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Effect of different herbicides on weed control in cotton and soybean intercropping system

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Abstract

A field experiment was conducted at Cotton Research Scheme Farm, VNMKV, Parbhani during kharif season 2015-16 and 2016-17 in randomized block design with seven treatments in three replicates. Sowing was done by dibbling with spacing 120 cm x 30 cm for Bt.cotton and for soybean 60cm x 5cm. The result indicated that, spraying of pre emergence application of Oxyflurofen 23.5% EC at 0.1 kg/ha ai followed by hand weeding and hoeing at 6 week after sowing (WAS) recorded significantly highest seed cotton equivalent yield (1868 kg ha-1), gross monetary returns (8159 Rs/ha) and net monetary returns (39024 Rs/ha) over rest of the treatment except it was on par with application of pre emergence application of Pendimethalin 30% EC at 0.75 kg/ha ai with hand weeding and hoeing at 6 WAS and Alachlor 50 % EC at 2.0 kg/ha ai followed by hand weeding and hoeing at 6 WAS. The treatment Spraying of pre emergence application of Oxyflurofen 23.5% EC at 0.1kg/ha ai followed by hand weeding and hoeing at 6 WAS was found productive and profitable followed by Pendimethalin 30% EC at 0.75 kg/ha ai with hand weeding and hoeing at 6 WAS and Alachlor 50 % EC at 2.0 kg/ha ai followed by hand weeding and hoeing at 6 WAS.

Keywords: Cotton, Herbicide, Oxyflourefen

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1. Introduction

Cotton is the most important and extensively cultivated commercial crop among the fiber crops and believed to have been originated from tropical and subtropical regions of the world (Bukun, 2004). In India area under cotton cultivation is 11.881 milion hectares with production of 7.664 milion tonne and 503 kg/ha lint productivity. The area under cotton in Maharashtra was 3.827 milion hectares with production of 1.551 milion tonne with a productivity of 187 kg/ha (Annual report, VNMKV, Parbhani 2015-16). The productivity of cotton in Maharashtra varies from year to year as per prevailing weather situations. Dry spells and heavy rains during crop growth period decide the yield potential of the crops. Out of many problems faced by the cotton growers, the most troublesome is the control of weeds particularly during early stages of crop growth. Malik et al. (2008) reported that wild radish and rye cover crops without herbicides reduced total weed density by 35 and 50%, respectively. Venugopalan et al. (2009) reported a reduction in yield due to weeds in cotton crop to the extent of 15 to 55 percent. Also the weeds compete with the crop for the nutrient, moisture, space and light, thus, affecting the growth and development of crop during early stages of growth. Weed competition is one of the major factors responsible for low yield of rice (Jagtap et al. 2018). Jain et al. (1982) reported that, weeds remove as high as 48-50 kg N, 8-15 kg P and 48-50 kg K ha^{-1}. In soybean, the weed competition is one of the most important causes of yield loss, which is estimated around 30-80 % (Yaduraju, 2002). Therefore attempts were made in the present investigation for different herbicides on weed control in Cotton + Soybean intercropping system so as to enhance the productivity of cotton. Intercropping has been recognized as a potentially beneficial system of sustainable crop production in semi-arid tropics. Subsequent evidences affirm the utility of the concept in realizing substantial yield advantages over their sole cropping. The advantages may especially be important as these are achievable not by means of costly inputs, but by simple expedient of growing crops together (Willey, 1979). The present study is planned during to evaluate the performance of different herbicides in cotton + soybean intercropping system.

2. Materials and Methods

A field experiment was conducted at Cotton Research Scheme, VNMKV, Parbhani during the *kharif* season of 2015 to 2016. The soil of experimental field was vertisol having low available nitrogen, medium in available phosphorus, fairly rich in available potash and pH was normal for the crop growth. The experiment was laid out in randomized block design with seven treatments i.e.T_1. Spraying of pre emergence application of Oxyflurofen 23.5% EC at 0.1kg/ha ai followed by hand weeding and hoeing at 6 week after sowing (WAS), T_2. Spraying of pre emergence application of Pendimethalin 30% EC at 0.75 kg/ha ai followed by hand weeding and hoeing at 6 WAS, T_3. Spraying of pre emergence application of Alachlor 50% EC at 2.0 kg/ha ai followed by hand weeding and hoeing at 6 WAS, T_4. Spraying of post emergence application of Quizolofopethyl 5% EC at 0.05 kg/ha ai, T_5. Three hand weeding and Hoeing at 6.9 and 12 week after sowing, T_6. Weed free and T_7. Weedy check. The experimental plot was sown on 19th Jun 2015 and 12th Jun 2016 during first and second year respectively, sowing was done by dibbling the seed at spacing 120 cm x 30 cm. Recommended dose of NPK at 150:75:75 kg/ha was applied uniformly to all the plots.

3. Results and Discussion

Data on cotton equivalent yield, seed cotton yield, intercrop yield, gross monetary returns, net monetary returns and C: B ratio are presented in table1 and table 2 respectively. During 2015-16, the treatment T_1 i.e. Spraying of pre emergence application of Oxyflurofen 23.5% EC at 0.1 kg/ ha ai followed by hand weeding and hoeing at 6 WAS recorded significantly highest seed cotton equivalent yield (1868 kg/ha) (Giri et al. 2006) over rest of treatments except it was on par with T_2, T_3 and T_6. Whereas during 2016-17, T_6 treatment recorded significantly highest seed cotton equivalent yield (2131 kg/ ha) over rest of treatments except it was on par with T_1, T_2 and T_5 (Table 1). Sultan et al. (2008) reported that, when hoeing was done 8 weeks late after sowing (WAS) or 4+8 (WAS) had a significant effect on reducing total dry weight of weeds in cotton. During 2015-2016, among the treatment T_1 i.e. Spraying of pre emergence application of Oxyflurofen 23.5 % EC at 0.1 kg/ ha a.i followed by hand weeding and hoeing at 6 WAS recorded significantly highest gross monetary returns (Rs.8159) followed by the treatment T_2 (Rs.79360), T_3 (Rs.73726), T_6

(Rs.71958). Whereas, during 2016-17 significantly highest gross monetary returns were recorded with T_6 i.e. weed free and it was on par with rest of the treatments except T_4 and T_7. NMR was significantly highest in T_6 as compared to other treatments except T_1 and T_2 during 2016-17. Highest B: C ratio was recorded with treatment T1 i.e. Spraying of pre emergence application of Oxyflurofen 23.5% EC at 0.1 kg/ ha a.i followed by hand weeding and hoeing at 6 WAS during 2015-16 and T_6 during 2016-17 (Table 2).

Table 1- Cotton Equivalent yield (kg/ha), seed cotton yield and soybean yield as influenced by different treatment.

Treatments	Cotton Equivalent Yield (kg/ ha)			Seed cotton yield (kg/ ha)			Soybean Yield (kg/ ha)		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean
T_1	1868	2073	1971	1316	1359	1338	650	1402	1026
T_2	1778	1990	1884	1251	1265	1258	620	1425	1023
T_3	1676	1839	1758	1038	1032	1035	750	1585	1168
T_4	1270	1651	1461	718	954	836	650	1370	1010
T_5	1515	2104	1810	902	1260	1081	720	1656	1188
T_6	1635	2131	1883	1047	1270	1159	810	1675	1243
T_7	638	1227	933	373	755	564	312	927	620
SE ±	80	90	--	--	79	--	--	61	--
CD at 5%	246	277	--	--	242	--	--	189	--
GM	1483	2073	--	--	1129	--	--	1434	--

Hallikeri et al. (2004) reported that, the post-emergence sprayed herbicide glyphosate and pre emergence Diuron reduced dry matter and promoted cotton growth. Cheema et al. (2005) found that total weed dry biomass was significantly reduced in all the weed control methods as compared to weedy check.

Table 2- GMR (Rs.), NMR (Rs.) and B: C ratio as influenced by different treatments.

Treatments	GMR (Rs/ ha)			NMR (Rs/ ha)			B:C		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean
T_1	81059	114010	97535	39024	72076	55550	1.93	2.73	2.33
T_2	79360	109460	94410	36865	67038	51952	1.87	2.56	2.22
T_3	73726	101160	87443	30731	58467	44599	1.71	2.33	2.02
T_4	55879	90812	73346	16484	55852	36168	1.42	2.60	2.01
T_5	66631	115700	91166	22181	60140	41161	1.50	2.10	1.80
T_6	71958	117230	94594	26808	80498	53653	1.59	3.20	2.40
T_7	28084	67496	47790	-5226	34438	14606	0.84	2.03	1.40
SE ±	3630	4959	--	1735	4959	--	--	--	--
CD at 5%	11170	15257	--	5339	15257	--	--	--	--
GM	65242	102270	--	23838	61215	--	--	--	--

2015-16: Sale price for Cotton= 4400 qt^{-1}. Soybean= 3600 qt^{-1}. 2016-17: Sale price for Cotton= 5500 qt^{-1}. Soybean= 2800 qt^{-1}.

Conflict of interest

Authors declare no conflicts of interest for this study.

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