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Effect of plant growth regulators on growth and yield of *Zaid* Mung bean (*Vigna radiata* L.)

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Abstract
An experiment was conducted during Zaid season of 2020 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (UP) to study the "effect of plant growth regulators on growth and yield of Zaid Mung bean (*Vigna radiata* L.)". The experiment was laid out in Randomized Block Design with ten treatments of plant growth regulators of Salicylic acid (100&150ppm), GA_3 (50&100ppm), NAA (10&20ppm) and Chlormequat chloride (146&337ppm) foliar spray at 25 and 35 DAS and replicated thrice. Among the different treatments, treatment 4 (GA_3 100ppm Foliar spray at 35 DAS) has recorded maximum plant height (47.47 cm), more number of branches per plant (4.63), more number of nodules per plant (12.85) and maximum plant dry weight (6.24 g/plant) and significantly highest number of pods per plant (33.29), number of seeds per pod (9.34), maximum seed yield (1289 kg/ha) and stover yield (2894 kg/ha) was obtained. Highest gross returns (97623 ₹/ha), net returns (64668 ₹/ha) and B:C ratio (1.96) was also noted under treatment 4 (GA_3 100ppm Foliar spray at 35 DAS).

Keywords: Mung bean, GA_3, NAA, salicylic acid, Chlormequat chloride

Introduction
Mung bean (*Vigna radiata* L. wilezek) is also known as green gram, it is an important pulse crop of India and grown in Rabi (South India), Kharif and Zaid seasons. It is green with husk and yellow when dehusked. The beans are small, ovoid in shape and green in color. The mung bean is mainly cultivated in India, Pakistan, Bangladesh, Nepal, China, Korea, South Asia and Southeast Asia. Mungbean is third most important pulse crop of India after chickpea and pigeonpea. Mung bean is a summer pulse crop with short duration (60-90 days) and high nutritive value. It has many effective uses, green pod is cooked as peas, sprout rich in vitamins and amino acids. This crop can be used for both seed and forage since it produces a large amount of biomass and then recover after grazing to yield abundant seeds and then can be used in broilers diets as a non-traditional feed stuff.

Plant growth regulators (PGRs) are organic compounds, other than nutrients, that modify plant physiological processes. PRGs, called bio stimulants or bio inhibitors, act inside plant cells to stimulate or inhibit specific enzymes or enzyme systems and help regulate plant metabolism. They normally are active at very low concentrations in plants. The importance of PGRs was first recognized in the 1930s. Since that time, natural and synthetic compounds that alter function, shape, and size of crop plants have been discovered. Today, specific PGRs are used to modify crop growth rate and growth pattern during the various stages of development, from germination through harvest and post-harvest preservation. Gibberellins commonly known as gibberellic acid. Gibberellic acid (GA) has been used to increase the length or height of plants, increase the number of flowers and induce early flowering. Gibberellins play a major role in root growth, induce mitosis in the leaves, increase seed germination rate, the control of flowering time even organ elongation (Giri *et al*. 2018) the use of GA_3 greatly enhances the growth of plants and total area of leaf surfaces and also prevents premature falling of fruits. The application of Naphthalene acetic acid (NAA) can increase fruit setting ratio, prevent fruit dropping, promote flower sex ratio. Foliar application of NAA has also found to increase plant height, number of leaves per plant, fruit size with consequent enhancement in seed yield in different crops (Parmar *et al*. 2012) [6]. Salicylic acid is a growth regulator of phenolic nature, which participates in the regulation of physiological processes in plant, such as stomata! closure, ion uptake, inhibition of ethylene biosynthesis, transpiration and stress tolerance. Foliar application of salicylic acid exerted a significant effect on plant growth metabolism when applied at physiological concentration and thus acted as one of the plant growth regulating substances (Rowndel *et al*. 2019) [9]. Chlormequat chloride (CCC) inhibits cell elongation without inhibiting cell division. Studies have shown that CCC can decrease the growth of stems, leaves and thicken the stem of mung beans effectively by controlling vein

growth and lodging. The CCC application results in dwarfed plants; thickened stalks, darkened, greened, and thickened leaves; increased chlorophyll content; and a well-developed root system.

Materials and Methods

The experiment was carried out during Zaid season of 2020 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P). Which is located at 25o 24' 42" N latitude, 81o 50' 56" E longitude and 98 m altitude above the mean sea level. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.5), low in organic carbon (0.28%), medium in available N (225 Kg/ha), high in available P (19.60 Kg/ha) and low in available K (92.00 Kg/ha). The seeds of Mung bean (*Vigna radiata* L.) variety "Samrat" were sown on 21st April 2020 with seed rate 20-25 kg/ha and sown at 5 to 6cm depth. Recommended doses of N P K were applied.

The experiment was laid out in Randomized Block Design comprised of 3 replications and total 10 treatments viz. Treatment 1 (Salicylic acid 100ppm Foliar spray at 25 DAS), Treatment 2 (Salicylic acid 150ppm Foliar spray at 35 DAS), Treatment 3 (GA_3 50ppm Foliar spray at 25 DAS), Treatment 4 (GA_3 100ppm Foliar spray at 35 DAS), Treatment 5 (NAA 10ppm Foliar spray at 25 DAS), Treatment 6 (NAA 20ppm Foliar spray at 35 DAS), Treatment 7 (Chlormequat Chloride 146 ppm Foliar spray at 25 DAS), Treatment 8 (Chlormequat Chloride 337 ppm Foliar spray at 35 DAS), Treatment 9 (Control- Foliar spray with water at 25 DAS), Treatment 10 (Control- Foliar spray with water at 35DAS).

Results and Discussion

Growth attributes

Effect of plant growth regulators on growth attributes of *Zaid* Mung bean at 60 DAS presented in below Table 1.

Plant height

Plant height increased significantly due to the application of plant growth regulators. Among these, GA_3 100ppm foliar spray at 35 DAS recorded maximum plant height (47.47 cm). The effect of growth regulators on morphological characters like plant height indicated that these parameters differed significantly due to growth regulators. Basically, plant height is a genetically controlled character, but several studies indicated that the plant height is influenced by the application of GA_3. The GA_3 significantly increased the plant height and the concentration GA_3 150ppm was found more effective to increase the plant height. Increase in plant height by GA_3 was also reported by Jeyakumar *et al*. (2008) [4], Prakash *et al*. (2003) [7] and Parmar *et al*. (2012) [6] in green gram.

Branches per plant

Among the treatments, the maximum number of branches of 4.63 was observed in treatment 4 (GA_3 100ppm foliar spray at 35 DAS) which was followed by treatment 3 (GA_3 50ppm Foliar spray at 25 DAS). The GA_3 increased the number of branches and (GA_3) concentration was found significantly superior as compared to control. It was at par with T6 (GA_3 40ppm). The increase in number of branches by growth regulator spray was reported by Kadam and Kalyankar (2008) in green gram.

Nodules per plant

Treatment with GA_3 100ppm foliar spray at 35 DAS was recorded higher Number of nodules/plant (12.85) which was significant over all the treatments. The highest root nodules attributed by the foliar application of GA_3 as it enhances the vigour of plant and strengthen the stalk (Senthil *et al*. 2004) [10]. The efficient nutrient application also profuse better root development and nodulation.

Dry weight

The maximum plant dry weight (6.24g) was recorded in treatment with GA_3 100ppm foliar spray at 35 DAS. Islam *et al*. (2010) [3] found that maximum dry weight observed in application of Gibberellic acid and Growth and metabolic efficiency was indirectly affected by dry weight accumulation which ultimately effects the yield of crop.

Yield attributes and yield

Effect of plant growth regulators on yield attributes and yield of Zaid Mung bean at 75 DAS presented below the Table 2.

Maximum Pods per plant (33.29), seeds per pod (9.34) was observed in GA_3 100ppm foliar spray at 35 DAS. Maximum test weight (34.19g) was observed in NAA 20 ppm foliar spray at 35 DAS. Maximum seed yield (1289 kg/ha), Stover yield (2894 kg/ha) was recorded in GA_3 100ppm foliar spray at 35 DAS and harvest index (31.41 %) was recorded in the Control foliar spray with water 25 DAS.

Seed yield and its related parameters in green gram were influenced by the application of different growth regulators in genotype which indicated that GA_3 have differential influence on the allocation of assimilates between vegetative and reproductive organs. In general, crop yield depends on the accumulation of photo assimilates during the growing period and the way they are partitioned between desired storage organs of plant.

Economics

Highest gross returns (97623₹/ha), net return (64668 ₹/ha) and Benefit cost ratio (1.96) was recorded in GA_3 100ppm spray at 35 DAS (Table 3).

Table 1: Effect of plant growth regulators on growth attributes of *Zaid* Mung bean (60DAS)

Treatments	Plant height (cm)	Branches Per Plant (No)	Nodules Per Plant (No)	Dry weight (g)
1.Salicylic acid 100ppm Foliar spray at 25 DAS	31.36	4.26	10.47	4.85
2. Salicylic acid 150ppm Foliar spray at 35 DAS	29.85	3.39	11.64	4.98
3. GA_3 50ppm Foliar spray at 25 DAS	31.11	4.24	13.51	5.12
4. GA_3 100ppm Foliar spray at 35 DAS	33.97	4.49	14.68	5.31
5. NAA 10ppm Foliar spray at 25 DAS	30.86	4.29	11.87	4.93
6. NAA 20ppm Foliar spray at 35 DAS	32.65	4.28	14.25	5.21
7. Chlormequat Chloride 146ppm Foliar spray at 25 DAS	31.65	4.15	11.52	4.99
8. Chlormequat Chloride 337ppm Foliar spray at 35 DAS	31.36	4.28	10.09	4.86
9. Control- Foliar spray with water at 25 DAS	30.51	4.20	11.66	4.29
10. Control- Foliar spray with water at 35 DAS	29.99	4.20	9.39	4.44
SEm (±)	0.707	0.15	0.476	0.10
CD (p=0.05)	2.101	-	1.415	0.31

Table 2: Effect of Plant growth regulators on yield and yield attributes of *Zaid* Mung bean

Treatments	Pods Per Plant (No)	Seeds per Pod (No)	Test Weight (g)	Seed yield (q/ha)	Stover Yield (q/ha)	Harvest index (%)
1.Salicylic acid 100ppm Foliar spray at 25 DAS	27.10	7.74	32.43	9.52	25.28	27.36
2. Salicylic acid 150ppm Foliar spray at 35 DAS	26.31	7.52	31.49	9.15	24.47	27.22
3. GA_3 50ppm Foliar spray at 25 DAS	31.38	8.97	31.12	12.10	27.35	30.67
4. GA_3 100ppm Foliar spray at 35 DAS	33.29	9.34	31.10	12.89	28.94	30.82
5. NAA 10ppm Foliar spray at 25 DAS	27.44	7.84	32.85	10.95	25.63	29.92
6. NAA 20ppm Foliar spray at 35 DAS	31.44	8.98	34.19	12.04	28.57	29.68
7. Chlormequat Chloride 146ppm Foliar spray at 25 DAS	27.15	7.76	32.49	11.50	25.32	31.21
8. Chlormequat Chloride 337ppm Foliar spray at 35 DAS	27.32	7.81	32.70	11.35	25.50	30.75
9. Control- Foliar spray with water at 25 DAS	25.84	6.77	29.43	10.14	22.16	31.41
10. Control- Foliar spray with water at 35 DAS	27.87	7.34	33.35	9.37	21.35	30.50
SEm (±)	0.672	0.15	1.336	0.305	0.503	0.625
CD (p=0.05)	1.998	0.47	3.970	0.908	1.497	-

Table 3: Effect of plant growth regulators on economics of *Zaid* Mung bean.

Treatments	Gross return (INR/ha)	Net return (INR/ha)	B:C ratio
1.Salicylic acid 100ppm Foliar spray at 25 DAS	73285.00	40610.00	1.24
2. Salicylic acid 150ppm Foliar spray at 35 DAS	70488.90	37703.90	1.15
3. GA_3 50ppm Foliar spray at 25 DAS	91694.30	58989.30	1.80
4. GA_3 100ppm Foliar spray at 35 DAS	97623.00	64668.00	1.96
5. NAA 10ppm Foliar spray at 25 DAS	83226.40	50701.40	1.56
6. NAA 20ppm Foliar spray at 35 DAS	91669.10	59094.10	1.81
7. Chlormequat Chloride 146ppm Foliar spray at 25 DAS	86970.10	54295.10	1.66
8. Chlormequat Chloride 337ppm Foliar spray at 35 DAS	85943.00	53038.00	1.61
9. Control- Foliar spray with water at 25 DAS	76628.00	44173.00	1.36
10. Control- Foliar spray with water at 35 DAS	71027.20	38572.20	1.19

Conclusion

The present study clearly showed that foliar application of GA_3 100ppm at 35 DAS gave positive result as highest seed yield (1289 kg/ha), net return (64668.00 INR/ha) and B:C ratio (1.96) compare to others. Thus, foliar application of plant growth regulators is one of the possible ways to enhance seed yield and economics of Mung bean.

References

1. Ajay NC, Shukla KC, Singh OP, Rao PS. Effect of plant growth hormones on growth and yield of green gram. Indian Journal of Agronomy 2016;38:197-202.
2. Giri MD, Jaybhaye CP, Kanwade DG, Tijare. Effect of foliar application of gibberellic acid on pigeon pea (*Cajanus cajan* (*L*)) under rainfed conditions. Journal of Pharmacognosy and Phytochemistry 2018;7(2):617-620.
3. Islam MR, Prodhan AKM, Islam MO, Uddin MK. Effect of plant growth regulators on morphological characters and yield of black gram (*Vigna mungo* L.) Journal Agri. Res 2010;48(1):97-101.
4. Jeyakumar P, Velu G, Rajendran C, Amrutha R, Savery MAJR, Chidambaram S. Varied responses of black gram (*Vigna mungo*) to certain foliar applied chemicals and plant growth regulators. Legume Res 2008;31(2):110-113.
5. Kadam GR, Kalyankar SV, Borgaonkar SB, Kadam BP. Effect of sowing dates and NAA application on growth, development and yield in black gram. International Journal of plant Sciences 2008;3(2):567-569.
6. Parmar VK, Dudhatra MG, Thesiya NM. Effect of growth regulators on yield of summer Green gram. Legume Res 2012;34(1):65-67.
7. Prakash M, Kumar S, Kannan A, Kumar KSM, Ganesan J. Effect of plant growth regulators on growth, physiology and yield of Black gram. Legume Res 2003;26(3):183-187.
8. Pulak Kumar S, Shahidul Haque Md, Abdul Karim M. Effects of GA3 and IAA and their Frequency of Application on Morphology, Yield Contributing Characters and Yield of Soybean. Pakistan Journal of Agronomy 2001;1(4):119-122.
9. Rowndel K, Kumar A. Effect of plant growth regulators on yield attributes and productivity of mungbean *(Vigna radiata* L. *Wilczek).* International Journal of Chemical Studies 2019;7(2):1480-1483.
10. Senthil NK, Jaya KR. Effect of growth regulators on yield and quality of green gram *(Vigna radiate*) under graded levels of nitrogen. Madras Agricultural Journal 2004;91(1-3):92-95.