) and the highest grain yield (5557 kg ha^{-1}) was obtained with pre emergence application of pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} as post emergence (T_{10}) and it was at par with other integrated weed management practices (T_9, T_{11} and T_{12}) and also with hand weeding (T_2). The minimum grain yield (2159 kg ha^{-1}) and straw yield (3699 kg ha^{-1}) was observed in weedy check. The increased grain yield might be due to cumulative effect of lower weed density and weed dry weight, with improvement in yield attributes like productive tillers, number of filled grains per panicle Straw yield also followed almost similar trend to that of grain yield. These results are in agreement with the findings of Prabakaran *et al.* (2014).

Overall, the study revealed that pre emergence application of pendimethalin + pyrazosulfuron ethyl @ 920 g a.i ha^{-1} *fb* manual weeding at 20 DAS *fb* halosulfuron @ 35 g ha^{-1} as post emergence (T_{10}) was found an effective integrated weed management practice in managing weeds in direct seeded rice without any crop injury as an alternative to manual weeding.

LITERATURE CITED

Kalaiselvi K, Arul A, Swaminathan M and Ramamoorthy K 2009 Approaches on herbicides - herbicide interaction- A review. *Agricultural Reviews.* 30(1): 32-39.

Panse V G and Sukhatme P V 1978 Statistical methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, pp.152.

Prabhakaran N K, Sakthivel N and Nithya C 2014 Effect of herbicide combinations on weed control efficacy and grain yield of direct seeded rice. *Trends in Biosciences.* 7(24): 4244-4247.

Rao A N, Mortimer A M, Johnson D E, Sivaprasad B and Ladha J K 2007 Weed management in direct-seeded rice. *Advances in Agronomy.* 93 : 155-257.

Saha S 2005 Efficacy of certain new herbicide formulations in transplanted rice under shallow low land.*Indian Journal of Weed Science.* 37(1-2): 109-110.

Singh S, Latha J K, Gupta R K, Bhushan L, Rao A N, Sivaprasad B and Singh P P 2007 Evaluation of mulching, intercopping with *Sesbania* and herbicide use for weed management in dry-seeded rice (*Oryza sativa* L.). *Crop production.* 26: 518-524.

Singh U P, Singh R P and Singh Y 2006 Integrated weed management in direct dry seeded rainfed lowland rice. *Indian Journal of Weed Science*. 38 (1 & 2): 49-53.

Singh N K and Singh U P 2014 Crop establishment methods and weed management on growth and yield of dry direct seeded rice. *Indian Journal of Weed Science*. 46 (4):308 -313.