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Effect of sand mix application of Pendimethalin in irrigated blackgram

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Abstract

The present experiment was carried out to study the effect of sand mix application of pendimethalin in irrigated blackgram during *rabi* 2015 at Tamil Nadu agricultural university, AC & RI, Madurai. Results showed that sand mix application of pendimethalin were found to superior to other treatments. Sand mix application of pendimethalin at 1.0 kg ha⁻¹ on 3 DAS *fb* Hand weeding on 20 DAS + pendimethalin at 1.0 kg ha⁻¹ on 20 DAS resulted the maximum seed yield (1087 kg ha⁻¹), net monetary returns (Rs. 40546 ha⁻¹) and B:C ratio 2.86. The uncontrolled weeds growth caused significant reduction in seed yield of blackgram.

Keywords: pendimethalin, hand weeding, sand mix application, Blackgram

Introduction

Pulses are the important constituent of the Indian diet and supply a major part of the protein requirement. United Nation during 2013 declared that 2016 will be the “International year of pulse” to create awareness about the important role of pulses in sustainable food production, healthy diets and their contribution to food and nutrition security. Among the pulse crop, blackgram (*Vigna mungo* L.) is an important legume crop cultivated worldwide in tropical and subtropical regions. Among the various factors responsible for the lower yield of blackgram, weeds have been considered to be of prime importance as the losses caused by weeds are exorbitant. Reduction in yield may be as high as 30-50 per cent or even more depending upon the intensity and type of weed flora. Heavy weed infestation is the predominant reason for such a low yield of blackgram (Rao *et al.*, 2010) [4]. The weeds compete for nutrient, water, light and space with crop plant during early growth period. Various methods like cultural, mechanical, biological and chemicals are used for weed control in blackgram (Fand *et al.*, 2013) [2]. However an initial period of 20-40 days is very critical, the season long weed competition has found to reduce blackgram yield to the extent of 87 per cent depending on the type and intensity of weed flora (Singh *et al.*, 2002) [5]. Chemical weed management in pulse crops has been found effective and economical (Dungarwal *et al.*, 2003) [1]. Weeds could be controlled by hand weeding. However, hand weeding is laborious, time consuming, costly and tedious. Under these conditions, use of herbicides offers an alternative for possible effective control of weeds. More work has been done to manage the weeds emerged during initial growth stage of blackgram. Research information on the management of late emerged weeds during the later part of the crop growth of blackgram is lacking. Considering the importance of late season weeds, the present study was carried to know the effect of sand mix application of pendimethalin to control the weeds.

Materials and Method

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 sand mix application of pendimethalin. The normal weather condition of the location is as follows. The mean annual rainfall is 856 mm, out of which 39.8 per cent is distributed during south west monsoon, 42 per cent during north east monsoon, 2.1 per cent during winter and 16.2 per cent during summer. Mean maximum and minimum temperature are 35.5°C and 25.3°C. The average relative humidity is 83.4 per cent and the rainfall received

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during cropping season (October 2015-January 2016) was 396.8 mm in 25 rainy days. Mean maximum and minimum temperature prevailed during the cropping period were 30.55°C and 19.44°C, respectively. Mean relative humidity ranges from 87.78 to 68.08 per cent. The treatments comprised of ten different weed management practices viz., pre-emergence application of pendimethalin at 1 kg ha⁻¹ alone on 3 DAS or followed by 0.5 or 1.0 kg ha⁻¹ applied in sequence with or without hand weeding on 20 DAS or quizolofop-ethyl at 0.050 kg ha⁻¹ 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⁻¹), 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

Weed flora

Sedges and broad leaved weeds were the predominant weeds observed throughout the crop growth period. The weed flora consists of three species of grasses, two species of sedges and six species of broad leaved weeds. The major weeds were

Echinochloa colonum, *Echinochloa crusgalli*, *Cynodon dactylon*, *Cyperus rotundus*, *Cyperus iria*, *Commelina benghalensis*, *Cleome viscosa*, *Convolvulus arvensis*, *Trianthema portulacastrum*, *Phyllanthus niruri* and *Eclipta alba*. Similarly, such type of weed population were reports by Sasikala *et al.* (2014) [6].

Effect on weed

All the weed control treatments reduced the weed density significantly at all stages of crop growth. The sand mix application of pendimethalin at 1.0 kg ha⁻¹ 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha⁻¹ on 20 DAS (T₇) effectively controlled the broad spectrum of weeds like grasses, sedges and broad leaved weeds till harvest. Continuous maintenance of herbicide concentration in the soil due to the second dose of pre-emergence herbicide applied on 20 days after sowing effectively reduced the germination of weeds and provided weed free condition for the rest of the crop growth period. This result corroborates with the findings of Kalaiselvi *et al.* (1998). Weed control efficiency were highest in weed free check. This might be due to the periodical removal and poor rejuvenation of weeds. Among the herbicide treatments the pre-emergence application of pendimethalin at 1.0 kg ha⁻¹ 3 DAS *fb* HW on 20 DAS + pendimethalin at 1.0 kg ha⁻¹ on 20 DAS (T₇) recorded the higher weed control efficiency of 86.78 and 86.30 per cent at harvest (Table 1). The WCE was lowest in the unweeded check (T₁₀). In the unweeded check weeds remained throughout the crop season might have facilitated the weed flora for its sound establishment.

Table 1: Effect of various weed management practices on weed density, weed dry weight, weed control efficiency and weed index of irrigated blackgram

T. No	Treatments	Total weed density (No.m ⁻²)	Total weed dry weight (kg ha ⁻¹)	WCE (%)	Weed index
T ₁	Pendi at 1.0 kg ha ⁻¹ on 3 DAS	77.14 (5.11)	815.06 (16.39)	71.53	35.57
T ₂	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + pendimethalin at 0.5 kg ha ⁻¹ on 20 DAS	50.60 (4.14)	603.10 (14.19)	81.32	26.31
T ₃	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + pendimethalin at 1.0 kg ha ⁻¹ on 20 DAS	40.03 (3.71)	594.59 (14.09)	85.22	22.28
T ₄	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + quizolofop-ethyl 0.050 kg ha ⁻¹ on 20 DAS	71.17 (4.91)	672.63 (14.97)	73.73	34.23
T ₅	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS	58.94 (4.48)	652.00 (14.72)	78.25	31.37
T ₆	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 0.5 kg ha ⁻¹ on 20 DAS	38.20 (3.63)	470.82 (12.51)	86.30	16.31
T ₇	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 1.0 kg ha ⁻¹ on 20 DAS	34.71 (3.47)	453.07 (12.23)	86.78	8.62
T ₈	Hand weeding twice at 20 and 40 DAS	64.70 (4.67)	593.00 (13.86)	76.12	30.78
T ₉	Weed free check	0.00 (0.71)	0.00 (0.71)	100	0.00
T ₁₀	Unweeded check	271.00 (9.42)	2035.85 (26.00)	-	58.62
	SEd	0.38	0.84	-	-
	CD(P= 0.05)	0.80	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.

Effect on crop

Weed management practices had a favourable effect on yield parameters like number of pods plant⁻¹, number of seeds pod⁻¹, 100 grain weight and yield in blackgram. Among the treatments weed free check produced the highest plant height due to free of weeds throughout the crop growth period. Among the herbicide treatments the blackgram field treated

with sand mix application of pendimethalin at 1.0 kg ha⁻¹ 3 DAS *fb* Hand weeding on 20 DAS + pendimethalin at 1.0 kg ha⁻¹ on 20 DAS (T₇) (Table 2) recorded increased yield components like number of pod plant⁻¹, seeds per pod, hundred seed weight and yield of blackgram. This might be due to the effective weed control and favourable environment prevailed throughout the crop growth.

Table 2: Effects of various weed control management practices on yield attributes and yield of irrigated blackgram

T. No	Treatments	Yield attributes			
		No. of pods plant ⁻¹	No. of seeds pod ⁻¹	Haulm yield (kg ha ⁻¹)	Grain yield (kg ha ⁻¹)
T ₁	Pendi at 1.0 kg ha ⁻¹ on 3 DAS	17.17	4.52	1367	766
T ₂	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + pendimethalin at 0.5 kg ha ⁻¹ on 20 DAS	26.04	5.47	1438	869
T ₃	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + pendimethalin at 1.0 kg ha ⁻¹ on 20 DAS	28.41	6.42	1475	924

T ₄	Pendi at 1.0 kg ha ⁻¹ on 3 DAS + quizolofop-ethyl 0.050 kg ha ⁻¹ on 20 DAS	18.24	4.79	1386	782
T ₅	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS	23.09	4.84	1373	816
T ₆	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 0.5 kg ha ⁻¹ on 20 DAS	35.05	6.54	1673	995
T ₇	Pendi at 1.0 kg ha ⁻¹ on 3 DAS <i>fb</i> HW on 20 DAS + pendimethalin at 1.0 kg ha ⁻¹ on 20 DAS	36.24	6.62	1729	1087
T ₈	Hand weeding twice at 20 and 40 DAS	20.99	5.06	1351	823
T ₉	Weed free check	41.37	6.71	1803	1189
T ₁₀	Unweeded check	11.25	3.30	1082	492
	SEd	1.30	0.47	66.39	35.35
	CD(P= 0.05)	2.73	0.98	139.49	74.23

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

Conclusion

From the study, it could be concluded that under irrigated blackgram, the sand mix application of pendimethalin at 1.0 kg ha⁻¹ on 3 days after sowing followed by hand weeding on 20 days after sowing plus sand mix application pendimethalin at 1.0 kg ha⁻¹ on 20 days after sowing provided season long weed free condition resulted in higher grain yield, net income and return per rupee invested.

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