



INFLUENCE OF WEED MANAGEMENT PRACTICES ON WEED DYNAMICS AND YIELD OF DRUM SEEDED RICE UNDER PUDDLED CONDITION

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Abstract: Field experiment was conducted at Agricultural Research Station, Thirupathisaram during Rabi season (November- March) of 2017 - 2018 to evolve suitable weed management practices for drum seeded rice under puddled condition. Among the chemical treatments tried, the application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as Early Post Emergence (EPoE) recorded significantly lowest total weed density, total dry weight and highest weed control efficiency when compared to other treatments. Higher grain yield (6436 kg ha⁻¹) and straw yield (7210 kg ha⁻¹) was recorded in the application of pretilachlor @ 0.75 kg a. i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE apart from weed free check.

Keywords: Rice, Weed density, Weed dry weight, Weed control efficiency and Grain yield.

Introduction:

Rice (*Oryza sativa* L.) is the most important cereal crop and widely cultivated in the world. Asia is the home of rice as more than two billion people are getting 60-70% of their energy requirement from rice and its derived products (Raghavendra *et al.*, 2015). About 90% of the world's rice is grown and produced 142 million ha area with production of 622 million tons in Asia (Harunur Rashid *et al.*, 2012). Rice is one of the major contributors to the success by contributing approximately 43 per cent of total food grain production of India (Upendra *et al.*, 2013). In India rice is cultivated in an area of 44.38 million hectares with a production of 104.31 million tons. The country has to produce about 130 million tons of rice by 2025 to meet the food requirement of the growing



population. In Tamil Nadu, rice is cultivated in a area of 20.37 lakh hectare with an annual production of 79.83 lakh tones (TNSTAT, 2016).

Transplanting rice is the ancient system of sowing and it is popular in many rice growing areas. Water resources, both at surface and underground are diminishing and water existence is doubtful. Moreover, transplanting operation is usually carried out by waged labours which are costly (Riaz *et al.*, 2007). The drum seeder equipment on puddled field is the best alternative idea for transplanting because it involves minimal use of labour. The drum seeding may benefit in cost reduction, faster growth and easiness in intercultural, lesser seed rate and higher yield compared to other method. Development of a suitable weed management strategy to alleviate weed pressure on the available resources is known to prop up the crop productivity considerably. Keeping the above aspects in view, effect of various herbicides was compared with weed free check and weedy check for evaluating the reduction of density and dry matter production of weeds and obtaining higher yields in drum seeded rice.

Materials and Methods:

Field experiment was conducted at Agricultural Research Station, Thirupathisaram during *Rabi* season (November- March) of 2017 - 2018 to evolve suitable weed management practices on weed dynamics and yield of drum seeded rice under puddled condition. The experiment was laid out in a randomized block design with three replications. It consisted of nine treatments *viz.*, T₁- PE application of pretilachlor @ 0.75 kg ha⁻¹ on 8 DAS fb Hand weeding on 30 DAS, T₂ -PE application of pyrazosulfuron ethyl @ 10% WP 20g a.i.ha⁻¹ on 8 DAS fb Hand weeding on 30 DAS, T₃ - PE application of pretilachlor @ 0.75 kg ha⁻¹ on 8 DAS fb EPoE application of chlorimuron ethyl 10% + metsulfuron methyl 10% @ 20g a.i.ha⁻¹ on 20 DAS, T₄ - PE application of pyrazosulfuronethyl @ 10% WP at 20g a.i.ha⁻¹ on 8 DAS fb EPoE application of chlorimuron ethyl 10% + metsulfuron methyl 10% @ 20g a.i.ha⁻¹ on 20 DAS, T₅ - PE application of pretilachlor @ 0.75 kg ha⁻¹ on 8 DAS fb EPoE application of bispyribac sodium @ 25 g a.i.ha⁻¹ on 20 DAS, T₆ - PE application of pyrazosulfuron ethyl @ 10% WP 20g a.i.ha⁻¹ on 8 DAS fb EPoE application of bispyribac sodium @ 25 g a.i.ha⁻¹ on 20 DAS, T₇ - Hand weeding twice on 15 and 30 DAS, T₈ - Weed free check and T₉ - Unweeded control. Rice TPS 5 was used as a test variety. Pre-germinated seeds were used for wet drum seeding of rice. Pre emergence and early post emergence herbicides were applied as per the treatment schedule. Observation on weed density, weed dry weight and yield of rice were recorded.



Result and Discussion:

Effect on weeds

Dominant weed flora noticed in rice crop established through drum seeder under saturated field condition were *Echinochloa colona*, *Echinochloa crusgalli* and *Cynodon dactylon* and under grasses, *Cyperus difformis* and *Cyperus rotundus* under sedges and *Eclipta alba*, *Marsilea quadrifolia* and *Sphaeranthus indicus* under broad-leaved weeds. Broad leaved weeds were found to be the predominant category followed by grasses and sedges. Satyanarayana Reddy *et al.* (2013) and Kumaran *et al.* (2015) also reported similar observation.

Weed density, weed dry weight and weed control efficiency

Significant variation on the total weed density and weed dry weight were observed due to the adoption of different weed management practices at all stages of observation viz., 15, 30 and 45 DAS (Table.1). At 15 DAS, the total weed density weed dry weight was zero in weed free check. This was followed by application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE which recorded significantly lowest total weed density of 4.14 m⁻² and weed dry weight of 5.36 g m⁻². This treatment was found to be superior than the rest of the treatments. At 30 and 45 DAS also apart from weed free check, application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE significantly reduced the total weed density (30.15 m⁻² and 1.68 m⁻² respectively) and weed dry weight (43.01 g m⁻² and 2.37 g m⁻² respectively) compared to other treatment combinations. This might be due to the control of weeds at germination phase by the application of pre emergence herbicides and significant reduction at later growth stage as late germinating weeds were controlled by post emergence application of herbicides. Similar findings were reported by Sanjoy Saha and Rao (2010) and Prameela *et al.* (2014).

Weed control efficiency indicates the magnitude of effective reduction of weed density by weed control treatments over weedy check. This was highly influenced by different weed control treatments (Table 1). Among the weed management practices, application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE registered more reduction of weed density and resulted in higher WCE (98.0 %). It was mainly due to the better control of weed upto critical stage by the above treatment combination resulting in lower weed densities. Similar results have been reported by Prameela *et al.* (2014) and Sandeep Nayak *et al.* (2014).



Economic Yield

Grain yield and Straw yield of rice was significantly influenced by various weed management practices adopted (Table. 2). Among the different treatment combinations tried, weed free check significantly recorded highest grain yield and straw yield. With respect to weed control methods, application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE recorded significantly produced higher grain (6436 kg ha⁻¹) and straw yield (7210 kg ha⁻¹) over the rest of the treatments. The percentage of yield increase due to application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE was 68.1 per cent over unweeded control. The increase in yield was mainly attributed to better control of weeds throughout the crop growth resulting in better availability of nutrients, moisture and light to the crop growth. This was reflected through increased leaf area, DMP, which contributed to more number of productive tillers m⁻², number of filled grains panicle⁻¹, test weight and higher yield. Earlier findings by Walia *et al.* (2012) agreed with the present findings. Next to the above treatments, application of pretilachlor @ 0.75 kg ha⁻¹ on 8 DAS as PE fb chlorimuron ethyl 10% + metsulfuron methyl 10% @ 20 g a.i.ha⁻¹ on 20 DAS as EPoE and application of pyrazosulfuron ethyl @ 10% WP 20 g a.i.ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i.ha⁻¹ on 20 DAS as EPoE recorded a grain yield of 6240 and 6181 kg ha⁻¹ and these two were on par with each other.

Unweeded control significantly resulted in lowest grain yield of 3828 kg ha⁻¹. This clearly indicated severe competition exerted by weeds on the crop and thus turn in lower yield obtained in unweeded plot as reported by (Vijay Singh *et al.* 2016). Similar trend was also observed in straw yield.

Conclusion:

From the above results, it could be concluded that application of pretilachlor @ 0.75 kg a.i ha⁻¹ on 8 DAS as PE fb bispyribac sodium @ 25 g a.i ha⁻¹ on 20 DAS as EPoE was found to be the viable and effective weed management practice for drum seeded rice under puddled condition to realise through higher yield.



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Table 1: Effect of different weed management practices on weed dynamics in drum seeded rice

Treatments	Weed density (No. m ⁻²)			Weed dry weight (g m ⁻²)			WCE* (%)
	15DAS	30 DAS	45 DAS	15DAS	30 DAS	45 DAS	
T ₁ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fb Hand weeding on 30 DAS	5.43 (2.44)	46.31 (6.84)	17.23 (4.21)	8.47 (2.99)	64.34 (8.05)	27.35 (5.28)	79.7
T ₂ -PE application of Pyrazosulfuron ethyl @ 10% WP 20g a.i.ha ⁻¹ on 8 DAS fb Hand weeding on 30 DAS	12.00 (3.54)	46.59 (6.86)	17.52 (4.24)	17.11 (4.20)	64.73 (8.08)	27.87 (5.33)	79.3
T ₃ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fb EPoE application of Chlorimuron ethyl 10% + Metsulfuron methyl 10% @ 20g a.i.ha ⁻¹ on 20DAS	4.89 (2.32)	35.63 (6.01)	6.73 (2.69)	8.06 (2.93)	44.74 (6.73)	7.92 (2.90)	92.1
T ₄ -PE application of Pyrazosulfuron ethyl @ 10% WP at 20g a.i.ha ⁻¹ on 8 DAS fb EPoE application of Chlorimuron ethyl 10% + Metsulfuron methyl 10% @ 20g a.i.ha ⁻¹ on 20DAS	11.18 (3.42)	38.80 (6.27)	9.51 (3.16)	15.14 (3.95)	50.85 (7.17)	15.40 (3.99)	88.8
T ₅ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fb EPoE application of Bispyribac sodium @ 25 g a.i.ha ⁻¹ on 20 DAS	4.14 (2.15)	30.15 (5.54)	1.68 (1.48)	5.36 (2.42)	43.01 (6.60)	2.37 (1.69)	98.0
T ₆ -PE application of Pyrazosulfuron ethyl @ 10% WP 20g a.i.ha ⁻¹ on 8 DAS fb EPoE application of Bispyribac sodium @ 25 g a.i.ha ⁻¹ on 20 DAS	10.52 (3.32)	35.89 (6.03)	7.02 (2.74)	12.34 (3.58)	45.17 (6.76)	8.38 (2.98)	91.7
T ₇ -Hand weeding twice on 15 and 30 DAS	17.50 (4.24)	41.65 (6.49)	13.42 (3.73)	18.50 (4.36)	58.62 (7.69)	21.20 (4.66)	84.2
T ₈ -Weed free check	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	100.0
T ₉ -Unweeded control	26.65 (5.21)	67.12 (8.22)	84.79 (9.24)	39.73 (6.34)	87.82 (9.40)	126.06 (11.25)	-
SEd	0.11	0.15	0.12	0.10	0.17	0.12	-
CD (p=0.05)	0.23	0.32	0.25	0.21	0.35	0.25	-

Figure in parenthesis are $\sqrt{X + 0.5}$ transformed values.

*Data not statistically analysed



Table 2: Effect of different weed management practices on grain and straw yield of drum seeded rice

Treatments	Grain yield (Kg ha ⁻¹)	Straw yield (Kg ha ⁻¹)
T ₁ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fb Hand weeding on 30 DAS	5460	6157
T ₂ -PE application of Pyrazosulfuron ethyl @ 10% WP 20g a.i.ha ⁻¹ on 8 DAS fb Hand weeding on 30 DAS	5306	6125
T ₃ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fbEPoE application of Chlorimuron ethyl 10% + Metsulfuron methyl 10% @ 20g a.i.ha ⁻¹ on 20DAS	6240	6985
T ₄ -PE application of Pyrazosulfuron ethyl @ 10% WP at 20g a.i.ha ⁻¹ on 8 DAS fbEPoE application of Chlorimuron ethyl 10% + Metsulfuron methyl 10% @ 20g a.i.ha ⁻¹ on 20DAS	5940	6608
T ₅ -PE application of Pretilachlor @ 0.75 kg ha ⁻¹ on 8 DAS fbEPoE application of Bispyribac sodium @ 25 g a.i.ha ⁻¹ on 20 DAS	6436	7210
T ₆ -PE application of Pyrazosulfuron ethyl @ 10% WP 20g a.i.ha ⁻¹ on 8 DAS fbEPoE application of Bispyribac sodium @ 25 g a.i.ha ⁻¹ on 20 DAS	6181	6890
T ₇ -Hand weeding twice on 15 and 30 DAS	5740	6379
T ₈ -Weed free check	6632	7432
T ₉ -Unweeded control	3828	4360
SEd	91	109
CD (p=0.05)	194	220