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# Effect of Different Plant Growth Regulators on Yield and Growth Parameters in Mung Bean (*Vigna radiata* L.)

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**ABSTRACT**

*The experiments were conducted in field conditions of Department of Genetic and Plant Breeding, SHUATS, Prayagraj, (UP) during 2018-19 in order to standardize the suitable treatment of Plant growth regulators for mung bean. Nine treatments of plant growth regulators and one treatment of control, $T_1$: $GA_3$@ 50 ppm, $T_2$: $GA_3$@ 100 ppm, $T_3$: $GA_3$@ 150 ppm, $T_4$: NAA@ 15 ppm, $T_5$: NAA@ 25 ppm, $T_6$: NAA@ 35 ppm, $T_7$: Salicylic acid@ 100 ppm, $T_8$: Salicylic acid@ 150 ppm and $T_9$: Salicylic acid@ 200 ppm and $T_0$: control, were tested in Randomized Block Design with three replications, respectively. Results revealed that plant growth regulators with treatment $T_2$ ($GA_3$ @100 ppm) recorded significantly fewer days to 50% flowering (36.67), significantly maximum plant height (62.09 cm), highest number of primary branches (6.60), days to maturity at (59.90), number of pods/plant (29.68), seed yield per plant (13.32gm) and biological yield (26.40) of mung bean. The treatments $T_3$ ($GA_3$@ 150 ppm) and $T_9$ (Salicylic acid@ 200 ppm) were also found effective in improving the above parameters of growth, yield and seedling of mung bean.*

***Keywords:*** *Growth, mung bean, Plant growth regulators, Yield.*

## INTRODUCTION

Mung bean or green gram (*Vigna radiata* L.) (2n = 22) is a self-pollinated legume crop originated in South Asia. Mung bean is mostly grown in India, Pakistan, Sri Lanka, Burma and some other countries of south-east Asia. Mung bean is one of the important short season grain legumes in the conventional farming system of tropical and temperate regions. It can be grown on a variety of soil and climatic conditions, as it is tolerant to drought. It is mostly grown under dry land farming system where erratic rains often fetch the crop under moisture stress (Malik et al., 2006). It is economically important pulse crop followed by chickpea and pigeon pea and widely cultivated throughout India.

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Mung bean is an excellent source of protein (25%) with high quality of lysine (460 mg/gm) and tryptophan (60 mg /gm). It also has remarkable quantity of ascorbic acid when sprouted and also have riboflavin (0.21 mg/ 100 gm) and minerals (3.84 g/100 gm). It has the ability to fix atmospheric nitrogen through symbiotic activity and the green plants after removing the matured pods can be used as green manure.

Area under mung bean was 32.13 lakh hectare with a production of 19.01 lakh tonnes and productivity of 467 kg/ha in India during the year 2018-19 (Ministry of Agri., & FW (DAC&FW), Govt. of India; 2018-19). The low productivity of mung bean may be due to nutritional deficiency in soil and imbalanced external fertilization (Awomi et al., 2012).

## MATERIALS AND METHODS

The experiment was conducted in Randomized Block Design (RBD) with 10 plant growth regulator treatments (Gibberellic acid, Naphthalene acetic acid and Salicylic acid) with three replications in the Department of Genetics and Plant Breeding Research field, Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj during March to May, 2018. Total number of treatments were Ten *viz.* $T_0$ (control), $T_1$ (Gibberellic acid 50 ppm), $T_2$ (Gibberellic acid 100 ppm), $T_3$ (Gibberellic acid 150 ppm), $T_4$ (Naphthalene acetic acid 15 ppm), $T_5$ (Naphthalene acetic acid 25 ppm), $T_6$ (Naphthalene acetic acid 35 ppm), $T_7$ **(**Salicylic acid 100 ppm), $T_8$ (Salicylic acid 150 ppm), $T_9$ (Salicylic acid 200 ppm), and variety Samrat were used for cultivation.

**Climatic condition in the experimental site:**

The area of Prayagraj district comes under subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46$^o$ C- 48$^o$ C and seldom falls as low as 4$^o$C- 5$^o$C. The relative humidity ranges between 20 to 94 %. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

## RESULTS AND DISCUSSION

The present investigation entitled "Effect of plant growth regulators on growth and yield of Mungbean (*Vigna radiata* L.*)*" was carried out during March to May month of 2018 in Research Field of Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of the present investigation, regarding the effect of Pant growth regulators on growth and seed yield of Mungbean, have been discussed and interpreted in the light of previous research work done in India and abroad.

Treatments for different growth regulators on field emergence varied from 74.90 to 84.38 percent under different plant growth regulators treatments. Treatment T2 (GA3 100 ppm) followed by treatment T3 (GA3 150 ppm) reported the highest field emergence value. The effect of all treatments on the emergence of the field, however, was observed to be significant. Emongor (2007) recorded comparable results, for field emergence and a $GA_3$ treatment @ 30, 60 or 90 mg / liter significantly improved plant height, dry matter accumulation in cowpea.

The different plant growth regulators have an effect ranging from 30.00 to 42.33 with a mean value of 39.03 on 50 percent flowering stage. T0 (control) reported maximum days to 50 percent flowering (42.33) and T2 (36.67) recorded minimum days to 50 percent flowering with GA3 (100 ppm) application. Similar findings reported by Kothule *et al.* (2003) indicated different concentration of plant growth substances. GA3 100 ppm decreased the number of days in soybean to 50% flowering.

The plant height ranged from 35.03 cm to 62.09 cm with a mean value of 42.32 cm due to the influence of different plant growth regulators. T2 recorded maximum plant height (62.08 cm) with application of GA3@ 100 ppm and T0 control recorded minimum plant height (35.03 cm). Similar results observed by Marie et al. (2007) foliar spraying with GA3 actively enhanced plant height in Okra and Pandey et al. (2004) reported that application of GA3 @ 200 ppm increased plant height in garden pea.

The number of primary branches ranged from 4.87 to 6.60 with a mean value of 5.59 for different plant growth regulators. T2 found a maximum amount of branches (6.60) using (GA3@ 100 ppm) while minimum number of branches (4.87) in T0 (control) treatment. Parmar et al. (2012) indicated that spraying of GA3@ 20 ppm at 20 and 40 DAS significantly increased number of branches per plant in green gram and comparable outcomes were reported by Borkar et al. (1991) that spraying of GA3 (10 ppm) was more efficient in inducing higher number of branches in cowpea.

Treatment T0 (control) found maximum days to maturity (64.96) whereas minimum days to maturity by T3 (61.22) by different plant growth regulators with mean value of 4.7 days.

The number of pods per plant varied from 16.48 to 29.68 with a mean value of 22.70 in terms of treatments for different plant growth regulators. T2 reported the maximum number of pods per plant (29.68) using (GA3100 ppm) and T0 found the minimum number of pods per plant (16.48). The effect of interaction between apical pinching of the bud and GA3 sprays had a significant effect on growth, seed yield and yield attributes such as number of pods per plant was found by Vasudevan et al. (2008).

Different plant growth regulators ranged a seed index from 2.74 to 4.50, with a mean value of 3.59, the highest seed index (4.50) was recorded by T2 with application of (GA3@ 100 ppm) and was almost equivalent to T3 (4.45), followed by T9 (4.16), the minimum seed index was recorded in T0 (2.74). Bora and Sarma (2003) recorded comparable results, evaluated the effect of presoaking GA3 treatment and Alar foliar spray in pea (cv. Azad-P-1). They found that GA3's seed index increases upto 250 µgL-1. In supporting the seed index, GA3 250 + Alar 500 µgL-1 was most effective.

In terms of treatments for different crop growth regulators Biological yield (g) ranged from 20.01 to 26.40 with mean value of 23.58 Maximum biological yield(g) (26.40) was measured by T2 with application of (GA3@ 100 ppm) followed by T3 with application of (GA3@ 150 ppm) (25.69) and minimum biological yield (g) was reported by T0 (20.01). Similar results for GA3 application were revealed by Nasser Akhah et al. (2008).

The different plant growth regulators of Harvest index (%) ranged from 26.54 to 41.84 with mean value of 35.44. The lowest harvest index (%) was recorded by $T_0$ (26.54) and Maximum harvest index (%) (41.84) was obsreved by $T_2$ with application of ($GA_3$@ 100 ppm). Findings reported by Emongor (2007) revealed the impact of exogenous application of GA3 after the emergence @ 30, 60 or 90 mg/liter significantly increased harvest index in cowpea.

The seed yield per plant ranged from 8.17 (gm) to 13.32 (gm) with a mean value of 10.77 (gm) in terms of treatments for different plant growth regulators, the highest seed yield per plant (13.32gm) was reported by T2 and the minimum seed yield per plant was recorded by T0 (8.17gm). Similar findings reported by Sahu et al. (2002) indicated that GA3 and Ethrel significantly increased growth, yield and yield attributing fenugreek characteristics, such as seed yield per plant.

**Table 1: Analysis of Variance growth and yield characters due to the effect of different plant growth regulators in mungbean**

| S. No | Characters | Mean sum of squares | | |
|---|---|---|---|---|
| | | Replication (d.f. =02) | Treatment (d.f. =9) | Error (d.f.=18) |
| 1. | Field emergence | 3.72 | 32.85* | 7.70 |
| 2. | Day to 50 % flowering | 0.53 | 8.67* | 0.98 |
| 3. | Plant height | 5.13 | 175.43* | 6.75 |
| 4. | Number of primary branches | 0.32 | 0.92* | 0.28 |
| 5. | Days to maturity | 5.40 | 7.44 | 6.39 |
| 6. | Pod per plant | 1.41 | 56.32* | 7.82 |
| 7. | Seed yield per plant | 0.50 | 7.48* | 0.27 |
| 8. | Biological yield | 6.86 | 11.99* | 3.33 |
| 9. | Harvest index | 6.61 | 78.56* | 5.89 |
| 10. | 100 seed weight | 0.04 | 0.33* | 0.06 |

*Significance at 5% level of significance

**Table 2: Effect of different plant growth regulators treatments on mean performances for growth parameters in mungbean**

| Treatments | Field Emergence | Days to 50% flowering | Plant height (cm) | Number of primary branches | Days To maturity |
|---|---|---|---|---|---|
| T0: Control | 74.90 | 42.33 | 35.03 | 4.87 | 64.96 |
| T1:$GA_3$ 50 ppm | 78.90 | 38.67 | 40.46 | 5.73 | 63.07 |
| T2: $GA_3$100 ppm | 84.38 | 36.67 | 62.09 | 6.60 | 59.90 |
| T3: $GA_3$150 ppm | 83.94 | 37.00 | 45.94 | 6.13 | 61.22 |
| T4: NAA 15 ppm | 75.89 | 40.33 | 37.95 | 5.03 | 64.52 |
| T5: NAA 25 ppm | 76.23 | 40.00 | 38.49 | 5.07 | 64.18 |
| T6: NAA 35 ppm | 77.94 | 39.67 | 39.21 | 5.33 | 64.04 |
| T7: Salicylic acid 100 ppm | 78.64 | 39.33 | 39.31 | 5.37 | 63.41 |
| T8: Salicylic acid 150 ppm | 80.41 | 38.33 | 39.77 | 5.87 | 62.72 |
| T9: Salicylic acid 200 ppm | 81.98 | 30.00 | 44.94 | 5.93 | 62.21 |
| SEm± | 2.27 | 0.81 | 2.12 | 0.44 | 2.06 |
| CD 5% | 4.76 | 1.70 | 4.46 | 0.98 | 4.34 |
| Mean | 79.32 | 39.03 | 42.32 | 5.59 | 63.02 |

**Table 3: Effect of different plant growth regulators treatments on mean performances for yield parameters in mungbean**

| Treatments | Pod per plant | Seed index | Biological yield (gm) | Harvest index (%) | Seed yield per plant (gm) |
|---|---|---|---|---|---|
| T0: Control | 16.48 | 2.74 | 20.01 | 26.54 | 8.17 |
| T1:$GA_3$ 50 ppm | 23.10 | 3.57 | 23.96 | 37.43 | 10.53 |
| T2: $GA_3$100 ppm | 29.68 | 4.50 | 26.40 | 41.84 | 13.32 |
| T3: $GA_3$150 ppm | 28.45 | 4.45 | 25.69 | 40.64 | 12.41 |
| T4: NAA 15 ppm | 18.36 | 2.75 | 21.67 | 29.17 | 9.23 |
| T5: NAA 25 ppm | 18.88 | 3.15 | 22.13 | 31.87 | 9.81 |
| T6: NAA 35 ppm | 20.30 | 3.25 | 22.89 | 33.38 | 10.29 |
| T7: Salicylic acid 100 ppm | 22.36 | 3.27 | 23.02 | 35.15 | 10.37 |
| T8: Salicylic acid 150 ppm | 23.99 | 4.09 | 24.80 | 38.64 | 11.17 |
| T9: Salicylic acid 200 ppm | 25.43 | 4.16 | 25.21 | 39.68 | 12.40 |
| SEm± | 2.28 | 0.20 | 1.49 | 1.98 | 0.43 |
| CD 5% | 4.80 | 0.41 | 3.13 | 4.16 | 0.90 |
| Mean | 22.70 | 3.59 | 23.58 | 35.44 | 10.77 |

## CONCLUSION

According to this study, concluded mungbean seeds were treated with gibberellic acid (GA3) 100 ppm (T2) and gibberellic acid (GA3) 150ppm (T3) found to be most effective in improving crop growth parameters *viz.*, plant height (cm), days to 50 percent flowering, number of branches, days to maturity, number of pod / plant, biological yield, harvest index, seed index and seed yields. Greengram (cv. Samrat) showed different treatment responses. It is noted that increased seed yield after treatment with Gibberellic acid (GA3) 100ppm (T2) compared to other treatments of Greengram.

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