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STUDIES ON PERFORMANCE OF EARLY POST-EMERGENCE APPLICATION OF HERBICIDES ON WEED MANAGEMENT IN TRANSPLANTED RICE

T. Srinithan[1], K. Arivukkarasu[2*] and P. Sivasakthivelan[3]

[1]Department of Agronomy, College of Agricultural Technology, Theni (Tamilnadu), India.
[2*]Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalainagar (Tamilnadu), India.
[3]Department of Agric. Microbiology, Faculty of Agriculture, Annamalai University.
Annamalainagar (Tamilnadu), India.

Abstract

To study the performance of early-post emergence application of herbicides on weed management in transplanted rice, a field experiment was conducted during June - September, 2018. The experiment with eight treatments and three replications was laid out in a Randomized Block Design. All the treatments significantly influenced the weed parameters and crop parameters in rice. Among the treatments compared, hand weeding twice at 20 and 40 DAT recorded the lowest weed dry matter production (83.81kg/ha), highest weed control index (89.54 percent), higher grain yield (5563 kg/ha) and straw yield (7599 kg/ha), which was statistically on par with application of penoxsulam + cyhalofop butyl @ 135 g/ha (15 DAT) that recorded the lower weed dry matter production (93.01kg/ ha), higher weed control index (88.39 percent), grain yield (5453 kg/ha) and straw yield (7471 kg/ha). The highest weed dry matter production, with lowest grain and straw yield were recorded with unweeded control.

Key words: Early post emergence herbicides, penoxsulam + cyhalofop butyl (premix), Weed control index, Transplanted rice.

Introduction

Rice is the most important ancient crop cultivated in 117 countries and about 90 percent of total rice is grown and consumed in Asia (Seema *et al*., 2014). More than 2 billion people in Asian Continent are getting 60 to 70 percent of their energy requirement from rice and derived products. In Indian subcontinent, it is grown over an area of 44.5 million ha area with production and productivity of 116 million tonnes and 3.91 tonnes/ha, respectively. Rice requirement is growing in India and it is predicted that by 2020 AD, the demand would be 350 million tonnes (Veeraputhiran and Balasubramanian, 2013). To keep present food self-sufficiency and to manage future food requirement, India needs to increase rice productivity by 3 percent/annum. Weeds are the most important biotic constraint that reduces rice productivity. An increase in one kilogram of weed biomass leads to a reduction in one kilogram of crop dry matter and heterogeneous type of weed flora infestation reduces yield up to 48 percent with a yearly loss of 15 million tonnes in transplanted rice (Saha, 2009). Weed competition on rice resulted in the reduction of availability of nutrients to the crop, which adversely affected the growth and yield parameters that created a greater competition and finally reduced the yield of rice (Charan Teja *et al.,* 2015). Weeds compete with rice and causes yield losses to the tune of 50-65 percent under wet seeded rice and up to 76 percent in transplanted rice (Jai Prakash *et al*., 2017). Growth and colonization of diversified weed species can be impeded with timely hand weeding operations during the cropping season. Although hand weeding is the effective weed control measure when compared to cultural and chemical measures in reducing the weed infestation in transplanted rice, it is less economical due to higher cost of operation. In this situation, use of herbicides is highly desired by the rice farmers due to their rapid effect on weeds with lower cost compared to traditional methods.The current status in herbicide use is to spray low dose high efficiency herbicides, which will reduce the volume of herbicide per unit area, easier for application and economical to

the farmers (Kiran *et al*., 2010). Besides, use of early post emergence application of herbicides has greater potential for effective weed management and higher yield. In this situation, an investigation was carried out to evaluate early- post emergence application of new combination of herbicides having wider applicability and broad spectrum of weed control.

Materials and Methods

Field experiment was conducted to evaluate the early post emergence application of herbicides during *Kuruvai* (June – September, 2018) season in Experimental Farm, Department of Agronomy, Annamalai University, Annamalai Nagar. The short duration variety CO–47 rice was planted in the experimental field. The experiment was laid out in a randomized block design with 8 treatments and 3 replications. The treatments comprise *viz*., The weed flora was allowed to grow without any disturbance throughout the crop duration in the unweeded control (T_1). In treatment (T_2) Hand weeding twice were done on 20 and 40 DAT. In treatment (T_3) bispyribac sodium @ 25 g/ha was sprayed and the formulation used was 10 percent SC. In treatment (T_4) cyhalofop butyl @ 80/ha was sprayed and formulation used was 10 percent EC. In treatment (T_5) penoxsulam @ 25 g/ha was sprayed and formulation used was 21.7 percent SC In treatment (T_6) penoxsulam + cyhalofop butyl @ 105 g /ha (premix), in treatment (T_7) penoxsulam + cyhalofop butyl @ 120 g/ ha (premix) and in treatment (T_8) penoxsulam + cyhalofop butyl @ 135 g/ha (premix) was sprayed and formulation used was 6 percent OD. The individual plot size for treatments was 5×4m size. Twenty one days old CO-47 rice seedlings were transplanted with 2 seedlings/hill at a spacing of 15×10 cm. Herbicides were sprayed on 15 DAT as early post emergence application with 500 l/ha of water through knapsack sprayer fitted with flood jet nozzle in the morning hours. The data pertaining to the crop and weed were statistically analyzed as per the procedure suggested by Gomez and Gomez (1984). For weed DMP (Dry matter production), weeds in sample quadrants were collected from each plot separately on 60 DAT (Days after transplanting), oven dried at 80°C ± 5°C till a constant weight obtained that was expressed in kg/ha and using weed counts the weed control index was worked out. The matured crop was harvested from the net plot area and grains were weighed plot wise and the grain yield was computed to Kg/ ha at 14 percent moisture level. After threshing the grains, the dried straw was weighed plot wise and computed to Kg/ha. The data involving percentage values were transformed by angular transformations for analysis.

Result and Discussion

Effect of herbicides on weed parameters

In the experimental field, the weeds species *viz., Cyperus rotundus, Cyperus iria, Echinochloa colonum, Leptochloa chinensis, Bergia capensis, Echinochloa crusgalli* and *Marselia quadrifolia* were present in the experimental plot. Among the weed species *Cyperus rotundus, Cyperus iria*, *Echinochloa colonum* and *Leptochloa chinensi*s largely contributed for the total weed count and weed dry matter production that were significantly influenced by the treatments. Among the treatments compared, hand weeding twice during the cropping period gives exceptional results by recording the least weed dry matter production of 83.81 kg/ha and highest weed control index of 89.54 percent at 60 DAT. This treatment was on par with application of Penoxsulam + Cyhalofop butyl @ 135 g/ha (15 DAT) that recorded the weed dry matter production of 93.01 kg/ha and 88.39 percent at 60 DAT, respectively. These treatments were significantly superior to the rest of the treatments compared table 1. The superior performance of hand weeding twice was due to, manual removal of existing vegetation of all the weeds without sparing any one of group or individual weeds. This is evident from

Table 1: Effect of Early post-emergence application of herbicides on weed dry matter production (DMP), Weed Control Index (WCI), Grain yield and straw yield in rice crop.

Treatments	Weed DMP at 60 DAT(kg/ha)	WCIat 60 DAT(Percent)	Grain yield at harvest(kg/ha)	Straw yield at harvest(kg/ ha)
T_1 - Unweeded Control	801.43	-	2140	5906
T_2 - Hand weeding twice on 20 & 40 DAT	83.81	71.13(89.54)	5563	7599
T_3 - Bispyribac-sodium @ 25/ g ha	123.92	66.84(84.54)	5166	7072
T_4 - Cyhalofop butyl @ 80/ g ha	178.28	61.85(77.75)	4683	6576
T_5 - Penoxsulam @ 25 g /ha	194.57	60.47(75.72)	4121	6318
T_6 - Penoxsulam + Cyhalofop butyl @ 105 g/ ha	146.05	64.73(81.78)	4916	6822
T_7 - Penoxsulam + Cyhalofop butyl @ 120 g/ ha	113.62	67.87(85.82)	5252	7235
T_8 - Penoxsulam + Cyhalofop butyl @ 135 g/ ha	93.01	70.07(88.39)	5453	7471
S.Ed	5.42	0.84	86.58	103.09
CD(p=0.05)	11.6	1.80	185.28	220.63

(Figure in the parenthesis indicates).

the highest weed control index of 89.54 in transplanted rice. This finding is in line with the results of Chandraprakash *et al.,* (2013). Early post emergence application of premix combination of penoxsulam+ cyhalofop butyl @ 135 g/ha (15 DAT) also contribute higher weed control index of 88.39 percent. This might be due to the fact that, penoxsulam is a potent inhibitor of Acetolactate synthase (ALS) enzyme of the plant which interferes with the production of amino acids and ultimately inhibits protein synthesis resulted in lesser weed density of broad leaved weeds and sedges (WSSA, 2007; Yadav *et al*., 2008). The another herbicide combination Cyhalofop butyl is a selective post emergence herbicide that control grasses in rice by inhibiting Acetyl Coenzyme A Carboxylase an enzyme that catalyze the first step in fatty acid biosynthesis (Ruiz-Santaella *et al.,* 2006). Further, the combined effect of penoxsulam + cyhalofop butyl makes these herbicide premix with a broad spectrum of activity and this might have contributed for effective control of all the weed species, as reflected by lesser weed parameters with higher weed control index in this treatment. The highest weed dry matter production of 801.43 kg/ha was recorded with unweeded control.

Effect of herbicides on crop yield

Hand weeding twice showed exemplary performance in weed management in transplanted rice by recording highest grain yield and straw yield of 5563 kg/ha and 7599 kg/ha respectively. This was on par with application of Penoxsulam+ Cyhalofop butyl @ 135 g/ha (15 DAT) that recorded grain yield of 5453 kg/ha and 7471 kg/ha. These treatments were significantly superior to the rest of the treatments compared table 1. Competition free environment achieved by hand weeding twice might ultimately help the crop to attain higher grain and straw yield. This finding is in close conformity with the reports of Prasanthi *et al.,* (2017). Similarly, the increased grain and straw yield in the treatment with application of premix combination of penoxsulam+ cyhalofop butyl @ 135 g/ ha (15 DAT) was observed. As Penoxsulam+ cyhalofop butyl is highly selective over broad spectrum of weeds during critical stages of crop growth that performed better by suppressing weeds, that leads to higher grain and straw yield in rice. This finding is in concomitance with the findings of Sheeja and Elizabeth (2018). Unweeded control treatment recorded the lowest grain yield and straw yield of 2140 kg/ ha and 5906 kg/ ha, respectively.

Conclusion

From this study, it can be concluded that, hand weeding twice at 20 and 40 DAT during the cropping season could be an effective weed control programme and trustworthy operation for transplanted rice. However, on times of labor scarcity and higher cost incurred for hand weeding, early post emergence application of premix formulation of penoxsulam + cyhalofop butyl @ 135 g/ ha (15 DAT) could be used as alternative weed control programme with better grain and straw yield in transplanted rice.

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