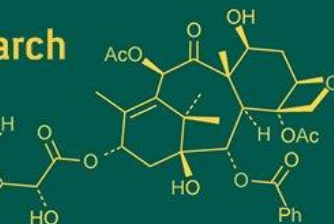
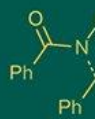


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Effect of plant growth regulators on morpho-physiological characters, growth and yield parameters in mungbean (*Vigna radiata* L.)

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Abstract

A field experiment was conducted during Kharif 2025 at the Field of Pulses Research Centre, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, to evaluate the effect of plant growth regulators on morpho-physiological characters, growth and yield parameters of mungbean (*Vigna radiata* L.). The experiment was laid out in a Randomized Block Design with nine treatments and four replications. The treatments consisted of IAA, GA₃, salicylic acid and NAA applied at 50 and 100 ppm, along with an untreated control. Growth and physiological observations were recorded at 30, 45 and 60 DAS, while yield attributes were recorded at harvest. The results revealed that plant growth regulators improved growth and yield attributes compared with the control. Among the treatments, GA₃ @ 100 ppm (T₅) recorded the highest plant height (52.24 cm) and number of branches plant⁻¹ (6.04) at 60 DAS. It also produced the maximum number of pods plant⁻¹ (33.33), seeds pod⁻¹ (9.18), seed yield plant⁻¹ (7.611 g) and pod length (8.26 cm). GA₃ @ 50 ppm (T₄) showed a favourable response for growth and yield and promoted earlier flowering and maturity. Overall, GA₃ @ 100 ppm was found to be the most effective treatment for improving the growth and yield performance of mungbean under the conditions of the present investigation.

Keywords: Mungbean, *Vigna radiata*, plant growth regulators, GA₃, IAA, NAA, salicylic acid, growth, yield

Introduction

Mungbean (*Vigna radiata* L.) is an important short-duration grain legume cultivated extensively in tropical and subtropical regions. It is valued for its high-quality protein, vitamins, minerals and good digestibility, making it an important component of human nutrition. In addition to its nutritional importance, mungbean contributes to soil fertility through biological nitrogen fixation and fits well into various cropping systems because of its short growth duration.

Despite its importance, mungbean productivity is often limited by inadequate vegetative growth, poor assimilate accumulation, moisture stress and unfavourable environmental conditions during critical growth stages. Improvement in physiological efficiency and yield components is therefore essential for increasing productivity. Plant growth regulators (PGRs) are organic compounds that, even at low concentrations, influence plant growth and development by regulating processes such as cell division, cell elongation, photosynthesis, flowering, dry matter accumulation and assimilate partitioning.

Among the commonly used PGRs, gibberellic acid (GA₃) promotes cell elongation and vegetative growth, while indole-3-acetic acid (IAA) and naphthalene acetic acid (NAA) influence cell division, differentiation and root and shoot development. Salicylic acid plays an important role in physiological processes, including photosynthetic activity, water relations and stress tolerance. Foliar application of these regulators at appropriate concentrations can improve growth and yield by enhancing physiological and biochemical activities in plants.

Several studies have reported beneficial effects of PGR application on growth and yield attributes of mungbean. However, the response varies with the type and concentration of the regulator, crop stage and environmental conditions.

Therefore, the present investigation was undertaken to evaluate the effect of IAA, GA₃, NAA and salicylic acid at 50 and 100 ppm on morpho-physiological characters, growth and yield parameters of mungbean (*Vigna radiata* L.) and to identify the most effective treatment for improving crop performance.

Materials and Methods

The experiment was conducted during Kharif 2025 at the Field of Pulses Research Centre, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra. Mungbean variety PKV Green Gold was used for the experiment. The experiment was laid out in a Randomized Block Design (RBD) with nine treatments and four replications. The

treatments were: T₁ - Control, T₂ - IAA @ 50 ppm, T₃ - IAA @ 100 ppm, T₄ - GA₃ @ 50 ppm, T₅ - GA₃ @ 100 ppm, T₆ - Salicylic acid @ 50 ppm, T₇ - Salicylic acid @ 100 ppm, T₈ - NAA @ 50 ppm and T₉ - NAA @ 100 ppm. Observations on plant height, number of branches plant⁻¹, leaf area, leaf area index, chlorophyll index, total dry weight and relative water content were recorded at 30, 45 and 60 DAS. Relative growth rate (RGR) and crop growth rate (CGR) were calculated for 30-45 and 45-60 DAS. Days to 50% flowering, days to maturity and yield attributes including pods plant⁻¹, seeds pod⁻¹, seed yield plant⁻¹, pod length, 100-seed weight and harvest index were recorded. The data were statistically analysed using analysis of variance for RBD.

Results and Discussion

Treatments	Plant height			Number of branches		
	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS
T1 CONTROL	15.16	27.76	41.40	2.37	3.87	4.89
T2 (IAA 50ppm)	13.78	31.50	46.69	2.39	4.05	5.05
T3(IAA 100 ppm)	14.74	33.42	49.45	2.71	4.53	5.46
T4(GA 50 ppm)	15.32	34.11	51.20	2.74	4.69	5.64
T5(GA 100 ppm)	14.22	36.39	52.24	2.77	4.79	6.04
T6 (Salicylic acid 50 ppm)	16.29	30.33	47.20	2.60	4.46	5.28
T7 (Salicylic acid 100 ppm)	15.86	30.99	46.67	2.56	4.33	5.23
T8 (NAA 50 ppm)	16.33	28.37	46.91	2.40	4.37	5.26
T9 (NAA 100 ppm)	17.46	32.76	49.39	2.42	4.67	5.63
SE (m) ±	1.21	1.48	1.72	0.17	0.15	0.21
CD at 5 %	3.54	4.32	5.01	0.48	0.42	0.62

The data presented in the table indicate that plant height was influenced by the application of different plant growth regulators at 30, 45 and 60 DAS. At 30 DAS, the differences among treatments were statistically non-significant. At 45 DAS, plant height showed an increasing trend with PGR application. The maximum plant height was recorded in T₅ (GA₃ @ 100 ppm) (36.39 cm), followed by T₄ (GA₃ @ 50 ppm) (34.11 cm) and T₃ (IAA @ 100 ppm) (33.42 cm), whereas the control recorded 27.76 cm. At 60 DAS, the effect of PGR application was more pronounced. The

maximum plant height was recorded in T₅ (GA₃ @ 100 ppm) at 52.24 cm, followed by T₄ (GA₃ @ 50 ppm) at 51.20 cm. The control recorded the lowest plant height of 41.40 cm. The number of branches plant⁻¹ increased progressively with crop growth. At 30 DAS, differences among treatments were non-significant among all treatments. At 45 DAS, T₅ (GA₃ @ 100 ppm) recorded the highest branches (4.79), followed by T₄ (4.69), T₃ (4.67) and T₉ (4.53). At 60 DAS, T₅ recorded the maximum branches (6.04), followed by T₄ (5.64) and T₃ (5.63).

Treatments	No. of pods per plant	No. of seeds per pod	Seed yield gm/plant	Pod length (cm).
T1 CONTROL	24.64	6.17	6.031	6.42
T2 (IAA 50ppm)	25.89	7.32	6.107	6.96
T3(IAA 100 ppm)	31.03	8.07	7.021	7.95
T4(GA 50 ppm)	31.70	8.17	7.142	8.20
T5(GA 100 ppm)	33.33	9.18	7.611	8.26
T6 (Salicylic acid 50 ppm)	29.27	7.42	6.617	7.39
T7 (Salicylic acid 100 ppm)	29.99	7.17	6.577	7.47
T8 (NAA 50 ppm)	28.34	7.15	6.612	6.72
T9 (NAA 100 ppm)	30.88	8.03	6.651	7.60
SE (m) ±	0.93	0.42	0.33	0.26
CD at 5 %	2.71	1.22	0.98	0.75

Number of pods plant⁻¹: T₅ (GA₃ @ 100 ppm) recorded the highest number of pods (33.33), followed by T₄ (31.70) and T₃ (31.03), while the control recorded the lowest value (24.64). Number of seeds pod⁻¹: The maximum seeds pod⁻¹ were recorded in T₅ (9.18), followed by T₄ (8.17), T₃ (8.07) and T₉ (8.03), whereas the control recorded 6.17 seeds pod⁻¹. Seed yield plant⁻¹: T₅ recorded the highest seed yield (7.611 g plant⁻¹), followed by T₄ (7.142 g) and T₃ (7.021 g), compared with 6.031 g in the control. Pod length: The longest pods were recorded in T₅ (8.26 cm), followed by T₄

(8.20 cm) and T₃ (7.95 cm), while the control recorded 6.42 cm. Overall, GA₃ @ 100 ppm (T₅) was the best treatment for improving all the studied yield parameters.

Conclusion

The present investigation demonstrated that foliar application of plant growth regulators had a favourable effect on growth and yield attributes of mungbean. The response varied with the type and concentration of plant growth regulator and crop growth stage. GA₃ treatments

showed a comparatively better response, particularly at 100 ppm. GA₃ @ 100 ppm (T₅) recorded the maximum plant height and number of branches at 45 and 60 DAS, indicating enhanced vegetative growth. It also produced superior yield attributes, including number of pods plant⁻¹, number of seeds pod⁻¹, seed yield plant⁻¹ and pod length. GA₃ @ 50 ppm (T₄) also performed well and showed a favourable response for growth and yield parameters. The better performance of GA₃ may be associated with its role in promoting cell elongation, vegetative growth and assimilate accumulation. Overall, among the treatments evaluated, GA₃ @ 100 ppm (T₅) emerged as the most effective treatment for improving the overall growth and yield performance of mungbean under the conditions of the present investigation. The findings suggest that appropriate foliar application of GA₃ can be useful for enhancing mungbean productivity.

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