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STUDY OF EFFECT OF NEW HERBICIDES ON WEED MANAGEMENT IN TRANSPLANTED RICE

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Abstract

A field investigation was carried out at Annamalai Univeristy Experimental Farm, Annamalainagar to study the effect of new herbicides on weed management in transplanted rice during samba, 2013 in a randomized block design with eleven treatments and three replications by using the rice variety ADT-38. The treatments comprised of T_1 – Unweeded control, T_2–Pretilachlor 0.6kgha^{-1} on 3DAT, T_3–Metsulfuronmethyl + Chlorimuronethyl 0.004 kgha^{-1} on 3DAT, T_4 – Bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT, T_5 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_6 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_7 – Bensulfuron methyl + Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_8 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT, T_9 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT fb bispyribac sodium 0.02 kg ha^{-1} on 30 DAT, T_{10} – Bensulfuron methyl + Pretilachlor 0.66 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT and T_{11} – Two hand weeding on 15 and 30 DAT. Result of the experiment revealed that application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT is considered to be judicious recommendation to rice farmers in view of inadequate labour and higher weeding cost in transplanted rice.

Key words: Herbicides, Weed management and transplanted rice.

Introduction

Rice (*Oryza sativa* L.) is one of the most predominant food crop that is being extensively cultivated in India more than 90 per cent of the world's rice is grown and consumed in Asia. Rice is grown in 114 countries across the world with an area of 164 million hectares and the production of 741.4 million tonnes with productivity of 4.4 t ha^{-1} (FAO, 2013). In India, rice is grown in an area of 44.10 million hectares and production of 107 million tonnes with productivity of 3.58 t ha^{-1}. In Tamil Nadu, rice is grown predominantly among the state in India, which is cultivated in an area of 2.2 million hectares and production of 8.65 million tonnes with productivity of 3.93 t ha^{-1} (TNAU, 2013). However, yield is still lower than compared to the average productivity of producing countries such as Japan (8.25 t ha^{-1}), China (6.70 t ha^{-1}), Egypt (7.50 t ha^{-1}) and Israel (5.50 t ha^{-1}) (USDA, 2012). More than 90 per cent of the world's rice produce is consumed in Asia, providing 50 per cent of the total calorie intake of Asia's population. India has to produce 135-145 million tonnes of rice by 2020 to feed the additional 350 million people (Prakash *et al.,* 2008).

Rice crop suffers from various biotic and abiotic constraints. Weed competition is one of the prime yield-limiting biotic constraints in rice is weeds compete with crops for water, light, nutrients and space. Weeds are the most competitors in their early growth stages than at later stages and hence the growth of crops was suffered and finally reduced the grain yield (Jacob and Syriac, 2005). Weeds grow profusely in the rice field and reduce crop yields drastically normally the loss in yield range between 15 to 20 per cent yet in severe cases the yield losses can be more than 50 per cent, depending upon the species and intensity of weeds Weed flora under transplanted condition is very much diverse and consists of grasses, sedges and broad-leaved weeds causing yield reduction of rice crop up to 76 per cent (Govindra Singh *et al.,* 2004). Chemical method of weed control is effective to control the weeds economically. Now a day

use of herbicides is gaining popularity in rice culture due to their rapid effects and less cost involvement compared to traditional methods. The use of herbicides offers selective control of weeds right from beginning, giving crop and advantage of good start and competitive superiority over weed (Saha *et al.,* 2006). Much attention is required towards the chemical weed control in transplanted rice. Several new herbicides are coming to market and its necessitates to test the efficiency of new herbicides alone or in combination for the control of weeds in transplanted rice. Keeping these in view, a field experiment was conducted during samba season ,2013 at Annamalai University Experimental Farm, Annamalainagar, to study the evaluation of new herbicides *viz.,* Metsulfuron methyl + Chlorimuron ethyl, Bensulfuron methyl + Pretilachlor, 2,4-D and Bispyribac sodium on weed control in transplanted rice.

Materials and methods

Field experiment was conducted at Annamalai University Experimental Farm, Annamalainagar during Samba, 2013 to study the effect of new herbicides on weed management in transplanted rice. The Experimental Farm is geographically located at $11^0$24 North latitude and $79^0$44 East longitude and at an altitude of 5.79 m above mean sea level. The weather of Annamalainagar is moderately warm with hot summer months. While the maximum temperature ranges from 36.6^{0}C to 28.3^{0}C with mean of 32.45^{0}C, the minimum temperature ranges from 26.5^{0}C to 20.6^{0}C with a mean of 23.55^{0}C and relative humidity ranges from 74 to 90 per cent. The soil of the experimental field was clay loam in texture. The experiment was laid out in a Randomized block design (RBD) with three replications with eleven weed control treatments. *viz.*, T_1 -Unweededcontrol, T_2– Pretilachlor 0.6kgha^{-1} on 3 DAT, T_3–Metsulfuron methyl+Chlorimuron ethyl 0.004kg ha^{-1}on 3 DAT, T_4 – Bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT, T_5 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_6 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_7 – Bensulfuron methyl + Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT, T_8 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT, T_9 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT fb bispyribac sodium 0.02 kg ha^{-1} on 30 DAT, T_{10} – Bensulfuron methyl + Pretilachlor 0.66 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT and T_{11} – Two hand weeding on 15 and 30 DAT. The nursery field was puddled to a fine colloidal condition and leveled, suitable irrigation and drainage channels were formed. Alternate drying and wetting was practiced for the first four days till sufficient germination was noticed. Thereafter, thin film of water was maintained throughout the nursery period.

The paddy seeds of ADT 38 was sown by adopting a seed rate of 40 kg ha^{-1}. The seeds were treated with carbendazin @ 2 g kg^{-1} of seeds. After 24 hours the seeds were treated with *Azospirillum* @ 600 g ha^{-1} of seeds. Then the seeds were stored in gunny bag, soaked in water for 12 hours and incubated for 12 hours. The sprouted seeds were sown in the nursery. The main field was puddled well with a tractor and field corner were dug with a spade. The bunds were trimmed and plastered. The field was finally leveled and divided into plots of 5´4 m dimension. The bunds of the plots, initially laid out to a thickness of 0.5 m were strengthened and plastered as and when required in order to retain its identify till the completion of the study. Twenty five days old rice seedlings were transplanted, with 2 seedlings per hill. The crop geometry of 20´ 10 cm was adopted. Recommended dose of fertilizer 150 kg of N, 50 kg P_2O_5 and 50 kg of K_2O were applied for ADT 38 and 75 kg N, 50 kg P_2O_5 and 25 kg K_2O ha^{-1} were applied as basal. The remaining 75 kg of N and 25 kg K_2O were applied in two equal splits as top dressing one at active tillering stage and another at panicle initiation stage. All the plots were irrigated to maintain a standing water level of 5 cm throughout the crop period. The water from the field was drained completely ten days before the harvest for facilitating the hardening at rice grains. As per the treatment schedule required quantity of pre-emergence and post emergence herbicides were sprayed with knapsack sprayer filled with flood jet nozzle using 600 litres of water ha^{-1}. All the pre-emergence and post emergence herbicides were sprayed on 3 DAT and 30 DAT, respectively with adequate soil moisture. Observations on total weed count, weed biomass and weed control efficiency were recorded on 30 DAT. Rice growth and yield attributes and grain yield were observed and economics in terms of net returns and benefit cost ratio were computed.

Results and discussion

Total weed count: The weed count was significantly influenced by the weed control treatments on 30 DAT. Among the different weed control measures, application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT (T_{10}) controlled most of the weeds and recoded the least weed count of 11.98 m^{-2} on 30 DAT. The highest total weed count of 95.77 m^{-2} was recorded in unweeded

control (T_1). This herbicide controlled the weed seed emergence and establishment initially and depleting the soil seed reserves and the late emerged weeds can be controlled through application of bispyribac sodium on 30 DAT. It was absorbed by roots, shoots and germinating weeds and inhibits the synthesis of essential branched chain amino acid, cell division and early development and thus effectively controlled the weeds and performed better than other herbicides. The weed infestation was controlled effectively which led to least value of total weed count. The unweeded control registered the highest weed count, weed biomass, nutrients removal and the least WCI was reported by Hasan *et al.* (2003).

Weed biomass: Among the treatments, application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT (T_{10}) was superior and recorded the lowest weed biomass of 72.91 kg ha^{-1} on 30 DAT. The highest biomass was recorded in unweeded control 334.00 kg ha^{-1} on 30 DAT. This might be attributed to prolonged weed control by herbicides effectively, which led to least values of weed biomass.

Weed control efficiency (WCE): Among the various treatments tested, application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT (T_{10}) recorded the highest WCI of 78.17 per cent on 30 DAT. This could be attributed to efficient and prolonged weed control by the pre-emergence herbicide and later emerging weeds were controlled by post emergence herbicide it led to higher weed control efficiency.

Growth attributes:

Plant height (cm):

Among the treatments, pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT

Table 1 : Effect of new Herbicides on weed mangement in transplanted Rice

Treatments	Total weed count m^{-2} on 30 DAT	Weed biomass (kg ha^{-1})	WCI (per cent)	Plant height (cm)	DMP (kg ha^{-1})	Number of panicles m^{-2}	Grain yield (kg ha^{-1})
T_1 – Unweeded control	9.81 (95.77)	334.00	–	34.92	2765	228	2543
T_2 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT	9.03 (81.10)	293.66	12.07	36.66	3190	241	2798
T_3 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT	8.39 (69.95)	242.79	27.30	39.29	3625	254	3046
T_4 –Bensulfuron methyl + Pretilachlor 0.66 kg ha^{-1} on 3 DAT	7.59 (57.20)	202.28	39.43	41.89	4067	267	3313
T_5 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT	6.89 (47.05)	151.82	54.54	44.06	4503	280	3593
T_6 – Metsulfuron methyl + Chlorimuron ethyl 0.004 ha^{-1} on 3 DAT fb 2,4-D 1 kg ha^{-1} on 30 DAT	6.41 (40.65)	146.11	56.25	45.06	4743	290	3809
T_7 –Bensulfuron methyl + Pretilachlor 0.66 kg ha^{-1} on 3 DAT fb 2,4-D1 kg ha^{-1} on 30 DAT	5.62 (31.15)	134.30	59.79	47.66	5223	309	4267
T_8 – Pretilachlor 0.6 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT	4.89 (23.45)	113.73	65.94	49.53	5820	322	4578
T_9 – Metsulfuron methyl + Chlorimuron ethyl 0.004 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT	4.12 (16.55)	93.27	72.07	51.67	6248	335	4892
T_{10} –Bensulfuron methyl + Pretilachlor 0.66 kg ha^{-1} on 3 DAT fb Bispyribac sodium 0.02 kg ha^{-1} on 30 DAT	3.53 (11.98)	72.91	78.17	54.52	6743	348	5226
T_{11} – Two hand weeding on 15 and 30 DAT	6.08 (36.55)	140.27	58.00	45.99	4973	300	4031
S.Ed	0.24	3.19	-	0.81	199	5.95	114
CD (p=0.05)	0.52	6.67		1.71	416	12.45	240

(Figures in parenthesis indicates the original value)

followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT (T_{10}) significantly registered the tallest plant height of 54.52cm on 30DAT. Unweeded control plot recorded the lowest plant height of 34.92cm. This is primarily because of better weed control and suppression of weed competition. However, increased mobility of nutrients, disease and pest control might have also added for the better performance of the crop.

Crop dry matter production (DMP):

Application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kgha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kg ha^{-1} on 30 DAT (T_{10}) significantly recorded the highest crop dry matter production of 6743 kg ha^{-1} on 30. The lowest dry matter production of 2765 kg ha^{-1} on 30 DAT was recorded in unweeded control treatment. In unweeded control because of severe weed competition from the beginning of the crop duration interfered with nutrient uptake, light and space for rooting was responsible for lesser crop DMP.

Yield attributes:

Number of panicles m^{-2}

Application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kgha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kgha^{-1} on 30 DAT (T_{10}) significantly recorded the highest number of panicles m^{-2} (348). Unweeded control recorded the lowest number of panicles m^{-2} of (228). The better performance of this treatment could be attributed to efficient control of weeds. Further enhanced crop vigour due to better nutrient mobility it's led to produce more number of panicles.

Grain yield (kg ha^{-1}):

Application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kgha^{-1} on 30 DAT (T_{10}) significantly registered the highest grain yield of 5226 kg ha^{-1}. Unweeded control recorded the lowest grain yield of 2543 kg ha^{-1}. Among the pre-emergence and post emergence herbicides, significantly highest grain yield and its attributes were obtained with the application of pre-emergence herbicide bensulfuron methyl + pretilachlor 0.66 kg ha^{-1} on 3 DAT followed by post emergence herbicide bispyribac sodium 0.02 kgha^{-1} on 30 DAT there by realizing an increase of 48.66 per cent yield over unweeded control due to better control of weeds throughout crop weed competition period it leads to produce higher grain yield. In unweeded control because of severe weed competition from the beginning of the crop duration interfered with nutrient uptake, light and space for rooting was responsible for lesser grain yield. The least growth characters and grain yield recorded under unweeded control was reported by Narayanan *et al*. (2000).

References

FAO (2013). Rice world, yield and production food agricultural organization.

Hasan, K.M., M.K. Begum, M. Salim and N. Islam (2003). Comparative performance of the herbicides Ronster 25 EC, Set off 20 WG and Golteer 5G different rates for weed control in Aman Rice (BR-11). *Asian J. of Plant Sciences,* **2(4)**: 380-383.

Jacob, D. and E.K. Syriac (2005). Performance of transplanted scanted rice (*Oryza satia* L.) under different spacing and weed management regimes in Southern Kerana. *J. Trop. Africa,* **43(1)**: 71-73.

Narayanan, A., R. Poonguzhalan, R. Mohan, J.R. Mohan, E. Subarayalu and A.M. Hanita. 2000. Chemical weed management in transplanted rice in Karaikal region of Pondicherry Union Territory. *Madras Agric. J.,* **87:** 691-692.

Prakash, H.C., B.G. Shekara, B.R. Jahadeesh, K.N. Kalyanamurthy and M.L. Sivalingam (2008). Paddy pulse cropping system for sustaining soil health and rice yield in Cauvery command area. *Res. On Crops,* **9(1)**: 7-9.

Saha, S. (2006). Comparative study on efficacy of sulfonyl urea herbicides and traditional recommended herbicides in transplanted rice. *Indian J. Agron.,* **51(4)**: 304-306.

Singh, G., V.P. Singh and M. Singh (2004). Effect of almix and butachlor along and in combinations on transplanted rice and associated weeds. *Indian J. Weeds Sci.,* **36(1&2)**: 64-67.

TNAU (2013). Rice area, yield and production. Tamil Nadu Agricultural Univeristy.

USDA (2012). Table 09 rice area, yield and production. United States Department of Agriculture, Foreign Agriculture Service.