



## Yield and Economics of Irrigated Blackgram under Lay by Method of Pre-Emergence Herbicide Application

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### Abstract

Field experiment was conducted during *rabi* 2015 at Tamil Nadu agricultural university, AC & RI, Madurai to study yield and economics of irrigated blackgram under lay by method of pre-emergence herbicide application. Results indicated that lay by method were found to superior to individual application with respect to weed control. Among the lay by treatments pre emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS followed by hand weeding on 20 DAS and sand mix application of pendimethalin at 1.0 kg ha<sup>-1</sup> immediately after hand weeding significantly reduced the weed growth and recorded higher seed yield (1087 kg ha<sup>-1</sup>), net monetary returns (Rs. 40546 ha<sup>-1</sup>) and B: C ratio 2.86. The results significantly superior over rest of the treatments. Uncontrolled weed growth caused reduction in seed yield of blackgram.

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### Introduction

Black gram (*Vigna mungo* L.) is important pulse crop cultivated in worldwide in tropical and sub-tropical regions. India is the largest producer and consumer of pulses accounting for 33.6 per cent of the world area and 24 per cent of the world production of pulses (Pramanik, 2009). Chemical weed management in pulse crops has been found effective and economical (Dungarwal *et al.*, 2003). The crop is not a very good competitor against the weeds and therefore weed control initiatives are essential to ensure proper crop growth, particularly in the early growth period. Application of pre-emergence herbicide last long only a very short period of crop growth. After the loss of herbicide concentration in soil due to various means, the left over weed seeds present in the weed seed bank start to emerge and compete with crops for natural resources. Management of weeds includes cultural, mechanical and chemical besides manual methods.

Though the hand weeding is considered as one of the best methods to check the emergence of weeds throughout the crop duration. Therefore, a field experiment was conducted to study the effect of pre-emergence herbicides compared with hand weedings and untreated check for evaluating weed control efficacy obtaining high yields of blackgram.

### Materials and Methods

A field experiment was conducted during *rabi* 2016 at Department of Agronomy, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai respectively (9°54' N latitude and 78°54' E longitude at an altitude of 147 m above mean sea level) to study the effect of pre-emergence herbicides on weeds, grain yield of blackgram and the economics involved. The experiment was laid out in randomized block design and replicated thrice. The treatments

comprised of ten different weed management practices viz., pre-emergence application of pendimethalin at 1 kg ha<sup>-1</sup> alone on 3 DAS or followed by 0.5 or 1.0 kg ha<sup>-1</sup> applied in sequence with or without hand weeding on 20 DAS or quizolofop-ethyl at 0.050 kg ha<sup>-1</sup> on 20 DAS. It was compared with hand weeding twice (20 and 40 DAS) weed free check and unweeded check. The soil type of the experimental field are sandy clay loam in texture, neutral in pH 7.20, low Ec (0.46 dSm<sup>-1</sup>), low organic carbon (0.29 per cent) medium in available N (234.26) and in available P (15.80) and K content (292.52). The crop was irrigated at critical stages. Need based plant protection measures were given as per the crop protection guide, 2012. The growth attributes were recorded from five selected plants in each plot. Observations on weeds were recorded with the help of a quadrat (0.5 m x 0.5 m) placed randomly at two places (outside the net plot area) in each treatment at 20, 50 DAS and at harvest. The data on weeds were subjected to square root transformation ( $\sqrt{X+2}$ ) to normalize their distribution.

## Results and Discussion

### Effect on weeds

The major weeds found in the experimental field were *Echinochloa colonum*, *Echinochloa crusgalli* and *Cynodon dactylon*. Among the grasses *Cynodon dactylon* is the dominant grass weed. *Cyperus rotundus* and *Cyperus iria* were the predominant sedges. In sedges *Cyperus rotundus* is the key sedge weeds in the experimental trial. The important broad leaved weeds were *Commelina benghalensis*, *Cleome viscosa*, *Convolvulus arvensis*, *Trianthema portulacastrum*, *Phyllanthus niruri* and *Eclipta alba*. The weed density and dry weight were recorded at 20, 30 DAS and at harvest (Table 1).

The sequential application of pre-emergence followed by pre-emergence (3 and 20 DAS) with different doses significantly reduced the weed density and weed dry weight compared to other weed control treatments. The pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS T<sub>7</sub> recorded low weed density and weed dry weight. The pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* post-emergence application of quizolofop-ethyl at 0.050 kg ha<sup>-1</sup> on 20 DAS reduced the grass weed density at 50 DAS. This might be due to the effect of the post-emergence herbicide over the grassy weeds. The results corroborate with the findings of Dixit

*et al.*, (2011). The highest weed dry weight was recorded in unweeded check T<sub>10</sub>. It may be due the undisturbed weed growth during the entire crop growth period.

### Effect on crop

The maximum seed yield was recorded weed free check of 1189 kg ha<sup>-1</sup>. Among the herbicides treatments, pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS recorded grain yield of 1087 kg ha<sup>-1</sup> (Table 2). The pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* post-emergence application of quizalofop-ethyl at 0.050 kg ha<sup>-1</sup> on 20 DAS was not effective compared to that of lay by method of pre-emergence herbicide application which recorded only 782 kg ha<sup>-1</sup> grain yield.

The weed free plot recorded maximum haulm yield of 1803 kg ha<sup>-1</sup>. Among the weed control treatments pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS recorded haulm yield of 1729 kg ha<sup>-1</sup>. The control plot recorded lowest haulm yield of 1082 kg ha<sup>-1</sup>. This result corroborates with the findings of Kalaiselvi *et al.*, (1998).

The highest harvest index (0.40 per cent) was recorded with the weed free check. Among the various weed control treatments the pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS recorded the higher harvest index of 0.39 per cent. Followed by the pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 0.5 kg ha<sup>-1</sup> on 20 DAS registered with harvest index of 0.37 per cent. All other weed control treatments were registered comparable harvest index with each other. The lowest harvest index of 0.31 per cent was observed in the unweeded check.

### Economics

Maximum gross return of Rs. 68111 ha<sup>-1</sup> was obtained with weed free check. Among the weed control treatments pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS and pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 0.5 kg ha<sup>-1</sup> on 20 DAS (T<sub>6</sub>) registered the higher gross return of Rs. 62353 and Rs.57235 ha<sup>-1</sup>.

**Table.1** Effect of weed control treatments on Total weed density (No.m<sup>-2</sup>) and total weed dry weight (kg ha<sup>-1</sup>) in irrigated blackgram

T. No	Treatments	Total weed density (No.m <sup>-2</sup> )			Total weed dry weight (kg ha <sup>-1</sup> )		
		20 DAS	50 DAS	HARVEST	20 DAS	50 DAS	HARVEST
T <sub>1</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS	31.43 (3.29)	104.49 (5.94)	77.14 (5.11)	158.70 (7.23)	468.51 (12.43)	815.06 (16.39)
T <sub>2</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + pendimethalin at 0.5 kg ha <sup>-1</sup> on 20 DAS	31.16 (3.29)	82.71 (5.29)	50.60 (4.14)	151.80 (7.08)	312.17 (10.21)	603.10 (14.19)
T <sub>3</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + pendimethalin at 1.0 kg ha <sup>-1</sup> on 20 DAS	31.67 (3.30)	63.73 (4.66)	40.03 (3.71)	158.86 (7.23)	280.34 (9.67)	594.59 (14.09)
T <sub>4</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + quizalofop-ethyl 0.050 kg ha <sup>-1</sup> on 20 DAS	31.84 (3.31)	76.37 (4.94)	71.17 (4.91)	155.02 (7.14)	357.93 (10.68)	672.63 (14.97)
T <sub>5</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS	32.59 (3.35)	78.88 (5.17)	58.94 (4.48)	148.80 (7.01)	307.85 (10.12)	652.00 (14.72)
T <sub>6</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 0.5 kg ha <sup>-1</sup> on 20 DAS	34.34 (3.43)	58.33 (4.46)	38.20 (3.63)	139.03 (6.79)	252.45 (9.18)	470.82 (12.51)
T <sub>7</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 1.0 kg ha <sup>-1</sup> on 20 DAS	33.40 (3.37)	44.43 (3.88)	34.71 (3.47)	147.52 (6.98)	198.00 (8.15)	453.07 (12.23)
T <sub>8</sub>	Hand weeding twice at 20 and 40 DAS	90.35 (5.45)	35.79 (3.48)	64.70 (4.67)	225.49 (8.60)	210.00 (9.51)	593.00 (13.86)
T <sub>9</sub>	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)
T <sub>10</sub>	Unweeded check	98.42 (5.69)	210.03 (8.30)	271.00 (9.42)	237.43 (8.84)	1204.26 (20.04)	2035.85 (26.00)
	<b>SEd</b>	0.39	0.44	0.38	0.43	1.00	0.84
	<b>CD(P= 0.05)</b>	0.82	0.94	0.80	0.90	2.11	1.76

Data were subjected to  $\sqrt{(X + 0.5)}$  transformation. Figures in parenthesis are means of transformed values  
Pendi- Pendimethalin, DAS- Days after sowing, HW- Hand weeding, *fb*- Followed by.

**Table.2** Effect of weed control treatments on yield attributes and economics in irrigated blackgram

T. No	Treatments	Yield attributes			Economics		
		Grain yield (kg ha <sup>-1</sup> )	Haulm yield (kg ha <sup>-1</sup> )	Harvest Index	Gross returns (Rs ha <sup>-1</sup> )	Net returns (Rs ha <sup>-1</sup> )	B:C ratio
T <sub>1</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS	766	1367	0.36	44177	27123	2.59
T <sub>2</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + pendimethalin at 0.5 kg ha <sup>-1</sup> on 20 DAS	869	1438	0.38	49945	31510	2.71
T <sub>3</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + pendimethalin at 1.0 kg ha <sup>-1</sup> on 20 DAS	924	1475	0.39	53040	33723	2.75
T <sub>4</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS + quizalofop-ethyl 0.050 kg ha <sup>-1</sup> on 20 DAS	782	1386	0.36	45085	25649	2.32
T <sub>5</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS	816	1373	0.37	46938	27394	2.40
T <sub>6</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 0.5 kg ha <sup>-1</sup> on 20 DAS	995	1673	0.37	57235	36310	2.74
T <sub>7</sub>	Pendi at 1.0 kg ha <sup>-1</sup> on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 1.0 kg ha <sup>-1</sup> on 20 DAS	1087	1729	0.38	62353	40546	2.86
T <sub>8</sub>	Hand weeding twice at 20 and 40 DAS	823	1351	0.37	47275	24266	2.05
T <sub>9</sub>	Weed free check	1189	1803	0.40	68111	39375	2.37
T <sub>10</sub>	Unweeded check	492	1082	0.31	28674	13883	1.94
	<b>SEd</b>	35.35	66.39	1.45	-	-	-
	<b>CD(P= 0.05)</b>	74.23	139.49	3.06	-	-	-

Pendi- Pendimethalin, DAS- Days after sowing, HW- Hand weeding, *fb*- Followed by.

Pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS registered the maximum net return of Rs. 40546 ha<sup>-1</sup>. The highest B: C ratio of 2.86 was registered in pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS. Unweeded check recorded the lowest gross returns of Rs. 28674 ha<sup>-1</sup> and B:C ratio of 1.94. From these study it could be concluded that pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha<sup>-1</sup> on 20 DAS is cost effective in controlling the weeds of irrigated blackgram.

From the study, it could be concluded that under irrigated blackgram, the lay by method of pre-emergence application of pendimethalin at 1.0 kg ha<sup>-1</sup> on three days after sowing followed by hand weeding on 20 DAS and sand mix application of pendimethalin at 1.0 kg ha<sup>-1</sup> immediately after hand weeding provided season long

weed free condition resulted in higher grain yield, net income and return per rupee invested.

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