



RESEARCH PAPER

Efficacy of integrated weed management practices on yield and yield contributing parameters of black gram (*Phaseolus mungo*)

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Abstract : A field investigation was carried out during *Kharif* season in 2010 at Agronomy Department Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, to evaluate the effect of four herbicides (imazethapyr, pendimethalin, fenoxyprop-p-ethyl and quizalofop-p-ethyl) applied at different rates with different time of application (pre-emergence, post emergence and combination of both) and cultural practices on yield and yield contributing parameters of black gram (*Phaseolus mungo*). Data revealed that different chemicals and cultural weed control practices were exhibited their superiority over weedy check and reduced the crop weed competition by controlling the annual and broad leaved weeds. Among all the weed control treatments, pre-emergence application of pendimethalin @ 1.5 kg/ha showed higher grain weight plant⁻¹ (4.87), number of pods plant (16.27), number of seeds per pod (7.00) and yield per ha (10.05).

Key Words : Yield parameters, Weed parameters, Cultural methods, Herbicidal practices, WCE, WI

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INTRODUCTION

Black gram (*Phaseolus mungo*) is one of the important pulse crop grown in the rainfed farming system through out the India. It is the second most important pulse crop covering 31,00,000 ha (16.28 %) area in the country. It has high nutritive value and consist high content of proteins, vitamins and minerals. During *Kharif* (monsoon) season the weeds emerge along with the crop due to favourable environment condition and the crop suffers heavy loss from unchecked weeds

particularly in the initial stage of its growth (Vats and Sawhney, 1983). In the later stage, however, the black gram offers good competition (Ali *et al.*, 1982). Overall effect is that the weeds caused grain yield losses up to 50% or even more (Sharma and Nayital, 1). The conventional method of weed control through cultural practices *i.e.* Hand weeding, Hoeing is not only too expensive but at times it is not feasible due to wet soil conditions prevailing during rainy season. So, the use of new selective herbicides (pendimethalin, fenoxyprop-p-

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ethyl, Imazethapyr and quizalofop-p-ethyl) with cultural practices in legumes can be effective and economical for controlling the broad spectrum of annual grassy and broad leaf weeds (Yadav *et al.*, 1983). Apart from growth and yield attributes, the nature of yield response to weed management determines the feasibility of adoption of the technology by growers. With this objectives, the present study was under taken to enhance the yield and morphological parameters of black gram by controlling annual and broad leaved weeds and reduced the crop weed competition through different chemical and cultural weed control practices.

MATERIAL AND METHODS

The experiment was conducted on the Research farm of Agronomy Department, Dr. Panjabrao Deshmukh Krishi Vidyapeeth (Dr. PDKV), Akola during *kharif* season of 2010. The soil of the experimental field was clay loam with pH 7.8, 0.55% organic carbon, 234.58 kg/ha available N, 20.86 kg/ha available P₂O₅ and 322.94 kg/ha available K₂O. The experiment was conducted in a randomised block design replicated three times with thirteen treatments comprising cultural and chemical weed control methods with weed free and weedy check treatments were also included.

The number of weeds present in one square meter area and dry weight of weeds in each plot was counted and measured at 15, 30, 45, 60 DAS and at harvest. These weeds were further classified into sedges, grasses and broad-leaved weeds. The weeds were uprooted from the destructive sampling area of one m² and were oven dried to a constant weight at 60°C and the dry weight of weeds was expressed in g per m². Weed control efficiency at harvest and weed index after harvest of different treatments were computed based on the formula suggest by Gautam *et al.* (1975) and Gill and Vijaykumar in (1969). Data on grain yield was recorded after harvest.

Weed control efficiency (%):

Weed control efficiency was calculated by the help of formula:

$$WCE = (X - Y/X) * 100$$

where, X: Weed dry matter production in weedy plot.

Y: Weed dry matter production in treated plot.

Weed index (%):

Weed index indicates the extent of reduction in yield

due to weed competition. It was worked out for different treatments by adopting the formula:

$$\text{Weed index} = (A - B/A) * 100$$

where, A: seed yield of the best treatment,

B: seed yield of the particular treatment for which the index is computed.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Dry matter of weeds:

The dry matter production of weeds were significantly highest in weedy check treatment and lowest in weed free treatment among all the weed control treatments. Different weed management practices significantly reduced the dry matter of weeds and minimum weed dry matter observed under pre-emergence application of pendimethalin @1.5 kg/ha (2.01) more effective and superior in controlling the broad spectrum of annual grassy and broad leaved weeds closely followed by pendimethalin 1.0 kg/ha (3.05) among herbicidal treatments and in cultural practices two hand weeding at 15 and 30 days after sowing recorded minimum weed dry matter than rest of the treatments as compared to the weedy check treatment.

The pre-emergence application of pendimethalin gave significantly lower weed population and weed dry weight as compared to Imazethapyr and post-emergence application of quizalofop-p-ethyl and fenoxypop-p-ethyl similar observations were recorded by Mishra and Bhanu (2006) (Table 1).

Weed control efficiency:

Weed control efficiency denotes the control of weeds in respective treatments shows lower weed count and better weed practices. Increased weed control efficiency and decreased weed population and weed dry matter were noticed with higher dose of herbicides. Weed free condition recorded higher weed control efficiency among all the weed control treatments through out the crop growth stages. In case of chemical weed control treatments among all the weed control treatments at all the crop growth stages, result of pendimethalin as pre-emergence application gave the highest reduction in number and dry weight of weeds per square metre and better WCE was reported by Ahmed *et al.* (2008) in

peanut crop. Pre-emergence application of pendimethalin @1.5kg/ha have higher weed control efficiency in black gram as compared to weedy check. (Malliswari *et al.*, 2008).

Weed index :

Weed index was computed as the yield reduction comparative to the highest yielding treatment (weed free). Among the weed management practices pre-emergence

Table 1: Weed parameters influenced by chemical and cultural weed control treatments in black gram

Treatments	Total weed Population (m ⁻²) At harvest	Weed dry weight (g/m ²) At harvest	Weed control Efficiency (%) At harvest	Weed index (%) after harvest
T ₁ - Weed free	2.39	0.47	97.06	0
T ₂ - Weedy check	65.44	15.98	-	59.13
T ₃ - 2 Hand weeding (15 fb 30 DAS)	27.40	3.78	76.35	26.77
T ₄ - 2 Hoeing (10 fb 20 DAS)	44.00	5.99	62.52	45.82
T ₅ - Imazethapyr at 50 g/ ha PE (At sowing)	38.62	5.00	68.71	52.18
T ₆ - Imazethapyr at 75 g/ ha PE (At sowing)	33.10	3.95	75.28	33.43
T ₇ - Pendimethalin at 1000 g/ ha PE (At sowing)	19.25	3.05	80.91	21.52
T ₈ - Pendimethalin at 1500 g/ ha PE (At sowing)	15.75	2.01	87.42	20.46
T ₉ - Fenoxypop-p-ethyl at 100 g/ ha POE (15 DAS)	30.70	3.88	75.72	29.33
T ₁₀ - Fenoxypop-p-ethyl at 125 g/ ha POE (15 DAS)	20.60	3.15	80.29	22.49
T ₁₁ - Quizalofop-p- ethyl at 50 g/ ha POE (15 DAS)	50.20	10.02	37.30	36.57
T ₁₂ - Quizalofop-p- ethyl at 75 g/ ha POE (15 DAS)	35.55	4.95	69.02	31.54
T ₁₃ - Imazethapyr at 50 g/ ha PE fb Quizalofop-p- ethyl at 50 g/ ha POE (At sowing fb 15 DAS)	47.00	8.80	44.93	34.11
SE(m) ±	2.31	0.45	-	-
C.D.at 5% -	6.75	1.32	-	-
G.M. -	33.08	5.46	65.81	31.8

Table 2 : Effect of weed control treatments on yield and yield contributing parameters

Treatments	Number of pods/plant ⁻¹ At harvest	Number of seeds/pod ⁻¹ At harvest	Grain weight plant ⁻¹ (g) After harvest	Test weight (g) After harvest	Grain yield (q ha ⁻¹)
T ₁ - Weed free	20.00	7.13	5.30	55.04	12.67
T ₂ - Weedy check	8.33	5.97	3.20	50.32	5.14
T ₃ - 2 Hand weeding (15 fb 30 DAS)	15.40	6.53	4.20	52.56	9.31
T ₄ - 2 Hoeing (10 fb 20 DAS)	10.33	5.73	3.13	50.55	6.81
T ₅ - Imazethapyr at 50 g/ ha PE (At sowing)	10.47	5.27	3.73	51.22	6.11
T ₆ - Imazethapyr at 75 g/ ha PE (At sowing)	11.17	6.20	4.20	52.53	8.28
T ₇ - Pendimethalin at 1000 g/ ha PE (At sowing)	13.20	6.03	4.60	53.63	9.97
T ₈ - Pendimethalin at 1500 g/ ha PE (At sowing)	16.27	7.00	4.87	53.17	10.05
T ₉ - Fenoxypop-p-ethyl at 100 g/ ha POE (15 DAS)	11.67	5.73	4.13	51.83	8.83
T ₁₀ - Fenoxypop-p-ethyl at 125 g/ ha POE (15 DAS)	14.07	6.53	4.20	52.83	9.86
T ₁₁ - Quizalofop-p- ethyl at 50 g/ ha POE (15 DAS)	9.87	5.40	3.60	50.40	7.78
T ₁₂ - Quizalofop-p- ethyl at 75 g/ ha POE (15 DAS)	11.47	6.20	4.20	51.67	8.55
T ₁₃ - Imazethapyr at 50 g/ ha PE fb Quizalofop-p- ethyl at 50 g/ ha POE (At sowing fb 15 DAS)	12.00	5.60	3.73	50.53	8.22
SE(m) ±	1.22	0.36	0.44	1.78	0.86
C.D.at 5% -	3.57	1.06	1.27	5.21	2.52
G.M. -	12.63	6.10	3.99	51.90	8.58

application of Pendimethalin @ 1.5 kg/ha recorded minimum weed index (20.46 %). Better weed control in this treatments provided favourable condition for crop growth and less yield reduction than other treatments. Weedy check treatment recorded the maximum weed index (59.13%) among all the treatments. Rao and Rao (2003) also reported weed index of 49% due to uncontrolled weed growth during the crop season.

Effect on yield attributes :

With the significant reduction of weed weight in weed control treatments, the number of pods per plant, number of seeds per pod, grain weight per plant and test weight (1000 grains weight) of black gram increased significantly over control. The reduced weed competition by weed control treatments had a positive impact on the yield attributing characters (Table 2). Among all the treatments , weed free treatment significantly recorded highest number of pods per plant, seeds per pod ,grain weight per plant and test weight than the weedy check treatment. In herbicidal treatments, pre-emergence application of pendimethalin @ 1.5 kg/ha (16.27,7.00 and 4.8) recorded significantly higher number of pods/plant , seeds/pod ,Grain wt./plant than the weedy check treatment and which was significantly on par on the rest of the treatment and followed by the cultural practices of the hand weeding treatments at 15 and 30 DAS. But, pre-emergence application of pendimethalin @ 1.0 kg/ha observed significantly higher 1000 grain weight followed by pendimethalin @ 1.5 kg/ha than the weedy check treatment as comparable to the rest of the treatments. Effective weed control in the early stage of crop growth would have resulted in increased pods/plant. Similar findings reported by Srinivasan *et al.* (1992). Pre-emergence application of pendimethalin gave significantly higher seed weight/plant and higher 1000 seeds weight as compared to imazethapyr, quizalofop-p-ethyl and fenoxypyr-p-ethyl. Similar, findings were recorded by Mishra and Bhanu (2006).

Grain yield :

Weed management practices significantly improved the grain yield over weedy check. Uncontrolled weeds on an average reduced black gram yield by 45%. Weed free treatment recorded significantly highest (12.67 Q/ha) grain yield among all the treatments and weedy check treatment recorded significantly lowest (5.14 q /ha) grain yield than rest of the weed control treatments (Table 2).

Similar results were recorded by Sharma *et al.* (1988). In herbicidal treatments , pre-emergence application of pendimethalin @ 1.5kg/ha recorded maximum (10.05 q /ha) yield among rest of the herbicidal treatments followed by PE application of pendimethalin @ 1.0 kg/ha recorded (9.97 q /ha) grain yield and remaining herbicidal treatments bring at par with each other. This treatments controlled the weeds efficiently and thus resulted in significant increased in grain yield. Pre-emergence application of pendimethalin at 1.5 kg/ha and 1.0 kg/ha gave significantly higher seed yield of black gram as compared to weedy check , Imazethapyr, quizalofop-p-ethyl and fenoxypyr-p-ethyl. Above results are in accordance with the findings of Malliswari *et al.* (2008) and Mishra and Bhanu (2006).

Conclusion:

Different chemicals and cultural weed control treatments improved yield and yield contributing characters significantly. Significant improvement like pod yield and 1000 seeds weight also might have helped in attaining better pod yield in the black gram. It can be stated that the highest percent increased in yield over control was observed in treatment with pre-emergence application of pendimethalin @ 1.5 kg/ha (10.05) except weed free treatment over weedy check and superior as well as economical and feasible among all the treatments.

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