*International Journal of Plant & Soil Science*

***Volume 35, Issue 18, Page 1709-1713, 2023; Article no.IJPSS.103572***
***ISSN: 2320-7035***

# Effect of Growth Regulators on Growth and Yield Attributes of Black Gram (*Vigna mungo L.*)

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/IJPSS/2023/v35i183450

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/103572

***Original Research Article***

***Received: 18/05/2023***
***Accepted: 24/07/2023***
***Published: 07/08/2023***

## ABSTRACT

The field experiment was conducted during Zaid season of 2022 at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. To study the Influence of Growth Regulators on the growth and yield of Black gram. The treatments consist of levels of Gibberellic Acid ($GA_3$ – 15 ppm, $GA_3$ – 30 ppm, $GA_3$ – 45 ppm) and Salicylic acid (SA – 50 ppm, SA – 75 ppm, SA – 100 ppm). The soil of experimental plot was sandy loamy in texture, nearly neutral in soil reaction (pH 7.8), low in organic carbon (0.35%). Results revealed that application of GA3 45 ppm + 50 ppm Salicylic acid (Treatment – 10). recorded with plant height (40.08 cm), plant dry weight (7.13 g/plant), number of pods/plant (36.27), number of seeds/pod (7.12), test weight (35.29 gm), 29.3 seed yield (957.86 kg/ha) were also recorded in treatment - 10 $GA_3$ 45 ppm + 100 ppm Salicylic acid at 15 & 40 DAS.

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*Keywords: Black gram; gibberellic acid; growth parameters; salicylic acid; yield attributes and economics.*

## 1. INTRODUCTION

Leguminosae is the family that includes black gramme. The significant pulse crop grown throughout India's various agro-climatic zones is black gramme (*Vigna mungo* L.). Although this crop is farmed during the Kharif and Rabi seasons, the majority of its land is planted during the former, when intercropping with crops like sorghum, pearl millet, maize, cotton, castor, and pigeon pea is highly common. In terms of India's main pulse crops, black gramme holds a significant position [1-3]. A complete array of nutrients, including 20 to 25% protein, 40 to 47% starch, ash lipids, carbs, and important vitamins, may be found in black gramme [4-6]. In 2012–2013, the total area, production, and productivity of black gramme in India were 3.11 million hectares, 1.90 million tonnes, and 611 kg/ha, respectively (Anonymous et al. 2014).

A vast class of tetracyclic diterpenoid plant growth agents is known as the gibberellins. In order to control plant growth, GA3 acts as a hormone, and this knowledge dates back to the 1950s [7]. Salicylic acid, also known as ortho-hydroxybenzoic acid, is a secondary metabolite that functions similarly to chemicals that control development. important in increasing the crop's yield [8].

Salicylic acid, or salicylate, is frequently referred to as "Aspirin" in acetylated form. Signalling is aided by salicylic acid. Salicylic acid is a member of an incredibly diverse class of plant phenols, which are substances with an aeromatic ring bearing a hydroxyl group [9-11]. In order to ascertain the impact of external application stress on the antioxidative enzymatic of salicylic acid (SA) under salt activities in black gramme, the green house experiment was carried out [12-16]. Black gramme crop grain output has mostly increased as a result of the cumulative effect of yield-attributing traits, improved photosynthetic efficiency, and improvement in the reproductive and sinks' ability to utilise incoming assimilates as a result of the foliar application of $GA_3$.

## 2. MATERIALS AND METHODS

A field experiment was conducted during *zaid* 2022 at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The soil of experimental plot was sandy loamy in texture, nearly neutral in soil reaction (pH 7.2), low in organic carbon (0.72%), The treatments consist of Control, $GA_3$ 15 ppm + 50 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 15 ppm + 75 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 15 ppm + 100 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 30 ppm + 50 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 30 ppm + 75 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 30 ppm + 100 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 45 ppm + 50 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 45 ppm + 75 ppm salicylic acid at 15 & 40 DAS, $GA_3$ 45 ppm + 100 ppm salicylic acid at 15 & 40 DAS. Ten treatments were replicated three times, and the experiment was set up using a randomised block design. By using the analysis of variance approach, statistical analysis of the acquired data was performed [17].

## 3. RESULTS AND DISCUSSION

### 3.1 Pre and Post-Harvest Parameters

**Plant Height:** At 60 DAS, the significantly higher plant height of (40.08 cm) [Table.1] was recorded with treatment-10 ($GA_3$ 45 ppm + 100 ppm salicylic acid at 15 & 40 DAS). However, treatment-9 $GA_3$ 45 ppm + 75 ppm salicylic acid at 15 & 40 DAS (39.34cm) was found to be statistically at par with treatment-9 ($GA_3$ 45 ppm + 100 ppm salicylic acid at 15 & 40 DAS). The plant height of Black Gram increased significantly due to with At Harvest, Foliar application of GA3 significantly influenced the black gram plant height (cm), number of pods/cluster, length of pod (cm), number of seedspod, number of pods/plant and grain yield/ plant (g). Two applications of 30 ppm $GA_3$ at flower and pod initiation stages (T10) recorded significantly higher number of pods/cluster, length of pod (cm), and grain yield/ plant. Similar results were reported by Rehem Dawar et al. [8] and Kodhati Vishnu et al. (2020).

**Number of Pods/Plant:** The significant and higher number of Pods/plant (36.27) were observed in treatment-10 with ($GA_3$ 45 ppm + 100 ppm Salicylic acid), which was significantly superior over rest of the treatments. However, treatment-8 ($GA_3$ 45 ppm + 50 ppm Salicylic acid), was found to be statistically at par with treatment-9($GA_3$ 45 ppm + 75 ppm Salicylic

**Table 1. Influence of phosphorus and foliar application of zinc on growth and yield attributes of black gram**

| Treatments | Plant Height (cm) | Plant Dry Weight (g/plant) | Pods/Plant | Seeds/Pod | Test Weight (g/) | Seed Yield (kg/ha) |
|---|---|---|---|---|---|---|
| Control | 35.05 | 5.43 | 26.28 | 3.72 | 29.87 | 627.50 |
| $T_2$ | 35.28 | 5.57 | 32.15 | 4.46 | 31.11 | 631.65 |
| $T_3$ | 36.28 | 5.73 | 33.19 | 4.91 | 32.18 | 670.77 |
| $T_4$ | 36.75 | 6.11 | 33.63 | 5.03 | 32.68 | 743.68 |
| $T_5$ | 37.12 | 6.13 | 34.06 | 5.27 | 32.97 | 754.60 |
| $T_6$ | 36.62 | 6.35 | 34.29 | 5.89 | 33.21 | 758.11 |
| $T_7$ | 37.83 | 6.38 | 34.54 | 6.19 | 33.54 | 784.53 |
| $T_8$ | 37.87 | 6.41 | 35.12 | 6.39 | 33.84 | 791.74 |
| $T_9$ | 39.34 | 6.53 | 35.73 | 6.83 | 34.47 | 932.33 |
| $T_{10}$ | 40.08 | 7.13 | 36.27 | 7.12 | 35.29 | 957.86 |
| F test | **S** | **S** | **S** | **S** | **S** | **S** |
| S Em. (±) | 0.49 | 0.23 | 1.06 | 0.21 | 0.38 | 12.04 |
| CD (P=0.05) | 1.47 | 0.69 | 3.15 | 0.62 | 0.96 | 35.78 |

acid). According to Singh and Totawat (2002), an improvement in the soil's nutrient status and the creation of a conducive environment for better root growth through the secretion of growth-promoting substances like Gibberellin, cytokinin, and auxin are responsible for the significant increase in the number of pods per plant following seed inoculation with growth regulators.

**Number of Seeds/Pod:** The significant and higher number of Seeds/pod (7.12) were observed in treatment-10 with ($GA_3$ 45 ppm + 100 ppm Salicylic acid), which was significantly superior over rest of the treatments. However, treatment-8 ($GA_3$ 45 ppm + 50 ppm Salicylic acid), was found to be statistically at par with treatment-9 ($GA_3$ 45 ppm + 100 ppm Salicylic acid). In this field experiment, the combined application of growth regulators hardly boosted the amount of seeds per pod. As seeds serve as a direct indicator of pollen viability, the presence of magnesium in multi-nutrient solutions may be to blame for the increase in seeds per pod. According to Solanki mittal et al. [7], magnesium has been shown to increase fruit set, pollen viability, and has a significant impact on pollen formation.

**Seed Yield:** The significant and higher Seeds yield (957.86 kg/ha) were observed in treatment-10 with (GA3 45 ppm + 100 ppm Salicylic acid), which was significantly superior rover rest of the treatments. However, treatment-8 (GA3 45 ppm + 100 ppm Salicylic acid), was found to be statistically at par with treatment-9 (GA3 45 ppm + 100 ppm Salicylic acid). Maximum seed yield (q) per hectare was recorded in T4 (SA 150 ppm). While, minimum seed yield (q) per hectare was recorded with treatment T7 ($GA_3$ 150 ppm) over the control. In this area, the combined use of growth regulators has only slightly boosted the amount of seeds per pod. The fact that the action of salicylic acid in mung bean reported greater seed output provided significant support for these findings. reported that salicylic acid's impact on chickpeas boosted seed production. Reported that salicylic acid treatment improved the physiological efficiency of the crop and resulted in greater growth and yield of black gramme cv. All yield and yield components were increased in pea plant. NDU-1. The results of this study suggest that PGRs may be used to increase bean productivity by optimising yield-related parameters Manjari et al. (2017).

## 4. CONCLUSION

It was concluded that with the application of $GA_3$ 45 ppm along with 50 ppm Salicylic acid at 15 & 40 DAS [Treatment-10, has performs positively and improves growth and yield parameters. Maximum seed yield, gross returns, net return and benefit cost ratio were also recorded with the application of $GA_3$ 45 ppm along with 100 Salicylic acid at 15 & 40 DAS [Treatment-10]. These results are based on a single season, therefore additional testing may be necessary for further conformation.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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