Plant Archives Vol. 19 No. 2, 2019 pp. 3093-3096 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF PRE AND POST EMERGENCE HERBICIDES ON WEED FLORA AND YIELD OF TRANSPLANTED RICE

Paulraj Suryakala[1], G. Murugan[2]*, P. Stalin[2], M. Saravanaperumal[2] and K. Suseendran[2]*

[1]Department of Agronomy, AC&RI, TNAU, Madurai - 625104
[2]*Depart. of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608002 (Tamilnadu), India

Abstract

A field study was conducted during Samba season of 2017 to evaluate the efficacy of pre and post emergence herbicides in transplanted rice. The herbicides evaluated were Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} along with post emergence herbicides Fenoxaprop-p-ethyl 9.3% w/w @ 875 ml ha^{-1}, Bispyribac-sodium 10% SC @ 200 ml ha^{-1}. Results of the study revealed substantial reduction in weed population in all the weed management practices adopted plots compared to weedy check. Pre-emergence herbicide application of Pretilachlor + Pyrazosulfuron-ethyl followed by post emergence herbicide application of Bispyribac-sodium recorded lower weed population, higher yield parameters, grain yield (5163 kg ha^{-1}) and straw yield (7654 kg ha^{-1}) followed by Pretilachlor + Pyrazosulfuron-ethyl + Fenoxaprop-p-ethyl. On the basis of the above results, it can be concluded that application of Pretilachlor + Pyrazosulfuron-ethyl + Bispyribac-sodium (T_7) hold promise as an appropriate method of weed management for obtaining lower weed population and higher yield in transplanted rice.

Key words: Herbicides, Weed management, transplanted rice.

Introduction

Rice (*Oryza sativa* L.) is life the slogan of the International year of rice-2004 A.D. as declared by the United Nations General Assembly (Jacques Dioxf, 2030) comes from the understanding that rice crop is essential to everyone directly for food security, livelihood improvement, cultural heritage and sustainable development for global peace (Viraltamath, 2006). Transplanted rice is infested with wide range of weed species *viz.*, grasses, sedges and broad leaved weeds.

In India, weed is one of the important biotic constraints that reduce yield up to 48 per cent and an yearly loss of 15 m.t due to weed competition (Duary *et al.,* 2015). Therefore, an efficient and economic weed management program is necessary to control different types of weeds throughout the cropping period. Hand weeding though efficient is expensive, time consuming, difficult and often limited by scarcity of labour in time. On the other hand, herbicides offer economic and efficient weed control if applied at proper dose and stage.

However, the continuous use of single herbicide or herbicides having the same mode of action may lead to the weed resistance problem and also weed shifts. Hence it is necessary to test some high efficacy herbicides to control mixed weed flora in transplanted rice. Keeping this in view, a field experiment was carried out to evaluate the performance of pre- and post-emergence herbicides alone and in combination in transplanted rice.

Materials and Methods

The field experiment was conducted at experimental farm, Annamalai University, Chidambaram, Tamil nadu, located at 11°24' N latitude and 79°44' E longitude and an altitude of + 5.79 m above MSL. The soil of the experimental field is clayey loam in texture. The soil pH was 7.3 and EC was normal (0.37 dS m^{-1} which is safe limit), high in organic carbon and available P, medium in available N and K. The field experiment was conducted during Samba season (September-January, 2017) by transplanting rice seedling variety of 'ADT -49' in

***Author for correspondence :** E-mail : muruganagronomy@gmail.com

Randomised Block Design with three replications. The treatments included different pre-emergence herbicides applied alone and their combinations with either post emergent herbicides or hand weeding.

The new herbicides used were Pretilachlor + Pyrazosulfuron-ethyl, Fenoxaprop-p-ethyl and + Bispyribac-sodium. The Treatments were Unweeded check, Two hand weeding (20 and 40 DAT), Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} + one hand weeding, Fenoxaprop-p-ethyl 9.3% w/w @ 875 ml ha^{-1} + one hand weeding, Bispyribac-sodium 10% SC @ 200 ml ha^{-1} + one hand weeding, Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} + Fenoxaprop-p-ethyl 9.3% w/w @ 875 ml ha^{-1}, Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} + Bispyribac-sodium 10% SC @ 200 ml ha^{-1}. All herbicides were applied using knapsack sprayer fitted with flat fan nozzle at spray volume of 500 l. ha^{-1}. Thirty days old seedlings of rice variety '*ADT 49*' were transplanted at a spacing of 20 × 10 cm. Half of the nitrogen and whole of phosphate and potash were applied at the time of final puddling and the remaining quantity of nitrogen was applied at panicle initiation stage.

A quadrat of size 50 × 50 cm was placed at random at two sites in the weed sampling area of each plot for weed observations. Ten sample plants were selected at random from the net plot area (avoiding two border rows) of each plot and tagged for recording crop observations. The data recorded at periodic intervals were subjected to Analysis of Variance techniques (ANOVA) after transformation wherever needed. Results of the study revealed substantial reduction in weed population in all the herbicide treated plots compared to weedy check (Table 1). Treatments receiving pre and post-emergence application of Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} + Bispyribac-sodium 10% SC @ 200 ml ha^{-1} recorded higher absolute density of weeds than Pretilachlor 6% + Pyrazosulfuron-ethyl 0.15% GR @ 10 kg ha^{-1} + Fenoxaprop-p-ethyl 9.3% w/w @ 875 ml ha^{-1} treated plots.

Results and Discussion

Weed density

Among the treatments, application of (Pretilachlor + Pyrazosulfuron ethyl) + Bispyribac-sodium (T_7) recorded the least weed count of 3.22 m^{-2}, 0.52 m^{-2}, 2.59 m^{-2}, 1.54 m^{-2}, 0.52 m^{-2}, 0.54 m^{-2}, 1.26 m^{-2} of *E. colonum* L. *chinensis*, *C. rotundus*, *M. quardrifolia*, *S. zeylanica*, *E.alba* and *B.capensis*, respectively on 60 DAT. The treatment (Pretilachlor + Pyrazosulfuron ethyl) + Fenoxaprop-p-ethyl (T_6) was next in order and the treatment twice hand weeding on 20 and 40 DAT (T_2) were on par. The highest weed count of 33.37 m^{-2}, 12.96 m^{-2}, 22.44 m^{-2}, 16.06 m^{-2}, 12.96 m^{-2}, 12.67 m^{-2}, 10.65 m^{-2} of *E. colonum*, *L. chinensis*, *C. rotundus*, *M. quardrifolia*, *S. zeylanica*, *E. alba* and *B. capensis* on 60 DAT, respectively were recorded in unweeded control (T_1) (Murugan and Kathiresan, 2010).

This might be due to the fact that the better placement of pre emergence herbicide on the inter row spacing provided and the better efficacy of herbicide in controlling the emerging weeds let to suppression of weeds from the beginning. The persistence of pretilachlor + pyrazosulfuron ethyl herbicides could have contributed significantly in controlling weeds because pretilachlor with a half life of 15.06 days and pyrazosulfuron ethyl with 24.75 days (Nagwanshi Anil *et al.,* 2016). This might have delivered the weed control effect on the germinating weed seeds over a prolonged duration and thereby exhausting the weed seeds over a prolonged duration and thereby exhausting the weed seed reserves in the soil (Reddy *et al*., 2000).

Application of pretilachlor + pyrazosulfuron ethyl drastically reduced the grasses, sedges and broad leaved weeds. The presence of pyrazosulfuron ethyl drastically reduced the grasses, sedges and broad leaved weeds. The presence of pyrazosulfuron ethyl controlled the broad leaved weeds and sedges and the presence of pretilachlor controlled the grassy weeds. Hence the combined action of both the above and efficient control of bispyribac sodium on annual and perennial grasses, sedges and broad leaved weeds attributed for efficient and prolonged control of wide spectrum weeds *viz*., grasses, sedges and broad leaved weeds. These are in line with the findings of Yadav *et al.,* 2009.

Yield Parameters and Yield

Among the treatments, (Pretilachlor + Pyrazosulfuron ethyl) + Bispyribac-sodium (T_7) recorded highest number of tillers of 434 m^{-2}. The treatment (Pretilachlor + Pyrazosulfuron ethyl) + Fenoxaprop-p-ethyl (T_6) was next in order and the treatment twice hand weeding on 20 and 40 DAT (T_2) were on par. The least number of tillers of 323 m^{-2} were recorded in unweeded control (T_1). There was significant difference between treatments with regard to number of panicles m^{-2}. Among the treatments, T_7 recorded highest number of panicles m^{-2} of 418. The treatment T_6 was next in order and the treatment T_2 were on par. The lowest number of panicles m^{-2} of 294 were recorded in T_1.

All the treatments significantly influenced the number of filled grains $panicle^{-1}$. Among the treatments, T_7

Table 1: Effect of weed management practices on absolute weed density (number m^{-2}).

Treatments	*Echinochloa colonum*	*Leptochloa chinensis*	*Cyperus rotndus*	*Marselia quadrifolia*	*Sphenoclea zeylanica*	*Eclipta alba*	*Bergia capensis*
T_1 - Un weeded control	5.82(33.37)	4.66(12.96)	4.79(22.44)	4.07(16.06)	3.67(12.96)	3.63(12.67)	3.34(10.65)
T_2 - HW twice on 20 and 40 DAT	2.96(8.26)	2.54(1.24)	2.53(5.90)	2.07(3.78)	1.32(1.24)	1.21(0.96)	1.75(2.56)
T_3- (Pretilachlor + Pyrazosulfuron ethyl) + one HW	3.98(15.34)	3.09(1.96)	2.86(7.67)	2.31(4.83)	1.57(1.96)	1.46(1.63)	2.01(3.54)
T_4 - Fenoxaprop-p-ethyl + one HW	4.45(19.30)	3.43(2.56)	3.01(8.56)	2.62(6.36)	1.75(2.56)	1.72(2.45)	2.21(4.38)
T_5 - Bispyribac-sodium + one HW	4.01(15.58)	2.98(1.84)	2.78(7.22)	2.28(4.69)	1.53(1.84)	1.42(1.51)	1.98(3.42)
T_6 - (Pretilachlor + Pyrazosulfuron-ethyl) + Fenoxaprop-p-ethyl	2.82(7.45)	2.48(1.16)	2.49(5.70)	2.01(3.54)	1.29(1.16)	1.19(0.91)	1.71(2.42)
T_7 - (Pretilachlor + Pyrazosulfuron ethyl)+Bispyribac-sodium	1.93(3.22)	1.73(0.52)	1.76(2.59)	1.43(1.54)	1.01(0.52)	1.02(0.54)	1.33(1.26)
S.Ed	0.07	0.05	0.05	0.04	0.03	0.03	0.03
CD (P = 0.05)	0.15	0.12	0.10	0.09	0.07	0.07	0.08

Table 2: Effect of weed management practices on Yield and Yield Parameters.

Treatments	Productive tillers m^{-2}	Number of panicles m^{-2}	Filled grains $panicle^{-1}$	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T_1 - Un weeded control	323	294	73.23	3046	4600
T_2 - HW twice on 20 and 40 DAT	409	382	85.95	4787	7150
T_3- (Pretilachlor + Pyrazosulfuron ethyl) + one HW383	349	81.75	4437	6653	
T_4 - Fenoxaprop-p-ethyl + one HW	345	322	77.23	4236	6303
T_5 - Bispyribac-sodium + one HW	389	358	82.22	4590	6850
T_6 - (Pretilachlor + Pyrazosulfuron ethyl) + Fenoxaprop-p-ethyl	416	395	89.24	4965	7366
T_7 - (Pretilachlor + Pyrazosulfuron ethyl) + Bispyribac-sodium	434	418	92.74	5163	7654
S.Ed	7.18	6.76	1.53	85.99	127.99
CD (P = 0.05)	15.63	14.73	3.34	187.38	278.89

recorded highest number of filled grains $panicle^{-1}$ of 92.74. The treatment T_6 was next in order and the treatment T_2 were on par. The lowest number of filled grains $panicle^{-1}$ of 73.23 was recorded in T_1.

All treatments significantly altered the grain yield. Among the treatments, T_7 recorded highest grain yield of 5163 kg ha^{-1}. The treatment T_6 was next in order and the treatment T_2 were on par. The lowest grain yield of 3046 kg ha^{-1} was recorded in T_1. As that of grain yield of rice, straw yield was also significantly influenced by various treatments. Among the treatments, T_7 recorded highest straw yield of 7654 kg ha^{-1}. The treatment T_6 was next in order and the treatment T_2 were on par. The least straw yield of 4600 kg ha^{-1} was recorded in T_1.

Pre-emergence herbicide application of Pretilachlor + Pyrazosulfuron-ethyl followed by post emergence herbicide application of Bispyribac-sodium produced more number of yield attributes and yield than unweeded control. The reason might be that the weed free situation at early stage favoured the vigorous growth of seeding, without any crop weed competition and sustained nutrient availability leads to better uptake of NPK by the crop might have contributed to synchoronous tillering and spikelet formation leading to higher mumber of panicles m^{-2} and higher post flowering photosynthesis and higher number of filled grains $panicle^{-1}$. It is logic to postulate that the resulting in increased grain and straw yields. Hence, the yield level of grain and straw fell in line with

treatments that performed well in the earlier days (Deepthi Kiran *et al.,* 2010).

References

Deepthi Kiran, Y., D. Subramanyam and V. Sumathi (2010). Performance of pre and post-emergence herbicides on weed flora and yield of transplanted rice (*Oryza sativa*). *Indian J. Weed Sci.*, **42(3&4):** 229-231.

Duary, B., K.C. Teja, S. Roy Chowdhury and R.B Mallick (2015). Weed growth and productivity of wet season transplanted rice as influenced by sole and sequential application of herbicides. *International Journal of Bio-Resource, Environmental and Agricultural Sciences.,* **1(4):** 187-192.

Murugan. G and Rm. Kathiresan (2010). A survey of weed flora in rice fields of Cuddalore district of Tamil nadu, *India. Plant Archives.*, **10(2):** 647-649.

Nagwanshi Anil, A.K. Dwivedi, Shoba Sondia and Rohit Pandey (2016). Persistence of pretilachlor, Penoxsulam and Pyrazosulfuron herbicides in soil. *International Journal of Agric. Sci.*, **8:** (8).

Reddy, M.D., C.N. Reddy, N.V. Reddy and M.P. Devi (2000). Effect of herbicides on weed growth and crop performance in rice–blackgram cropping system. *International J. Weed Sci.*, **32(3&4):** 169-172.

USDA. (2017). Table 09 Rice Area, Yield and Production. United States Department of Agriculture, Foreign Agricultural Service.

Yadav, D.B., Ashok Yadav and S.S. Punia (2009). Evaluation of bispyribac sodium for weed control intransplanted rice. *Indian J. Weed Sci.*, **41(1&2):** 23-27.