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Effect of Integrated Weed Management Practices on Weed Growth, Yield Attributes and Yield of Blackgram

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An experiment was conducted during *kharif* 2011 and 2012 to study the effect of pre and post emergence herbicides on weed control in blackgram. In this study, application of Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Imazethapyr @ 40 g a.i. ha^{-1} as POE + Quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}) provided a broad spectrum of weed control by significantly reducing weed density and dry weight at 40 DAS and resulted in significantly higher weed control efficiency. Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Imazethapyr @ 40 g a.i. ha^{-1} as POE + Quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}) recorded significant improvement in plant height, yield attributes like No. of pods plant^{-1}, No. of seeds pod^{-1}, Test seed weight and significantly higher grain yield.

Key words: Blackgram, Weed density, Weed dry weight, Yield parameters and yield

Among the pulses, blackgram is the third most widely cultivated pulse crop in India. The main constraint in pulses production is the weed growth, which inflicts heavy losses on the crop yield by competing for essential growth factors *viz.,* nutrients, space, light and moisture (Kandasamy, 2000). Kumar and Tewari (2004) reported that the critical period of competition between crop and weed in blackgram was between 10 to 40 days after sowing. Being a short duration crop and initially slow growing in nature, blackgram is heavily infested with grasses, broad-leaved weeds and sedges, which compete with crop, resulting in yield reduction (Mishra, 1997). Keeping these points in view the present study was undertaken to find out the effect of pre and post emergence herbicides and hand weeding practices on weed control of irrigated blackgram.

Materials and Methods

Field experiments were conducted at Tamil Nadu Agricultural University, Coimbatore, during *kharif* 2011 and 2012. The investigation was carried out on weed management in irrigated blackgram with 14 treatments under randomized block design (RBD) with three replications. The test variety was blackgram CO 6. The weed management treatments imposed were Weedy check (T_1), Hand weeding twice at 20 and 40 DAS (T_2), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + one HW 20 DAS (T_3), Quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_4), Imazethapyr @ 40 g a.i. ha^{-1} as POE (T_5), Fenoxaprop- p-ethyl @ 50 g a.i. ha^{-1} as POE (T_6), Quizalofop ethyl @ 37.5 g a.i. ha^{-1} + Imazethapyr @ 40 g a.i. ha^{-1} as POE (T_7), Fenoxaprop- p-ethyl @ 50 g a.i. ha^{-1} + Imazethapyr @ 40 g a.i. ha^{-1} as POE (T_8), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Quizalofop ethyl @ 37.5 g a.i. ha^{-1} (POE) (T_9), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Fenoxaprop- p-ethyl @ 50 g a.i. ha^{-1} (POE) (T_{10}), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Imazethapyr @ 40 g a.i. ha^{-1} as POE (T_{11}), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Imazethapyr @ 40 g a.i. ha^{-1} as POE + Quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}), Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + Imazethapyr @ 40 g a.i. ha^{-1} as POE + Fenoxaprop-p-ethyl @ 50 g a.i. ha^{-1} as POE (20 DAS) (T_{13}) and Weed free check (T_{14}). The observations on weeds, crop growth, yield attributes and yield were recorded and statistically analyzed.

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Results and Discussion

Weed flora

The weed flora observed in the experimental field during the course of study consisted of grasses, sedges and broad leaved weeds. The predominant category of weed was broad leaved weeds followed by grasses and sedges. The weed flora mainly consisted of *Chloris barbata*, *Cynodon dactylon, Dactyloctenium aegyptium, Dinebra retroflexa* and *Panicum javanicum* under grasses, *Cyperus rotundus* under sedges and *Amaranthus viridis, Boerhaavia diffusa, Euphorbia geniculata, Flaveria australasica, Parthenium hysterophorus, Phyllanthus niruri, Portulaca oleracea* and *Trianthema portulacastrum* under broad leaved weeds.

Weed growth

All the weed control treatments significantly reduced weed density at 40 DAS over weedy check (T_1) (Table 1). Among the various weed management practices, application of pendimethalin 1.0 kg a.i.

Table 1. Effect of IWM on weed growth and yield attributes and yield of blackgram (*Kharif* 2010 and 2011)

Treatment	*Kharif* 2011					*Kharif* 2012					*Kharif* 2011	*Kharif* 2012	*Kharif* 2011	*Kharif* 2012
	Weed count (N . m^{-2}) 40 DAS				Weed dry weight kg ha^{-1}	Weed count (N . m^{-2}) 40 DAS				Weed dry weight kg ha^{-1}	No. of pods $plant^{-1}$	No. of pods $plant^{-1}$	Grain yield kg ha^{-1}	Grain yield kg ha^{-1}
	Grasses	Sedges	Broad leaved weeds	Total		Grasses	Sedges	Broad leaved weeds	Total					
T_1	7.81	3.32	9.43	12.53	32.62	6.42	3.41	10.77	12.85	24.25	9.4	17.40	164	386
	(59)	(9)	(87)	(155)	(106)	(39.24)	(9.66)	(114)	(163)	(586)				
T_2	3.00	2.00	3.32	4.47	8.37	2.45	1.74	4.12	4.69	8.43	38.5	43.58	912	902
	(7)	(2)	(9)	(18)	(68)	(4.02)	(1.03)	(15)	(20)	(69)				
T_3	3.46	2.24	3.00	4.69	8.60	2.51	1.81	4.58	5.20	8.94	35.2	36.04	878	882
	(10)	(3)	(7)	(20)	(72)	(4.28)	(1.29)	(19)	(25)	(78)				
T_4	3.32	3.00	7.81	8.77	22.18	2.77	3.07	9.00	9.70	19.80	19.5	19.50	397	427
	(9)	(7)	(59)	(75)	(490)	(5.67)	(7.43)	(79)	(92)	(390)				
T_5	5.57	2.00	3.46	6.56	15.46	4.88	3.06	5.48	7.68	16.34	26.8	26.80	596	596
	(29)	(2)	(10)	(41)	(237)	(21.82)	(7.38)	(28)	(57)	(265)				
T_6	3.16	2.83	7.48	68.37	21.66	3.05	3.09	9.75	10.49	20.69	20.7	18.49	410	409
	(8)	(6)	(54)	(8)	(467)	(7.28)	(7.52)	(93)	(108)	(426)				
T_7	4.47	2.24	4.24	6.24	13.96	2.79	2.90	5.48	6.48	15.13	27.4	27.40	684	684
	(18)	(3)	(16)	(37)	(193)	(5.78)	(6.40)	(28)	(40)	(227)				
T_8	5.00	2.00	4.12	6.48	14.39	2.81	3.02	5.57	6.63	15.75	27.1	27.10	649	642
	(23)	(2)	(15)	(40)	(205)	(5.92)	(7.12)	(29)	(42)	(246)				
T_9	3.61	2.24	4.47	5.83	13.67	2.87	2.50	5.39	6.32	14.14	29.3	53.80	783	749
	(11)	(3)	(18)	(32)	(185)	(6.21)	(4.25)	(27)	(38)	(198)				
T_{10}	3.61	2.65	4.58	5.92	11.45	2.92	2.55	5.57	6.48	14.73	33.8	32.35	749	705
	(11)	(5)	(19)	(33)	(129)	(6.52)	(4.52)	(29)	(40)	(215)				
T_{11}	4.24	2.45	3.00	5.39	11.49	2.81	2.51	3.61	4.80	9.64	34.3	39.30	872	857
	(16)	(4)	(7)	(27)	(130)	(5.92)	(4.28)	(11)	(21)	(91)				
T_{12}	2.65	2.24	2.45	3.74	7.07	2.88	2.55	4.00	5.20	10.05	39.4	44.19	936	915
	(5)	(3)	(4)	(12)	(48)	(6.30)	(4.49)	(14)	(25)	(99)				
T_{13}	2.65	2.45	4.24	5.20	10.34	3.34	2.12	3.87	5.20	10.30	33.8	38.52	861	842
	(5)	(4)	(16)	(25)	(105)	(9.15)	(2.51)	(13)	(25)	(104)				
T_{14}	2.24	2.24	2.65	3.87	6.16	3.00	2.05	3.61	4.69	9.43	40.1	40.14	952	943
	(3)	(3)	(5)	(13)	(36)	(7.00)	(2.22)	(11)	(20)	(87)				
SEd	0.10	0.05	0.09	0.38	0.31	0.05	0.05	0.15	0.17	0.39	2.12	2.19	46	40
CD (p=0.05)	0.20	0.10	0.19	0.81	0.64	0.11	0.11	0.31	0.36	0.81	4.55	4.48	99	82

Data were subjected to "(X + 2)) transformed values. Figures in parenthesis are means of original values

ha^{-1} as PE (3 DAS) + imazethapyr @ 40 g a.i. ha^{-1} as POE + quizalofop ethyl @ 37.5 g a.i. ha^{-1} POE (20 DAS) (T_{12}) significantly lowered the weed density (grasses, sedges, Broad leaved weeds) at 40 DAS and It was followed by hand weeding twice at 20 and 40 DAS (T_2), which was on par with T_3 treatment, respectively during 2011 and 2012.

Weed dry weight is the most important parameter to assessp the competitiveness of weeds to the crop growth and productivity. Among the weed control treatments at 40 DAS, significantly reduced weed dry weight was noticed in application of Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + imazethapyr @ 40 g a.i. ha^{-1} as POE + quizalofop ethyl @ 37.5 g a.i. ha^{-1} POE (20 DAS) (T_{12}) at 40 DAS; and It was followed by hand weeding twice at 20 and 40 DAS (T_2) which was comparable with T_3 treatment during *kharif* 2011 and 2012. Due to the effectiveness of these herbicides in checking weed germination and growth, pre emergence application of pendimethalin @ 1.0 kg a.i. ha^{-1} + imazethapyr 66 g a.i. ha^{-1} recorded lower weed dry weight and higher yields of blackgram (AICRP on MULLaRP, 2012). However, post- emergence application of quizalofop ethyl @ 50 g ha^{-1} had given an excellent weed control with 90 to 94 per cent weed control efficiency in rice fallow blackgram Rao (2011).

Yield attributes

Application of Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + imazethapyr @ 40 g a.i. ha^{-1} as POE + quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}) recorded higher number of pods $plant^{-1}$, number of seeds $plant^{-1}$ and test weight (Table 1) due to effective integrated weed control, lower weed density and dry weight. Reduced nutrition depletion by weeds and increase of nutrient uptake by plants due to less weed competition was further observed.

Yield

Among the weed control treatments, integrated weed management practice, application of Pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + imazethapyr @ 40 g a.i. ha^{-1} as POE + quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}) recorded higher grain yield of 936, 915 kg ha^{-1} during 2011 and 2012, respectively. This was followed by hand weeding twice at 20 and 40 DAS (T_2). This might be due to inhibition of germination or growth of weeds by integrated weed management practice of pre and post emergence herbicides. Higher yields in these treatments might be due to lower weed density and dry matter production, leading to better availability of nutrients, light and moisture to the crop, which would have resulted in higher yield attributes

of number of pods plant^{-1} of the crop. This results are in conformity with the earlier findings of Rao *et al.* (2010), who observed that the pre - emergence sand mix application of pendimethalin @ 1.0 kg ha^{-1} followed by sequential application of imazethapyr @ 50 g ha^{-1} at 20 DAS, resulted in reduced weed growth, increased crop growth, yield components and yield. However, the post- emergence application of quizalofop ethyl @ 50 g ha^{-1} recorded the highest seed yield (1877 kg ha^{-1}), crop dry weight (60g m^{-1}) at harvest, number of pods plant^{-1} (6.83) and 100 seed weight (6.56 g) in rice fallow blackgram Rao (2011).

It could be concluded from these investigations that integrated weed management practice of application of pendimethalin 1.0 kg a.i. ha^{-1} as PE (3 DAS) + imazethapyr @ 40 g a.i. ha^{-1} as POE + quizalofop ethyl @ 37.5 g a.i. ha^{-1} as POE (20 DAS) (T_{12}) at 40 DAS could keep the lower weed density and dry weight and increase plant growth, yield attributes and yield of irrigated blackgram (Var. CO 6).

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