

Effect of Foliar Application of Plant Growth Regulators and Nutrients on Seed Yield and Quality Attributes of Mungbean (*Vigna radiata* (L) Wilczek)

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ABSTRACT Studies were conducted to evaluate the effect of plant growth regulators and nutrients (urea) on seed yield and seed quality in mungbean (*Vigna radiata* (L) Wilczek). Among different treatments, spraying of NAA (25ppm) recorded significantly higher seed yield by 21-22 per cent than control through increased flower production (18%), clusters per plant (24%), pod setting percentage (31%) and pods per plant (55%). The variety PM-9339 gave maximum seed yield, which was 11-12 per cent higher than Kop. 1. The higher seed yield was most probably due to more number of flowers per plant, pods/plant, seed yield/plant and 100-seed yield.

Keywords : Green gram, plant growth regulators, germination, seedling vigour

Among the pulses grown in India, mungbean ranks third after chickpea and pigeon pea. In India, the area under mungbean is about 30.4 lakhs ha producing 8.8 lakh tonnes with average productivity of 291 kg/ha [1]. The mungbean is grown on marginal lands, in low rainfall areas, under poor management and poor crop husbandry resulting poor yield. Among the various factors responsible for increasing per hectare yield, use of fertilizers, growing high yielding varieties and proper plant protection measures are the most important. In fact, achievement of higher yields, use of plant growth regulators and nutrients has also been found to be promising.

The plant growth regulators in general, help to increase the number of flowers on the plant when applied at the time of flowering [2]. The flower and pod drop may be reduced to some extent by spraying various growth regulators on foliage [3]. Different legumes differ in their requirement of hormones for reducing flower abscission and increasing biomass production and seed yield. In legumes, the plant growth regulators help in various ways. Therefore, the present study was undertaken to study the effect of foliar application of growth substances like NAA,

GA₃, ethrel and urea on seed yield and seed quality of mungbean.

MATERIALS AND METHODS

The pure seeds of mungbean cultivars viz, PM-9339 and Kop 1 were sown during Kharif 2000 season in factorial randomized block design (FRBD) in four replications. Each plot had 4.0 m x 2.4 m gross and 3.6 m x 1.8 m net plot size. The row spacing was 30 cm and plant to plant distance was 10 cm. The fertilizers were applied uniformly before sowing as basal dose of 25kg N and 50kg P₂O₅ per ha. The experimental crop was sprayed with different plant growth regulators and nutrients viz. NAA (25 ppm), GA₃ (50 ppm), ethrel (50ppm) and Urea (2%), at 30 and 40 days after sowing (DAS). Observations on randomly selected five plants from each plot in each replication were recorded on days to flower, no. of flowers/plant, pod setting percentage, no. of pods/plant, seed yield/plant and seed yield/ha. After harvesting and threshing, the data on seed quality parameters viz. 100-seed wt., germination percentage and seedling vigour index were recorded. The germination percentage was

* A part of M.Sc (Agri.) thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri.

tested according to ISTA rules [4] and seedling vigour was determined by using the formula given by Abdul-Baki and Anderson [5].

RESULTS AND DISCUSSION

The data presented in Table 1 indicated that mean differences for all characters studied were significant due to spraying of plant growth regulators. The mean days required for initiation of flowering revealed that the treatment of 25 ppm NAA was responsible for earliest initiation of flowering by 2 days over the control. While urea spraying delayed initiation of flowering by 1 day than control. The promotion of floral initiation by NAA has been reported by Khan and Rao [6] in green gram. Similar effect of urea on floral initiation has been reported by Bharud [7] in pigeon pea.

The number of clusters per plant is one of the important yield contributing characters. It was observed that all spraying treatments except urea had significant effect on number of flowers per plant and clusters per plant. The treatment of NAA (25 ppm), ethrel (50 ppm) and GA_3 (50 ppm) increased the number of flowers per plant by 18, 15 and 14 per cent and no. of cluster per plant by 24, 19, 17 per cent respectively over control. The application of urea could not increase the number of flowers per plant. Earlier, similar results were reported by Subbain and Chany [8] in green gram and Bhujbal [9] in black gram.

The pod setting play an important role in seed yield. The foliar application of NAA (25 ppm) exhibited higher pod setting (31%) than other treatments and control. The increase in pod setting percentage may be due to reduced flower and immature pod drop. The growth regulators prevented formation of abscission layer which resulted the formation of more pods and their retention on plant. The reduction in flower drop and increased pod setting percentage due to NAA, ethrel, GA_3 or urea has been reported earlier in black gram [10] and green gram [11].

The plant growth regulators (PGRs) and urea showed significant effect on number of pods per plant. The pod number per plant was highest under the treatment of NAA (25 ppm) and it was 55 per cent more than control. The treatment ethrel (50 ppm), GA_3 (50 ppm) and urea (2%) increased pods per plants by 44, 37 and 20 per cent over control. The increase in number of pods per plant by spraying treatments may probably be due to increased pod setting. An increase in pod number by foliar application of NAA, ethrel, GA_3 and urea has also reported earlier in green gram [8, 12, 13, 14].

The foliar application of PGRs and urea significantly increased seed yield per plant. The seed yield per plant appears to be the most important component closely associated with seed yield per unit area. The treatment NAA had the highest seed yield per plant (6.39 g/plant) followed by ethrel (5.81g), GA_3 (5.30g) and urea (5.07g) over control (4.39 g). It was observed that all the spraying treatments significantly produced higher seed yield than the control. Maximum seed yield was recorded for NAA (7.95 q/ha), followed by ethrel (7.53 q/ha). Other treatments also showed marginal improvement, although significant. The production of higher seed yield due to growth regulators may be attributed to the fact that plants treated with growth regulators remained physiologically more active to build up sufficient food reserves for developing flowers and seeds. Thus, the plant gave early flower initiation and better seed development that resulted in higher seed yield.

The increase in seed yield due to spraying of growth regulators was the cumulative effect of increase in number of flowers, clusters per plant, increased pod setting, increased pods and seed yield. These results are in conformity with earlier results [8, 12, 13].

The data on mean 100-seed weight revealed that plant growth regulators significantly increased 100-seed weight, while urea increased it slightly. The foliar application of PGRs and urea resulted in divergence of more flow of assimilates towards the developing seeds and as a result the seed size in terms of 100-seed weight of treated plants increased over untreated plants. The present results also confirmed the earlier finding [12]. Germination capacity of a seed lot indicates its ability to establish seedling under good field condition which was significantly increased by foliar application of GA_3 only. GA_3 showed high germination percentage (93 %) which is 4 % higher than the control (89 %). Similar results were obtained by Baghel and Yadava [15] in blackgram and Borkar *et.al* [16] in green gram. The PGR had significant effect on seedling vigour index. The treatment GA_3 recorded highest (3153) vigour index followed by NAA (2950) and ethrel (2804). This was higher by 21, 13 and 7 per cent over control respectively.

Among the cultivars PM-9339 was superior for all the characters than Kop1. The cultivar PM-9339 produced higher yield per plant (19 %) than Kop1. The higher seed yield per plant of PM-9339 might be due to higher number of flowers, pod numbers per plant and high 100-seed weight.

Table 1. Effect of plant growth regulators and nutrients on yield contributing characters of mungbean.

Treatments	Days to initiate flowering			No. of flowers/plant			No. of clusters/plant			Pod setting (%)		
	PM-9339	Kop. 1	Av.	PM-9339	Kop. 1	Av.	PM-9339	Kop. 1	Av.	PM-9339	Kop. 1	Av.
Control	33.5	35.3	34.4	23.7	21.1	22.4	5.10	4.70	4.90	60.2	57.6	58.9
Urea	34.5	36.8	35.6	24.1	21.0	22.6	5.45	5.05	5.25	69.4	70.9	70.2
NAA	31.5	33.5	32.5	27.2	25.8	26.5	6.20	5.95	6.07	77.9	76.5	77.2
GA ₃	34.0	35.8	34.9	26.1	24.7	25.4	5.80	5.70	5.75	71.5	71.5	71.5
Ethrel	34.3	36.3	35.3	26.9	24.3	25.6	6.05	5.60	5.82	74.0	74.6	74.3
Mean	33.6	35.5	34.5	25.6	23.4	24.5	5.72	5.49	5.56	70.6	70.2	70.4
CD (P=0.05)												
Cultivar		0.63			1.92			NS			NS	
Growth regulator		0.99			3.04			0.65			5.50	
Interaction		NS			NS			NS			NS	

Table 2. Effect of plant growth regulators and nutrients on seed yield and quality parameters of mungbean.

Treatments	No. of pods/plant			Seed yield (g)/plant			Seed yield (q)/ha			Mean 100-seed wt. (g)			Germination (%)		
	PM-9339	Kop. 1	Av.	PM-9339	Kop. I	Av.	PM-9339	Kop. I	Av.	PM-9339	Kop. I	Av.	PM-9339	Kop. I	Av.
Control	14.2	12.2	13.2	4.91	3.87	4.39	6.87	6.16	6.51	4.06	3.81	3.93	90.0	88.5	89.3
Urea	16.7	14.8	15.8	5.63	4.51	5.07	7.48	6.89	7.18	4.18	3.89	4.03	90.5	89.0	89.8
NAA	21.1	19.7	20.4	6.86	5.93	6.39	8.44	7.46	7.95	4.25	4.02	4.14	93.0	91.0	92.0
GA ₃	18.6	17.6	18.1	5.75	4.84	5.30	7.52	6.93	7.23	4.30	4.15	4.22	94.0	92.5	93.3
Ethrel	19.8	18.2	19.0	6.17	5.46	5.81	8.01	7.05	7.53	4.44	4.20	4.32	92.0	90.0	91.0
Mean	18.1	16.5	17.3	5.86	4.92	5.39	7.66	6.90	7.28	4.25	4.01	4.13	91.9	90.2	91.0
CD (P=0.05)															
Cultivar		1.32			0.09			0.35			0.08			NS	
Growth regulator		2.08			0.15			0.55			0.13			2.75	
Interaction		NS			NS			NS			NS			NS	

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