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Original Research Article

Efficacy of Pre and Post Emergent Herbicides in Rice at Coastal Zone of Karnataka, India

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Keywords

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A B S T R A C T

A field experiment was conducted during *kharif* 2015 at ZAHRS, Bramahavara to screen efficacy of pre and post emergent herbicides. The herbicides included were Bensulfuron methyl 0.6% G @ 60 g a.i. ha^{-1} + Pretilachlor 6% G @ 600 g a.i. ha^{-1}, Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1}, Bispyribac sodium 10 SC @ 20g a.i. ha^{-1}, Penoxsulum 240 SC @ 22.5g a.i. ha^{-1} and Ethoxysulfuron 15 WG @ 18.75g a.i. ha^{-1}. In addition hand weeding twice at 20 and 40 DAP and weedy check was also included for comparison. Among herbicides, sequential application of Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} at 3 DAP in combination with Penoxsulum 240 SC @ 22.5g a.i.ha^{-1} at 20 DAP recorded significantly lower weed population (9.67 to 36.00 0.25 m^{-2}) and dry matter production (0.33 to 3.30 g 0.25 m^{-2}) as a result recorded significantly higher grain yield (5351 kg ha^{-1}). The same treatment recorded the higher weed control efficiency and lower weed index.

Introduction

India occupies a pride place in rice production, among the food crops cultivated in the world. India has the largest area (43.95 m ha) among rice growing countries and stands second in production (106.54 mt) with a productivity of 2424 kg ha^{-1}. In Karnataka, it is grown in an area of 1.33 m ha with an annual production of 3.76 mt and a productivity of 2828 kg ha^{-1} (Anon, 2015). Rice production is facing various constraints including a declining rate of growth in yield, depletion of natural resources, labour shortages, gender-based conflicts, institutional limitations and environmental pollution. Among several factors responsible for low rice production, weeds are the major ones which cause reduction in yield of rice production worldwide. Losses caused by weeds vary from one country to another, depending on the predominant weed flora and on the control methods practiced by farmers.

In China, 10 mt of rice is lost annually due to weed competition (Ze Pu Zhang, 2001); such a quantity of rice is sufficient to feed at least 56 million people for one year. Labour component in agriculture is becoming scarce, not available in time and prohibitive cost. The farmers experience difficulty in managing weeds, as the available labour force is migrating to urban areas. Use of

herbicides to manage weeds forms an excellent alternative to manual weeding to reduce the human dredgery. Usage of pre-emergence herbicides assumes greater importance in the view of their effectiveness from initial stages.

As the weeds interfere during the harvesting of the crop, post-emergence herbicides at about 20-35 DAP may help in avoiding the problem of weeds at later stages.

Materials and Methods

A field experiment was conducted during kharif 2015 at Zonal Agricultural and Horticultural Research Station, Bramahavar. Experiment involves 10 treatments includes two pre-emergent herbicides Bensulfuron methyl 0.6% G @ 60 g a.i. ha^{-1} + Pretilachlor 6% G @ 600 g a.i. ha^{-1} (londax power), Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} (Sathi) applied alone as pre-emergent at 3 DAP and three post emergent herbicides Bispyribac sodium (Nominee gold) 10 SC @ 20g a.i. ha^{-1}, Penoxsulum (Granite) 240 SC @ 22.5g a.i. ha^{-1} and Ethoxysulfuron (Sunrice) 15 WG @ 18.75g a.i. ha^{-1}.

Post emergent herbicide applied as alone and each were preceded by pre-emergent herbicides which were compared with hand weeding twice at 20 and at 40 DAP and unweeded check which was laid out under randomized block design with three replication.

The main field was puddled and leveled and seedlings were transplanted at the age of 21 days. The data on weed population and dry matter were recorded at 30, 60, 90 DAP and at harvest with quadrate measuring 50 × 50 cm and expressed number /0.25 m^2 and g/0.25 m^2, respectively. The data was subjected to square root transformation using the formula X + 0.5 and statistical analysis was done as suggested by Gomez and Gomez (1984). Weed control efficiency by Mani *et al.*, (1973) and weed index by Gill and Kumar (1969) were calculated as per the standard formulae.

$$WCE\ (\%) = \frac{DMC - DMT}{DMC} \times 100$$

Where,

WCE = Weed control efficiency (%)

DMC = Dry matter of weeds in unweeded control plot

DMT = Dry matter of weed in treated plots

$$\text{Weed index } (\%) = \frac{X - Y}{X} \times 100$$

Where,

X = Grain yield of weed free plot (hand weeding twice)

Y = Grain yield from the treatment plot

The treatment combinations are as fallows

T_1: Bensulfuron methyl 0.6% G @ 60 g a.i. ha^{-1} + Pretilachlor 6% G @ 600 g a.i. ha^{-1} at 3 DAP

T_2: Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} at 3 DAP

T_3: Bispyribac sodium 10 SC @ 20g a.i. ha^{-1} at 20 DAP

T_4: Penoxsulum 240 SC @ 22.5g a.i. ha^{-1} at 20 DAP

T_5: Ethoxysulfuron 15 WG @ 18.75g a.i. ha^{-1} at 20 DAP

T_6: Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} 3 DAP + Bispyribac sodium 10 SC @ 20g a.i. ha^{-1} at 20 DAP

T_7: Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} 3 DAP + Penoxsulum 240 SC @ 22.5g a.i. ha^{-1} at 20 DAP

T_8: Pyrazosulfuran ethyl 10 WP @ 25g a.i. ha^{-1} DAP + Ethoxysulfuron 15 WG @ 18.75g a.i. ha^{-1} at 20 DAP

T_9: Hand weeding at 20 and 40 DAP

T_{10}: Unweeded check

Note: DAP- Days after planting

Results and Discussion

Among the treatments, sequential application of Pyrazosulfuran ethyl at 3 DAP fb Penoxsulum or Ethoxysulfuron recorded significantly the lower weed population and dry weight of weeds viz., monocots, dicot and sedge weeds which were on par with hand weeding twice at 20 and 40 DAP.

Further, results indicated that sequential application of herbicides were equally more effective in controlling monocots, dicot and sedges weed species coupled with lower dry weight of weeds resulting in higher weed control efficiency and lower weed index. Similar results were reported by Deepthi Kiran and Subramanyam (2010) and Sairamesh *et al.,* (2015).

However, the higher weed population and dry weight of weeds was recorded with the application of Pyrazosulfuran ethyl alone followed by Bispyribac sodium alone and Ethoxysulfuron alone over the sequential application of herbicides, indicating the superiority of sequential application of herbicides. Unweeded check recorded the significantly the higher weed population and dry weight of weeds which results in lower weed control efficiency and higher weed index over rest of the treatments.

The weed population and dry matter of different species differed significantly due to weed control ability of different formulation of chemicals at all the growth stages of crop.

Among the herbicide tested, the sequential application of Pyrazosulfuran ethyl 10 WP at 25g a.i. ha^{-1} 3 DAP in combination with Penoxsulum 240 SC at 22.5g a.i. ha^{-1} or Ethoxysulfuron 15 WG @18.75g a.i. ha^{-1} at 20 DAP recorded highest weed control efficiency and lower weed index and was found to be the best treatment combination for coastal rice ecosystem.

Table.1 Weed density, dry matter, weed control efficiency (WCE) and weed index as influenced by different herbicide application

Treatment	Weed density (No./ 0.25m^2)			Weed dry weight (g/ 0.25m^2)			WCE(%) @60 DAP	WI (%)	Yield kg ha^{-1}
	Grasses	Sedges	Dicots	Grasses	Sedges	Dicots			
T_1	5.26 (27.33)	4.26(17.67)	4.34(18.33)	1.80 (2.77)	1.71(2.43)	1.75(2.60)	63.09	17.09	4825
T_2	5.71 (32.37)	4.78(22.33)	4.84(23.00)	1.88 (3.07)	1.88(3.03)	1.89(3.07)	50.54	29.11	4080
T_3	5.27 (27.33)	4.64(21.00)	4.73(22.00)	1.83(2.87)	1.83(2.83)	1.88(3.03)	56.38	29.74	4116
T_4	5.11 (25.67)	3.98(15.33)	4.12(16.67)	1.73(2.52)	1.48(1.70)	1.56(1.97)	70.48	21.10	4608
T_5	5.18(26.33)	4.20(17.33)	4.30(18.33)	1.82(2.82)	1.56(1.93)	1.65(2.27)	66.45	25.04	4368
T_6	4.94 (24.00)	3.71(13.33)	3.87(14.67)	1.68(2.33)	1.40(1.48)	1.46(1.64)	76.94	17.22	4830
T_7	4.38 (18.67)	2.91(8.00)	3.13(9.33)	1.39(1.43)	1.20(0.93)	1.20(0.93)	89.45	8.11	5351
T_8	4.76 (22.33)	3.44(11.33)	3.44(11.33)	1.49(1.73)	1.28(1.13)	1.34(1.30)	85.63	13.57	5043
T_9	3.18 (9.67)	2.39(5.23)	2.41(5.33)	0.87(0.26)	1.04(0.60)	1.04(0.60)	97.15	0.00	5843
T_{10}	7.60 (57.33)	7.08(49.67)	7.10(50.00)	2.67(6.63)	2.00(3.50)	2.41(5.33)	0.00	36.36	3683
S.Em. ±	**0.22**	**0.15**	**0.22**	**0.04**	**0.05**	**0.08**	**2.51**	**3.17**	**198**
CD p=5%	**0.66**	**0.44**	**0.66**	**0.11**	**0.16**	**0.23**	**7.46**	**9.42**	**590**

Note: Figures in parentheses indicate original values

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