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RESEARCH ARTICLE :

Herbicidal effect of Propaquizafop, Imazethapyr and Pendimethalin on Morpho- Physiological structural components of black gram (*Vigna mungo* L.)

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SUMMARY : A field experiment was conducted at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during kharif 2014-15 to asses the effect of different herbicides on morpho-physiological structural component of black gram (*Vigna mungo* L.). The experiment was laid out in randomized block design (RBD) with three replications and nine treatments included different herbicides *i.e.* Propaquizafop, Imazethapyr and Pendimethain in different concentration which significantly affected the physiological parameters, growth determinants and yield attributing traits. It was concluded that post emergence herbicide application as combination of propaquizafop+ imazethapyr (56+85 to 53+80 g/ha) was found more effective to control weeds after the hand weeding in black gram.

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KEY WORDS :
Propaquizafop, Imazethapyr, Pendimethalin

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BACKGROUND AND OBJECTIVES

Black gram (*Vigna mungo* L.) belongs to family fabaceae is one of the important *kharif* pulse crops grown in tropical and sub-tropical climate and throughout the India, next to green gram. It is sown with the onset of rainy season. Simultaneous emergence and rapid growth of weed competition for light, moisture, space and nutrients. It have ideal temperature range between 25 C to 30 C. It is consumed in the form of 'dal' (whole or split, husked or un-husked). In India black gram cultivated on 3.11 million hectare area with total production of 1.90 million tonnes and average productivity of 642 kg/ha. (Anonymous, 2012). In Madhya Pradesh it is one of the leading pulses crop and occupied area of 0.59 million hectares, with the production and productivity of 0.21 million tonnes and 374 kg/hectares.

Among the several factors limiting the crop yields, weeds by their manifold harmful effects, rank as prime enemies. Weeds compete with crop in initial stages for limited essential resources and seriously depress the crop growth and developmen. Imazethapyr 10% SL is the herbicide of the Imidazolinone group used for selective broadleaf and grass

weeds control in crop.It is a systemic herbicide that is rapidly absorbed by the roots and the leaves and translocated to the apical meristem. Propaquizafop 10% EC is a herbicide of the Arylophenoxy propionates family. It is a systemic herbicide, which is quickly absorbed by the leaves and translocated from foliage to the growing points of the leaves and roots of the sprayed weeds. Plant height was altered due to application of different herbicides compared to un-weeded control. At 30 and 40 DAS, application of EPOE (Early post emergence) Imazethapyr at 100g/ha registered taller plants followed by EPOE Imazethapyr at 200g/ha.

Among the herbicide treatments, application with Pendimethalin has recorded significant increase in total dry matter content followed by Imazethepyr as compared to control. Significantly lower TDM was observed in control at all the stages.(Amaregouda *et al.*,2013). Application of Imazethapyr + Quizalofop treatments providing favourable environment for crop with controlling weeds, which reduces the competition of crop with weeds for space, air, sunlight, moisture and nutrients. Significantly higher number of pods and seed weight per plant. (Prachand *et al.*, 2014).

The only alternative that needs to be explored is the use of post-emergence herbicides Imazethapyr is very effective post emergence herbicides for controlling weeds in kharif pulses including black gram. But, its weed control efficacy has not been tested in combination with Propaquizafop for wide spectrum weed control in urdbean in different parts of the country including Kymore Plateau and Satpura Hill Zone of Madhya Pradesh. Hence, the present investigation was carried out to find out the optimum level of herbicides for efficient growth physiological parameters, yield attributes and yield of black gram.

RESOURCES AND METHODS

The present experiment was conducted at, research Farm Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during Kharif 2014. The experiment was laid out in randomized block design (RBD) with three replications and nine treatments *viz.* T_1 (Propaquizafop + Imazethapyr 47+ 70 g/ha), T_2 (Propaquizafop + Imazethapyr 50 +75 g/ha), T_3 (Propaquizafop+ Imazethapyr 53+ 80 g/ha), T_4 (Propaquizafop + Imazethapyr 56+ 85 g/ha), T_5 (Propaquizafop 100 g/ha), T_6 (Imazethapyr 100 g/ha), T_7(Pendimethalin 1500 g/ha), T_8 (Hand-weeding) twice at 20 and 40 DAS, T_9 (Weedy-Check means control).

Morpho-physiological structural observation were recorded :

Plant population m^{-2} row length was recorded from five randomly selected spots in each plot at 15 DAS and at harvest, Plant height (cm), Number of leaves $plant^{-1}$ and Number of branches $plant^{-1}$ was measured in 30, 45, 60 DAS and at harvest.Then the mean was computed. Number of nodules $plant^{-1}$The total number of nodules was counted in five tagged plant and their average was worked out.

Number of pods $plant^{-}$, Number of seeds pod^{-1} and Number of nodes $plant^{-1}$ was counted from five tagged plants from each plot of each replication at maturity and then mean was computed.Number of effective nodes $pod^{-1,}$Number of nodules $plant^{-1}$,Nodule weight (g) $plant^{-1,}$Root length (cm) $plant^{-1,}$Root weight (g) $plant^{-1,}$Number of root nodules $plant^{-1}$ measured from five tagged plants at maturity in each plot and the mean was calculated.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads :

Morphological structural components of yields and yield attributes:

Plant Height (cm) was varied significantly due to the black gram at different stages under the effect of different herbicides. at 30 DAS Significantly maximum plant height was exhibited by hand weeded plot T_8 (18.67) at par with T_6 (18.67),where the minimum height observed in weedy check plot T_1 (18.30). at 45 DAS Significantly maximum plant height was exhibited by hand weeded plot T_8 (30.53) and minimum height observed in weedy check plot T_9 (21.70.) at 60 DAS Significantly maximum plant height was exhibited by hand weeded plot T_8 (37.07) and minimum height observed in weedy check plot T_9 (25.73). at harvest Significantly maximum plant height was exhibited by hand weeded plotT_8 (36.23) followed by T_4 (33.03) at par with T_3 (32.82),and minimum height observed in weedy check plot T_9 (24.43) (Table no 1).

Number of branches $plant^{-1}$was varied under the effect of different herbicides. At 30 DAS Significantly

maximum branches was exhibited by hand weeded plot T_8 (1.57),where the minimum branches observed in weedy check plot T_9 (1.22).at 45 DAS Significantly maximum plant branches was exhibited by hand weeded plot T_8 (3.63) where the minimum branches observed in weedy check plot T_9 (2.40). at 60 DAS Significantly maximum branches was exhibited by hand weeded plotT_8 (4.60) at par with T_4 (3.93), where the minimum branches observed in weedy check plot T_9 (3.10) (Table no 1).

Number of nodes plant^{-1}was varied significantly due to the black gram treatments at maturity under the effect of herbicides. Significantly maximum number of nodes per plant was expressed in hand weeded plot T_8 (10.55) at par with T_4 (9.47) followed by T_3 (8.03) at par with T_7 (7.95) and minimum number of nodes was observed in weedy check plot T_9 (5.84) (Table no 2).Number of effective nodes plant^{-1} was varied significantly under the effect of different herbicide. Significantly maximum no. of effective nodes was estimated in hand weeded plotT_8 (7.14) at par with T_4 (6.86), where as the lower no. of effective nodes was noted in weedy check plot T_9 (3.91) as compared to all other treatments (Table no 2). No of nodes plant^{-1} Nodules weight was varied significantly due to the black gram treatments at different stages under the effect of different herbicides, at 45 DAS Significantly highest no of nodules per plant was noted in weedy checkT_9 (44.67). at 60 DAS Significantly highest number of nodules per plant was observed in hand weeded plot T_8 (108.38) and poorest number of nodules per plant was noted in weedy check plot T_9 (77.60) (Table no 2).

Nodules dry weight (g) plant^{-1} was at 45 DAS Significantly highest nodule dry weight per plant was observed in hand weeded plot T_8 (0.22) while poorest nodules dry weight plant was noted in weedy check T_9

Table 1 : Effect of different herbicide on Plant population / m$^{-2,}$ Plant height (cm), Number of branches/ plant^{-1} in branches of black gram

Treatments	Plant population / m^{-2}		Plant height (cm)				Number of branches/ plant^{-1}		
	30 DAS	At harvest	30 DAS	45 DAS	60 DAS	At harvest	30 DAS	45DAS	60 DAS
T_1	33.17	33.13	18.30	23.17	27.90	26.83	1.35	2.70	3.67
T_2	33.33	33.20	18.33	25.13	29.53	28.03	1.34	2.97	3.63
T_3	33.40	33.33	18.63	26.93	33.77	32.83	1.40	3.07	3.80
T_4	33.47	33.40	18.60	27.27	34.40	33.03	1.45	3.27	3.93
T_5	33.20	32.47	18.33	23.47	27.63	26.50	1.33	2.47	3.20
T_6	33.80	33.23	18.67	23.13	28.17	26.67	1.39	2.73	3.67
T_7	33.27	33.17	18.53	23.47	28.70	27.87	1.36	2.60	3.47
T_8	33.87	33.77	18.67	30.53	37.07	36.23	1.57	3.63	4.60
T_9	33.27	33.17	18.37	21.70	25.73	24.43	1.22	2.40	3.10
S.E. ±	0.30	0.33	0.58	0.85	0.85	0.90	0.04	0.20	0.24
C.D. (P=0.05)	NS	NS	NS	2.57	2.55	2.17	0.13	0.61	0.73

NS=Non-significant

Table 2 : Effect of different herbicides on and Number of nodes plant^{-1}, Number of Effective nodes plant^{-1},Nodules plant^{-1} and Nodules dry weight plant^{-1}(mg) in black gram

Treatments	No. of nodes plant^{-1}	No. of effective nodes plant^{-1}	Nodules plant^{-1}		Nodules dry weight plant^{-1}	
			45 DAS	60 DAS	45 DAS	60 DAS
T_1	6.25	4.44	60.58	87.73	0.09	0.24
T_2	7.33	5.77	68.00	90.33	0.08	0.22
T_3	8.03	6.36	70.47	98.78	0.17	0.26
T_4	9.47	6.86	84.84	100.06	0.20	0.30
T_5	7.13	5.46	67.48	87.27	0.12	0.23
T_6	7.64	5.35	55.27	85.73	0.11	0.22
T_7	7.95	5.99	59.47	79.87	0.11	0.21
T_8	10.55	7.14	97.81	108.38	0.22	0.31
T_9	5.84	3.91	44.67	77.60	0.07	0.21
S.E. ±	0.42	0.33	4.39	3.74	0.01	0.01
C.D. (P=0.05)	1.28	1.37	13.01	9.16	0.03	0.04

(0.07). at 60 DAS Significantly highest nodules dry weight per plant was observed in hand weeded plot T_8 (0.31) at par with T_4 (0.30) followed by T_3 (0.26) and T_1 (0.24) while poorest number of nodules per plant was noted in weedy check plotT_9 (0.19)(Table no 2).Root length (cm) plant^{-1} was at 45 DAS Significantly highest length of root was observed in hand weeded plot T_8(20.9) followed by T_4 (19.37) at par with T_3 (24.04) while poorest root length per plant was noted in weedy check plot T_9 (15.03). at 60 DAS Significantly highest root length was observed in hand weeded plot T_8(25.05) followed by T_4 (24.41) while poorest root length was noted in weedy check plotT_9 (15.38) (Table no 3),Root weight (g) plant^{-1} was at 45 DAS Significantly highest root weight per plant was observed in hand weeded plotT_8 (0.89) while poorest root weight per plant was noted in weedy check plot T_9 (0.28).at 60 DAS Significantly highest root weight per plant was observed in hand weeded plot T_8 (1.10) at par with T_4 (1.04) while poorest root weight was noted in weedy check plot T_9 (0.50) (Table no 3).

Number of pods plant^{-1} varied significantly due to different doses of herbicides on black gram. Significantly highest number of pods per plant was observed in hand weeded plot T_8 (21.20) at par with T_4 (20.50), while poorest number of pods per plant was noted in weedy check plot T_9 (11.20) (Table no 3). Application of Imazethapyr + Quizalofop as PoE (Post emergence) was found to be more efficient to control monocot and dicot weeds in soybean which recorded lowest weed density, dry matter and weed index. It showed superiority in respect of various growth and yield attributes (*viz.* plant height, dry matter, number of pods per plant, 100 seed weight and seed yield per plant these findings were also confirmed by Prachand *et al.*(2014).

Pod length (mm) plant^{-1} Pod length was varied significantly due to different doses of herbicides. Significantly maximum pod length was observed in hand weeded plot T_8 (47.47) at par with T_4 (47.25), whereas

Table 3 : Effect of different herbicides on the number of Root length, Root weight, pod, pod length, pod width and pod weight in the black gram

Treatments	Root length (cm)		Root weight (mg)		No of Pods plant^{-1}	Pod length (mm)	Pod width (mm)	Pod weight (g)
	45 DAS	60DAS	45 DAS	60 DAS				
T_1	17.74	16.74	0.29	0.58	18.80	37.71	13.80	2.201
T_2	17.40	17.22	0.45	0.79	19.23	42.60	14.27	3.229
T_3	19.05	24.04	0.58	0.94	20.20	46.50	16.22	3.261
T_4	19.37	24.41	0.59	1.04	20.50	47.25	17.49	3.279
T_5	15.74	18.37	0.45	0.81	17.40	41.92	15.48	2.247
T_6	17.05	19.04	0.44	0.69	17.63	44.75	16.03	3.241
T_7	16.06	17.72	0.55	0.77	16.77	43.02	15.28	2.259
T_8	20.9	25.05	0.89	1.10	21.20	47.47	17.80	3.290
T_9	15.03	15.38	0.25	0.50	11.20	34.88	13.04	2.191
S.E. ±	0.22	0.22	0.03	0.02	0.66	0.40	0.03	0.004
C.D. (P=0.05)	0.67	0.65	0.09	0.08	1.98	1.20	0.09	0.018

Table 4 : Effect of herbicides on biological yield, seed yield (kg/ha.), harvest index (%) and seed index

Treatments	Biological yield (g/plant)	Biological yield (kg/ha.)	Seed yield (g/plant)	Seed yield(kg/ha)	Harvest Index (%)	Seed Index (g)
T_1	14.39	14390	3.60	3600	25.03	3.95
T_2	15.26	15260	4.00	4000	26.22	4.01
T_3	16.37	16370	4.47	4470	27.35	4.20
T_4	16.59	16590	4.62	4620	27.84	4.21
T_5	13.37	13370	3.27	3270	24.51	3.90
T_6	14.45	14450	3.60	3600	24.93	4.09
T_7	12.46	12460	3.15	3150	25.33	3.94
T_8	16.94	16940	4.77	4770	28.19	4.22
T_9	8.36	8360	1.88	1880	22.50	3.77
S.E. ±	0.078	780	0.061	610	0.01	0.03
C.D. (P=0.05)	0.236	2360	0.185	1850	0.02	0.10

minimum pod length was noted in weedy check plot T_9 (34.88) (Table no 3).Pod width (mm) plant^{-1} Pod width was varied significantly due to the black gram treatments under the different doses of herbicide. Significantly highest pod width was exhibited by T_8 (17.80) while lowest pod width was noted in T_9 (13.04) (Table no 3).

Pod weight (g) plant^{-1} was varied significantly due to different doses of herbicide,The significantly maximum pod weight was noted in hand weeded plot T_8 (3.290), while weedy check plot T_9 (2.191) observed least pod weight(Table no 3).

Seed yield (g) plant^{-1} was varied significantly due to different doses of herbicides on black gram. Significantly highest seed yield per plant was produced by hand weeded plot T_8 (4.77) it was at par with T_4 (4.62) while lowest seed yield was noted in weedy check plot T_9 (1.88).Seed yield (kg/ha) was varied significantly due to effect of herbicide on black gram (Table no 4). Significantly highest seed yield was produced by T_8 (4770) followed by T_4 (4620), T_3 (4470), T_2 (4000), T_6 (3600), T_1 (3600), T_5 (3270), T_7 (3150), while lowest seed yield was noted in T_9 (1880) (Table no 4) The yield was maximum in hand weeding twice similar results were also reported by Bhillore *et al*. (1999).

Biological yield (g) plant^{1} was varied significantly due to effect of herbicide on black gram. Significantly maximum biological yield per plant was estimated in hand weeded plot T_8 (16.94) where as minimum biological yield per plant was noted in weedy check plot T_9 (8.36) (Table no 4). Biological yield (kg/ha) was maximum estimated in T_8 (16940), T_4 (16590) T_3 (16370), T_2 (15260), T_6 (14450) T_1 (14390), T_5 (13370), T_7 (12460) where as minimum biological yield was noted in T_1 (8360) (Table no 4). Seed index (g) was maximum recorded in hand weeded plot T_8 (4.22) at par with T_4 (4.21) and T_3 (4.20) while weedy check plot T_9 (3.77) had lowest seed index, Weed control treatments had positive influence on the dry matter production of soybean at different growth stages at 30 DAS, imazethapyr at 100 g/ha recorded higher dry matter production Similar results were also reported by Meena, *et al*.(2011). (Table no 4). Harvest index (%) was varied significantly due to the effect of herbicide on black gram. Significantly highest harvest index was observed in hand weeded plot T_8 (28.19while poorest harvest index was noted in weedy check plot T_9 (22.50) (Table no 4).

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REFERENCES

Bhillore SD, Joshi OP and Ramesh A. 1999. Herbicides effect on nodulation yield and weed control in soybean. Indian Journal of Agricultural Science 69 (5): 329-331.

Kumar V, Singh J and Srivastava CP. 2014. Genetic variability, correlation and path analysis based on seed yield attributes traits in diverse genotypes of pea (Pisum sativum L.). Environment and Ecology 32 (3A): 1019-1024

Meena D.S., Baldev Ram, Chaman Jadon and J. P. Tetarwal.2011.Efficacy of imazethapyr on weed management in soybean.Indian Journal of Weed Science 43 (3&4) : 169-171

Prachand S., Kubde K.J. and Bankar S. 2014. American-Eurasian J. Agric. & Environ. Sci., 14 (8): 698-701, 2014 ISSN 1818-6769 © IDOSI Publications,DOI: 10.5829/idosi.aejaes.2014.14.08.12376.