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WEED DYNAMICS AND PRODUCTIVITY OF DIRECT SOWN RICE UNDER POST EMERGENCE APPLICATION OF HERBICIDES

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Abstract

A Field experiment was conducted during Navarai season of 2014 at Experimental Farm of the Department of Agronomy, Annamalai University, Annamalai Nagar to find out the influence of post emergence herbicide on weed management in direct sown rice (*Oryza saliva* L.) under puddled conditions. The results indicated that application of flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} applied at 15 DAS recorded lowest weed population, higher weed control index (WCI) and yield, lower in total weed count and weed dry matter production. This was on par with hand weeding twice at 20 and 40 DAS. The least weed control index and yield were recorded with un weeded control.

Key words: Direct sown rice, rice herbicide, weed control index, weed dry matter

Introduction

Rice is one of the most important staple food crops of India (Singh and Paikra, 2014). Direct sown rice refers to the process of establishing a rice crop from seeds sown in the field. Weeds are the major constraints to the success of direct sown rice. The average yield loss under partially-weedy conditions ranged from 40 to 48 per cent compared with under weed-free conditions which confirms that weeds are a critical yield-limiting factors in direct sown rice and that weed management should be properly addressed to make direct sown rice cultivation more profitable. Due to labour scarcity and its high cost, herbicides are considered the best option for managing weeds in direct sown rice (Sharif Ahmed *et al.,* 2014).

The development of chemical weed control method has encouraged many farmers to switch from transplanting to direct sown rice (Farooq *et al.,* 2011). Chemical method of weed control is effective to control the weeds economically. Now a day's use of herbicides is gaining popularity in rice cultivation due to their rapid effects and less cost involvement compared to traditional methods. Herbicides have increasingly become a key component of weed management in India (Mallikarjun *et al.,* 2014). Hence the present study was undertaken to know the effect of post emergence on weed management in direct sown rice conditions.

Materials and method

Field experiment was conducted during Navarai season of 2014 at Experimental farm of the Department of Agronomy, Annamalai University, Annamalai Nagar to find out the influence of post emergence herbicide on weed management in direct sown rice (*Oryza saliva* L.) under puddled conditions. The soil was clay loam (Udic Chromustert), low in available nitrogen (201 kg/ha), medium in available phosphorus (19.9 kg/ha) and high in potassium (285 kg/ha), with organic carbon 0.52% and pH 7.3. The Experiment was laid out in randomized block design with three replications using variety of ADT -36 as the test crop. The treatments includes application of post emergence herbicide on flucetosulfuron 10% WG @ 15, 20, 25, 30 g a.i. ha^{-1}, Hand weeding twice on 20 and 40 DAS, Bispyribac sodium 10% SC @ 200 g a.i. ha^{-1}, Azimsulfuron 50% DF @ 70 g a.i. ha^{-1} and Unweeded control. The variety was raised under optimum conditions of agronomic practices and plant protection measures in the field. The soil was clay in texture having pH 6.7, EC 0.34 ds/m, low in available N (246.50 $kgha^{-1}$) medium in available P (18.5 $kgha^{-1}$) and high in available K (280.75 $kgha^{-1}$). Observations on individual weed count, total weed flora and weed biomass were taken at 30 and 60 days after sowing (DAS) and also the final yield was taken at the time of harvesting.

Results and Discussion

The major weed flora of the experimental field consists of sedges (*Cyperus rotundus*, *Cyperus iria* and *Cyperus compressus*), grasses (*Digitaria sanguinalis*, *Echinochloa* spp, *Eleusine aegyptiacum*, *Leptochloa chinesis* and *Eragrostis* spp.) and broadleaves (*Ammania baccifera* and *Caesulia axillaris*).

Effect of weed control measures

Different weed control measures significantly influenced the weed population. Among the various weed control measures, application of post emergence herbicide flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS and twice hand weeding recorded the lowest weed population of grasses (3.09 and 3.49), sedges (2.31 and 2.51) and broad leaved weeds (2.16 and 3.56) on 30 and 60 DAS respectively and significantly superior then the other treatments and they were on par with each other. This might be due to the effective control of annual grasses and broad leaf weeds (*leptochloa chinenesis*, *Marsilea quadrifoliata)* by this treatment on 15 DAS. Similar performance of twice hand weeding could be attributed to manual removal of existing vegetation of all the weeds. This finding is supported by the earlier reports of Veeraputhiran and Balasubramanian (2013). The highest weed count was recorded in unweeded control treatment.

Weed control indices

All the treatments significantly influenced the weed DMP and WCI. Application of post emergence herbicide flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS recorded the lowest weed DMP (20.20 and 26.50 kg/ha) on 30 and 60 DAS, respectively. The highest weed control index of 89.08 and 87.38 percent was recorded in the post emergence herbicide flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS. This treatment was superior to other treatments as it removed grasses, sedges, and broad leaf weeds effectively in the critical stages and also due to restriction of emergence of fresh weeds in the later stages of crop growth. Similar results were indicated by Moon *et al.* (2014). The practice of hand weeding also recorded the lower weed DMP and higher weed control index than other treatments. Lesser weed DMP and highest WCI in this treatment was due to better control of weeds especially in the early stages of crop growth. The results were in the line with finding of Bhurer *et al.* (2013). Both the treatments doesn't show any significant difference between them.

Grain Yield

Among the herbicides tested, application of post emergence herbicide flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS registered highest grain of 4500 kg / ha and straw yield of 6190 kg/ha. This might be due to lower weed density, weed dry weight and better weed

Influence of post emergence herbicides on individual weed flora m^{-2} on grasses, sedges and broad leaved weeds on 30 and 60 DAS

Treatments	Grasses		Sedges		Broad leaved leaf	
	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS
T_1 - Flucetosulfuron 10% WG @ 15 g a.i. ha^{-1} on 15 DAS	5.85 (34.20)	6.10 (37.17)	5.66 (32.04)	5.94 (35.33)	3.40 (11.54)	4.32 (18.70)
T_2 - Flucetosulfuron 10% WG @ 20 g a.i. ha^{-1} on 15 DAS	3.73 (13.88)	4.22 (17.85)	3.54 (12.50)	3.99 (15.91)	2.19 (4.78)	3.47 (12.02)
T_3 - Flucetosulfuron 10% WG @ 25 g a.i. ha^{-1} on 15 DAS	2.49 (6.18)	3.00 (9.02)	2.42 (5.84)	2.64 (6.96)	2.00 (3.99)	3.05 (9.33)
T_4 - Flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS	1.76 (3.09)	1.87 (3.49)	1.52 (2.31)	1.58 (2.51)	1.47 (2.16)	1.89 (3.56)
T_5 - Hand weeding twice on 20 and 40 DAS	1.77 (3.15)	1.91 (3.65)	1.56 (2.31)	1.58 (2.51)	1.48 (2.20)	1.91 (3.65)
T_6 - Bispyribac sodium 10% SC@ 200 g a.i. ha^{-1} on 15 DAS	3.95 (15.63)	4.75 (22.60)	4.36 (19.00)	5.04 (25.41)	2.55 (6.50)	3.73 (13.95)
T_7 - Azimsulfuron 50% DF @ 70 g a.i. ha^{-1} on 15 DAS	5.07 (25.69)	5.80 (33.66)	5.30 (28.12)	5.69 (32.41)	2.99 (8.97)	4.02 (16.13)
T_8 - Unweeded control	6.39 (40.89)	6.65 (44.16)	6.59(43.47)	6.82 (46.45)	3.80 (14.42)	4.68 (21.89)
S.Ed	0.12	0.18	0.17	0.24	0.06	0.10
CD (P = 0.05)	0.25	0.37	0.35	0.49	0.13	0.20

(Figures in parenthesis indicates the original value)

Influence of post-emergence herbicides on total weed count, dry matter of weeds, weed control index (WCI) and grain yield of direct down rice

Treatments	Total weed count	Dry matter of weeds	Weed control index	Grain yield (kg ha^{-1})
T_1 - Flucetosulfuron 10% WG @ 15 g a.i. ha^{-1} on 15 DAS	9.54 (91.20)	185.86	19.81 (11.49)	2636
T_2 - Flucetosulfuron 10% WG @ 20 g a.i. ha^{-1} on 15 DAS	6.76 (45.78)	69.92	54.75 (66.70)	3600
T_3 - Flucetosulfuron 10% WG @ 25 g a.i. ha^{-1} on 15 DAS	5.03 (25.31)	37.81	65.83 (83.24)	3923
T_4 - Flucetosulfuron 10% WG @ 30 g a.i. ha^{-1} on 15 DAS	3.09 (9.56)	26.50	69.19 (87.38)	4500
T_5 - Hand weeding twice on 20 and 40 DAS	3.15 (9.93)	29.78	67.87 (85.81)	4320
T_6 - Bispyribac sodium 10% SC @ 200 g a.i. ha^{-1} on 15 DAS	7.92 (62.76)	98.56	46.75 (53.06)	3252
T_7 - Azimsulfuron 50% DF @ 70 g a.i. ha^{-1} on 15 DAS	8.89 (79.20)	137.21	36.90 (36.06)	2911
T_8 - Unweeded control	10.60 (112.5)	210.00	-	2240
S.Ed	0.21	2.84	1.27	140
CD (P=0.05)	0.41	5.69	2.55	290

(Figures in parenthesis indicates the original value)

control efficiency and improvement of yield attributes like panicle/unit area, filled grains panicle^{-1} and test weight. The above results was in line with the finding of Moon *et al.* (2014).

Twice hand weeding also registered the maximum grain and straw yield next to (T_4) and was on par with each other. This increase might be due to effective control of weeds which reduced the crop - weed competition and increased the yield of rice.

The unweeded control recorded the least grain of 2240 kg/ha and straw yield of 2468 kg/ha. Severe competition of weeds in unweeded control resulted in the suppression of crop growth there by reduction in both grain and straw yield. These results agreed with the finding of Singh and Paikra (2014).

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