International Journal of Agricultural Sciences ☞ DOI:10.15740/HAS/IJAS/17-AAEBSSD/121-125
Volume 17 | AAEBSSD | 2021 | 121-125 ■ ISSN : 0973-130X Visit us : www.researchjournal.co.in

RESEARCH PAPER

Efficacy of chemical and cultural weed management practices on nutrient uptake in black gram (*Phaseolus mungo*)

Kavita D. Rajput*, J. P. Bholane, A.S. Latkar **and** V.M. Bhale
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) India
(Email: rajput.kavi13@rediffmail.com)

Abstract : The results of the field experiment carried out during kharif season of 2010 at agronomy department farm, Dr.P.D.K.V.,Akola revealed that N,P,K uptake by black gram (*Phaseolus mungoL.*) and weeds were significantly higher under weed free and weedy check treatments among all of the weed control treatments. The experiment was laid out in Randomized Block Design replicated three times with thirteen treatments, in that chemical and cultural treatments were compared with weedy check and weed free control. Herbicide application in general and pre-emergence application of pendimethalin @1.5kg/ha in particular reduced the nutrients removal by weeds and enhanced the nutrient uptake by the crop followed by cultural practices of two hand weeding at 15 & 30 days after sowing. The pre-emergence application of pendimethalin in @ 1.5 kg/ha recorded highest nutrient uptake in grain (34.92, 6.50, 34.16 NPK kg/ha resp.) and strover (63.26, 10.60, 57.60 NPK kg/ha resp.) among all the weed control treatment except weed free treatment. The crude protein content of grain was the highest with pre-emergence application of pendimethalin @ 1.5 kg/ha (21.65) followed by pendimethalin @ 1.0 kg/ha (21.55).

Key Words : Chemical, Cultural weed, Management practices, Nutrient uptake, Black gram

View Point Article : Rajput, Kavita D., Bholane, J.P., Latkar, A.S. and Bhale, V.M. (2021). Efficacy of chemical and cultural weed management practices on nutrient uptake in black gram (*Phaseolus mungo*).*Internat. J. agric. Sci.*, **17** (AAEBSSD) : 121-125, **DOI:10.15740/HAS/IJAS/17-AAEBSSD/121-125.**

Article History : Received : 13.07.2021; **Revised :** 16.07.2021; **Accepted :** 20.07.2021

INTRODUCTION

Black gram (*Phaseolus mungo L.*) is an important pulse crop and included in many of the crop rotations followed in India , is exposed to severe competition from weeds as they extend a formidable competition for soil nutrients resulting in a serious handicap to the young crop in its growth and development. Weeds which are efficient competitors deprive crop for its major requirements of nutrients, moisture, light and space,there by create adverse environment which results in poor crop growth and yield. Moody (1981) reported that weed usually grow faster than crop plants and thus absorb the nutrients earlier resulting in lack of nutrients for growth of crop plants. Rajan and Sankaran (1974) reported that weeds when not checked removed 9 times more of N, 10 times more of P and 7 times more for K than the maize crop at early stages. Yadav et.al (1985) found that in mung bean the weeds when allowed to compete till crop harvest, removed 120 kg N, 15.9 kg P_2O_5 and 114 kg K_2O per hectare. Not much work has been carried out regarding the nutrient uptake by weeds and crop particularly in

* Author for correspondence :

black gram, a short duration pulse and hence , the present study was therefore undertaken to find out the effect of weed management practices on the availability of nutrients and crude protein content in the rainfed black gram crop and also the removal of nutrients by associated weeds.

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 P_2O_5 and 322.94 kg/ha available K_2O. 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 (Table 1).

At the time of harvest, weeds and five plant samples were collected in a randomly selected area in each plot and dry weight were recorded. The yields of grain and stover were also taken.The collected plant and weed samples were processed and N,P and K contents of the samples as well as crude protein content of grain were analysed using standard procedures. The uptake values were obtained by multiplying the content with dry matter production. The data for one season analysed statistically. For calculating Weed dry matter counted weeds by using quadrate of 0.5 m as monocot and dicot weeds were first air dried and then kept in an oven at 65°C till the constant dry weight was obtained and then periodically taken observations were later converted to per square meter basis.

Nutrient Uptake (kg ha^{-1}):

The plant removed for dry matter study at harvest were used for estimation of nitrogen, phosphorus and potassium content. These plants were dried, grinded and nitrogen, phosphorus and potassium content in plant and seed were estimated by micro Kjeldahl's method (Anonymous, 1980), colorimetric and flame photometer, respectively.The total nutrient uptake in kg ha^{-1} was calculated by using following formula:

$$\text{Nutrient uptake (kg ha}^{-1}) = \frac{\text{Yield x Nutrient content}}{100}$$

Proteincontent(%)andproteinyield(kgha^{-1})

The nitrogen content in seed was multiplied by 6.25 to find out the protein content and from protein percentage and seed yield, the protein yield q ha^{-1} was worked out by using following formula:

$$\text{Protein yield (q ha}^{-1}) = \frac{\text{Seed yield (q ha}^{-1}) \text{ x Protein content (\%)}}{100}$$

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 (15.98) and lowest in weed free (0.47) 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) 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 (3.78) than rest of the treatments as compared to the weedy check (15.98) 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-ethly and fenoxyprop-p-ethly similar observations were recorded by Mishra and Bhanu (2006) (Table 2).

Nutrient uptake by black gram :

Application of herbicides in general showed less nutrient removal by weeds as compared to weedy check. Among all the weed control treatments, weed free treatment resulted in highest (110.13,19.79 and 106.47 kg/ha of N,P and K) uptake of N,P and K nutrients and weedy check treatment recorded significantly lowest (41.92,4.58 and 27.44 kg/ha of N,P and K) nutrients by crop than the rest of the weed control treatments. Among the herbicidal treatments, pre-emergence application of pendimethalin @ 1.5 kg/ha significantly recorded maximum removal of NPK by black gram (98.18,17.10 and 91.76 kg/ha of N,P and K) which was closely followed by cultural practices of two hand weeding at

15 and 30 days after sowing (92.33,16.06 and 87.48 kg/ha of N,P and K) among treatments as compared to the weedy check treatment. The probable reason for these results might be due to the selectivity for pendimethalin to the crop and resulted in weed free environment that existed upto harvest period may be the reason for the increased nutrient uptake by crop in these treatments (Table 1).

Pre-emergence application of Imazethapyr @ 0.050 kg/ha computed lower uptake (60.70,8.33 and 50.32 kg/ha of N,P and K) of nutrients by the black gram crop due to its phyto-toxic effect to crop and results in ineffectiveness in controlling annual and broad leaved weeds among all the weed control treatments expect weedy check treatment (Table 1).

Pre-emergence application of pendimethalin, fenoxyprop-p-ethly and the farmers practices of hand weeding twice checked the nutrient depletion by the weeds significantly upto harvest of the crop and the loss of N,P and K from these treatments were only marginal and hence the present results.

Nutrient removal by weeds:

Significantly higher removal of N,P and K nutrients by weeds were observed under weedy check treatment and removed 25.60, 9.0 and 20.10 kg/ha of N,P and K respectively while the weed free treatment at the same time could take 3.90, 2.50 and 3.00 kg/ha of the

Table 1: Effect of chemical and cultural weed control treatments on uptake of N, P and K by crop and weeds

Treatments	Nutrient uptake by seed(kg/ha)			Nutrient uptake by straw (kg/ha)			Total nutrient uptake byplant (kg/ha)			Nutrient uptake by weed		
	N	P	K	N	P	K	N	P	K	N (kg/ha)	P (kg/ha)	K (kg/ha)
T_1 - Weed free	43.95	8.37	43.45	66.18	11.42	63.01	110.13	19.79	106.47	3.90	2.50	3.00
T_2 - Weedy check	15.81	1.35	7.50	26.11	3.23	19.94	41.92	4.58	27.44	25.60	9.00	20.10
T_3 - 2 Hand weeding (15 fb 30 DAS)	32.24	6.06	30.00	60.08	10.00	57.48	92.33	16.06	87.48	7.49	5.80	5.88
T_4 - 2 Hoeing (10 fb 20 DAS)	21.45	3.69	20.45	44.90	8.00	39.95	66.35	11.69	60.40	10.20	9.41	9.39
T_5 - Imazethapyr @ 50 g ha^{-1} PE (At sowing)	19.07	2.39	15.82	41.63	5.94	34.51	60.70	8.33	50.32	16.00	11.00	10.50
T_6 - Imazethapyr @ 75 g ha^{-1} PE (At sowing)	27.21	3.55	21.00	47.21	7.22	39.35	74.42	10.77	60.35	13.33	10.00	9.40
T_7 - Pendimethalin @ 1000 g ha^{-1} PE (At sowing)	34.13	5.95	28.19	57.49	9.35	53.12	91.61	15.30	81.31	7.90	6.45	6.70
T_8 - Pendimethalin @ 1500 g ha^{-1} PE (At sowing)	34.92	6.50	34.16	63.26	10.60	57.60	98.18	17.10	91.76	6.55	5.33	5.30
T_9 - Fenoxyprop-p-ethyl @ 100 g ha^{-1} POE (15 DAS)	29.41	4.45	23.13	52.94	8.13	43.16	82.36	12.58	66.29	10.00	8.00	8.13
T_{10} - Fenoxyprop-p-ethyl @ 125 g ha^{-1} POE (15 DAS)	33.60	5.73	26.77	57.51	9.37	47.80	91.11	15.10	74.57	8.35	6.48	7.20
T_{11} - Quizalofop-p-ethyl @ 50 g ha^{-1} POE (15 DAS)	23.91	2.97	20.28	41.15	5.59	37.98	65.06	8.56	55.26	17.10	12.13	12.00
T_{12} – Quizalofop-p-ethyl @ 75 g ha^{-1} POE (15 DAS)	28.21	3.85	22.93	50.09	7.27	40.77	78.31	11.12	63.70	14.30	10.37	10.10
T_{13} - Imazethapyr @ 50 g ha^{-1} PE fb Quizalofop-p-ethyl @ 50 g ha^{-1} POE (At sowing fb 15 DAS)	25.63	3.20	21.37	43.77	5.85	36.38	69.40	9.05	57.74	14.98	11.80	11.40
SE (m)±	2.85	0.44	1.95	4.18	0.65	2.71	4.11	0.73	3.04	0.58	0.55	0.52
C.D. at 5%	8.32	1.27	5.10	12.19	1.89	7.91	11.99	2.13	8.87	1.69	1.59	1.52
G.M.	28.43	4.47	24.24	50.18	7.84	43.70	78.61	12.31	67.93	11.98	8.33	9.16

corresponding nutrients. This showed that weeds removed enormus amount of N, P and K as compared to the crop for its growth in early stages and there by extended a heavy competition to the crop. Similar findings were reported by Guneyli *et.al.*(1969) who stated that weeds which emerge with crop absorb fertilizer (nutrients) faster and in relatively larger amount than crop thereby depriving the crop of available nutrients and resulting in poor yield. All the weed management practices significantly minimized the nutrient removal by weeds as compared to weedy check treatment. Minimum removal of 6.55, 5.33 and 5.36 kg/ha of N,P and K respectively was observed in pre-emergence application of pendimethalin @ 1.5 kg/ha which was closely followed by the cultural practices of two hand weeding at 15 and 30 days after sowing (i.e 7.49, 5.80 and 5.88 kg/ha of N, P and K) than the rest of the weed control treatments as compared to the weedy check treatment (Table 1).

Similar findings were also reported by Rammorthy (1991), who observed greater removal of nutrients by weeds under unweeded check treatment of the total nutrient removal, weeds shared more under weedy check treatment, which led to reduced grain yield of crop. Considerable variation in nutrient removal by weed species was observed under different weed management practices. Post-emergence application (15 DAS) of quizalofop-p-ethly @ 0.05kg/ha recorded significantly maximum removal (17.10, 12.13 and 12.00 kg/ha of N, P and K) of nutrients by weed than the rest of the weed control treatments compared to weedy check treatment. Such higher nutrient depletion was due to its ineffectiveness in controlling the annual grassy and broad leaved weeds and higher dry matter accumulation because of poor crop growth due to failure of rains in 2010 (Table 1).

Grain yield and crude protein content:

The grain and stover yield, crude protein content and production due to various weed control treatments are presented in Table 2. The maximum grain yield was recorded in pre-emergence application of pendimethalin @ 1.5 kg/ha treatment closely followed by pendimethalin @ 1.0 kg/ha as PE application and these treatments were on par the rest of the weed control treatments as compared to the weedy check treatment. Among all the weed control treatments, weeds free treatment recorded highest grain yield (12.67 q/ha) and lowest grain yield (5.14 q /ha) was observed in weedy check plot. The increased yield with pendimethalin, fenoxyprop-p-ethyl and two hand weedings at 15 and 30 days after sowing treatments could be due to the efficient weed control which also resulted in higher nutrient uptake by the crop.

Table 2 : Effect of weed control practices on dry matter production of weed, yield and protein content of black gram

Treatments	Weed dry weight ($g\ m^{-2}$) At Harvest	Grain yield ($q\ ha^{-1}$)	Straw yield ($q\ ha^{-1}$)	Protein content (%)	Protein production ($kg\ ha^{-1}$)
T_1 - Weed free	0.47	12.67	39.38	21.75	274.70
T_2 - Weedy check	15.98	5.14	26.91	19.24	98.79
2 Hand weeding (15 fb 30 DAS)	3.78	9.31	36.40	21.52	201.51
- 2 Hoeing (10 fb 20 DAS)	5.99	6.81	30.97	19.67	134.07
- Imazethapyr @ 50 g ha^{-1} PE (At sowing)	5.00	6.11	29.52	19.35	119.17
- Imazethapyr @ 75 g ha^{-1} PE (At sowing)	3.95	8.28	32.78	20.55	170.07
- Pendimethalin @ 1000 g ha^{-1} PE (At sowing)	3.05	9.97	36.39	21.55	213.28
- Pendimethalin @ 1500 g ha^{-1} PE (At sowing)	2.01	10.05	38.11	21.65	218.25
- Fenoxyprop-p-ethyl @ 100 g ha^{-1} POE (15 DAS)	3.88	8.83	35.31	20.79	183.84
- Fenoxyprop-p-ethyl @ 125 g ha^{-1} POE (15 DAS)	3.15	9.86	37.32	21.45	210.02
- Quizalofop-p-ethyl @ 50 g ha^{-1} POE (15 DAS)	10.02	7.78	29.39	19.40	149.42
– Quizalofop-p-ethyl @ 75 g ha^{-1} POE (15 DAS)	4.95	8.55	34.56	20.69	176.33
- Imazethapyr @ 50 g ha^{-1} PE fb Quizalofop-p-ethyl @ 50 g ha^{-1} POE (At sowing fb 15 DAS)	8.80	8.22	30.83	19.42	160.18
SE (m)±	0.45	0.86	2.13	0.76	17.81
C.D. at 5%	1.32	2.52	6.21	-	51.98
G.M.	5.46	8.58	33.68	20.54	177.67

The stover yield was the highest in weed free treatment (39.38 q/ha) closely followed by Pendimethalin applied plot at higher rate of application and were significantly superior to the rest. The crude protein content and production were the highest in weed free treatment (21.75% and 274.70 kg/ha) and lowest in weedy check treatment (19.24% and 98.79 kg/ha) among all the weed control treatments respectively. Among the rest of the weed control treatments, pre-emergence application of pendimethalin @1.0 kg/ha closely followed by @ 1.5 kg/ha recorded significantly maximum crude protein content and production *i.e* 21.65%, 21.55% and 218.25 kg/ha, 213.28 kg/ha); however the same were on par on the rest of the weed control treatments (Table 2). The pre-emergence application of imazethapyr @ 0.050 kg/ha recorded significantly minimum crude protein content and production (19.35% and 119.17 kg/ha) than the rest of the weed control treatment as compared to the weed free treatment due to its phyto-toxic effect to crop. The reason being that the crude protein content is mostly a varietal charater and any agronomic manipulation will only be marginal however the crude protein production differed significantly due to different weed control practices and which resulted in different dry matter production.

The uptake of NPK by crop and weeds could be mainly attributed to the extent of their dry matter production. From the above results it is clear that weeds remove a large quantity of nutrients when compared to the crop. Pre-emergence application of pendimethalin @1.5 kg/ha was found to be highly selective and promotes nutrient uptake and consequent increase in yield, better weed control as well poor nutrient removal by weeds. Among herbicidal treatments pendimethalin is superior as well as effective and in cultural practices two hand weedings at 15 and 30 days after sowing is economical and effective treatment with regard to yield and other parameters.

Conclusion:

Among various chemical and cultural weed control practices higher nutrient uptake (N,P and K) by crop was recorded by application of Pendimethalin at 1500 g ha^{-1} PE (98.18, 17.10 and 91.76), followed by two hand weeding at 15 DAS and 30 DAS (92.33, 16.06 and 87.48). The crude protein content of grain was the highest with pre-emergence application of pendimethalin @ 1.5 kg/ha (21.65) followed by pendimethalin @ 1.0 kg/ha (21.55).

REFERENCES

Anonymous (1980). *Official method for analysis of association of Agril.Chemistry.* 13th Edn. Washington, D.C.

Guneyli, E. O.,Burnside, C. and Nordouist, P.T. (1969). Influence of seedling characteristics on weed competitive ability of sorghum hybrids and inbred lines. *Crop Sci.,* **9** : 713- 717.

Mishra, J. S. and Bhanu, C. (2006). Effect of herbicides on weeds, nodulation and growth of *rhizobium* in summer black gram. *Indian J. Weed Sci.*, **38** (1&2) : 150-153.

Moody, K. (1981). Weed fertilizer interaction in the *IRRI Research Paper Series* . November No.64.

Rajan, A.V. and Sankaran, S. (1974). Studies on crop weed competition for nutrient and its effect on grain yield of maize (Var - Ganga -5). *Madras Agric. J.*, **61**(8) : 413-416.

Rammorthy, K. (1991). Effect of integrated weed management on nutrient uptake by upland rice and associated weeds . *Indian Journal of Agronomy,* **32** (2):213-217 .

Yadav, S.K., Bhan,V.M. and Kumar, Ashok (1985). Nutrients uptake by Mung bean and weeds in relation to herbicides. *Indian J. Weed Sci.,* **17** (1): 1-5.