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# "Influence of Micro Nutrients and Naphthalene Acetic Acid on Growth, Yield and Economics of Summer Greengram (*Vigna radiata* 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.*

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## ABSTRACT

A field experiment was conducted during *Zaid* 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) to determine the "Influence of micronutrients and naphthalene acetic acid on growth, yield and economics of summer greengram (*Vigna radiata* L.)". To study treatments consisting of three Micronutrients *viz.* Zn @ 100 ppm, Boron @ 100 ppm and Mn @ 50 ppm and three levels of Naphthalene acetic acid *viz*. 30, 40 and 50 ppm. There were 10 treatments, each of which was replicated three times and laid out in a random block design. The results showed that treatment 3 [Zinc (100ppm) + NAA (50ppm)] recorded significantly higher plant height (47.6 cm), higher number of branches/plant (9.00), higher number of leaves/plant (13.60), higher dry weight (7.40g), higher number of nodules/plant (7.6). Whereas, maximum number of pods/plant (29.00), maximum number of seeds/pod (10.27), higher test weight (29.40 g), higher seed yield (1.24t/ha), higher stover yield (2.73 t/ha) and higher harvest index (30.30 %) was

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recorded in treatment 3 [Zinc (100ppm) + NAA (50ppm)]. Similarly, maximum gross return (86,085.00 INR/ha), higher net return (58,674.00 INR/ha) and highest benefit cost ratio (2.14) was also recorded in treatment 3 [Zinc (100ppm) + NAA (50ppm)] as compared to other treatments.

*Keywords: Micronutrients; naphthalene acetic acid; growth; yield; economic.*

## 1. INTRODUCTION

"Mung bean (*Vigna radiata* L.) commonly known as green gram is an important conventional pulse crop of India. It is originated from India and central Asia. It is also called as "Golden Bean" because of its nutritive values and suitability for increasing the soil, by the way of addition of nitrogen to the soil. Mung bean is short day, warm season crop, grown mainly in semi-arid to sub humid tropics and tropics with 600 to 1000 mm annual rainfall, for a high yield, a warm climate and deep well drained loam or sandy loam soils are desired. Mung bean is rapidly growing, erect or sub-erect annual usually 40 to 120 cm in height. It as high nutritive value, and due to this, has advantage over the other pulses. The seed contains protein (24.20%), fat (1.30%), and carbohydrates (60.4%), calcium is 118 and phosphorus is 340 mg/100gram of seed, respectively" [1]. "Green gram improves physical properties of soil and fixes atmospheric nitrogen" [2]. "It contains high quality of lysine(460 mg/g), tryptophan(60 mg/g), remarkable quality of ascorbic acid when sprouted, riboflavin (021 mg/100g) and minerals (3.84 mg/100g)" [3].

"Green gram is one of the important pulse crops, which ranks third in area and production after pigeon pea and chickpea and is grown in almost all parts of the country over a wide range of agro-climatic condition. In India, Green gram is grown over an area about 51.30 lakh ha with a production of 3.85 lakh tonnes and productivity of 601 kg/ha under 2020-21. Total coverage under green gram in Uttar Pradesh 0.86 Lakh ha with a production 0.61 Lakh tonnes and the productivity 709 kg/ha" [4]. According to government fourth advance estimates, greengram production in 2021-22 is at 3.15 million tonnes.

According to Kumar et al. [5] "the soil application of nutrients applied at the time of sowing or 35 days after sowing often results in lower fertilizer use efficiency of all concerned nutrients which ultimately affect the growth and yield of the crop". "Under the summer season, application of micro nutrient (Zn. B, Mn) through foliar spray at 25 days after sowing helped to improve yield attributes like grains/pod, Pods/plant, Stover yield and grain yield. Application of the nutrients through foliar spray at appropriate stages of crop growth becomes important for their utilization and better performance of the crop" [6].

"The yield potential of the greengram is very low because crop suffer from excessive vegetative growth, poor harvest index and low yield mainly due to poor pod setting in spite of the fact that flowering is profuse" [7]. Foliar application of growth regulator (NAA 50 ppm) at 15 and 30 DAS improves the flower formation, pod setting there by promotes growth and yield of greengram.

Micronutrients are essential for plant growth. Among the micronutrients Zn, B, Mn plays an important role in growth and development of plant. Foliar feeding of micronutrients has been shown to be a good strategy since it targets the plants that exhibit micronutrient shortage symptoms. By promoting more vigorous regrowth and increasing the yield potential stage period, micronutrient administration before visible symptoms of their deficiency might improve a crop. Micronutrient applications can increase plant resistance to environmental stresses and increase potential yield [8].

Among micronutrients Zn, B and Mn play an important role in growth and development of plant. Protein and RNA synthesis is affected by a shortage of zinc. Several enzymes, including tryptophan synthetase, superoxide dismutase, and dehydrogenases, are activated by zinc application [3]. Zinc applied directly to the leaves modulates plant growth and yield, including straw production and crude protein in seeds [9]. Auxin synthesis, dehydrogenase enzyme activation, and ribosomal fraction stability are all affected by zinc [10].

Reduced pollen germination, pollen grain count, etc. are all symptoms of boron deficiency [3]. "Boron is mostly needed for plant reproduction and pollen grain germination. The structural role that boron plays in the growth of cell walls, cell division, seed development, and the activation or inhibition of particular metabolic pathways for the transfer of sugar and the production of hormones" [11].

In plants, manganese helps in the synthesis of naturally occurring antifungal chemicals that help to prevent disease infection. It is a part of the enzyme, and growth of the enzyme may cause biological processes in plant tissue. It is also known to have a role in photosynthesis and act as an enzyme activator for a number of different enzyme-related functions [8].

"Recent times, plant growth regulators (PGRs) have gained recognition as a new class of agro chemicals. They are known to change plant architecture, improve source-sink relationships, and increase the transfer of photo-assimilates, helping to improve flower, pod, and fruit retention. improve seed growth, yield, and quality. Foliar applications of nutrients and growth regulators throughout the pre-flowering and flowering stages resulted in considerably higher reproductive effectiveness and grain production as well as a decrease in flower shed and flower drop" [12]. Plant growth regulators can increase a plant's physiological efficiency, including its capacity for photosynthetic growth, which helps the plant form flowers, produce fruit, and produce seeds more successfully. This increases crop yield overall [13]. The primary function of NAA is to facilitate the effective transfer of sugars from the photosynthesizing portions of the plant (source) to the growing grains (sinks), as well as to promote nitrogen accumulation, which probably increased the production of total dry matter [14]. "NAA is essential for cell growth, cell division, the differentiation of vascular tissue, the start of roots, apical dominance, leaf ageing, fruit abscission, fruit setting, and blooming" [15]. Keeping in view the above facts, the present investigation was undertaken to find out "Influence of micronutrients and naphthalene acetic acid on growth, yield and economics of summer greengram (*Vigna radiata* L.)".

## 2. MATERIALS AND METHODS

The experiment was conducted during summer season of 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). the soil of the field constituting a part of central Gangetic alluvium is neutral and deep. The soil of the experimental field was sandy loam in texture, nearly neutral in soil reaction (pH 7.8), low level of organic carbon (0.62%), available N (225 Kg/ha), P (38.2 kg/ha), K (240.7 kg/ha) and zinc (2.32 mg/kg). The treatment consists of micronutrient treatments consisting of three Micronutrients *viz.* Zn @ 100 ppm, Boron @ 100 ppm and Mn @ 50 ppm with combination of different levels of Naphthalene acetic. The experiment was laid out in RBD with 10 treatments each replicated thrice. The treatment combinations are $T_1$ - Zinc (100ppm) + NAA (30ppm), $T_2$ - Zinc (100ppm) + NAA (40ppm), $T_3$ - Zinc (100ppm) + NAA (50ppm), $T_4$ - Boron (100ppm) + NAA (30ppm), $T_5$ - Boron (100ppm) + NAA (40ppm), $T_6$ - Boron (100ppm) + NAA (50ppm), $T_7$ - Manganese (50ppm) + NAA (30ppm), $T_8$ -Manganese (50ppm) + NAA (40ppm) , $T_9$ - Manganese (50ppm) + NAA (50ppm) , $T_{10}$- Control N:P:K (25:50:25 Kg/ha).

All agronomic practices are followed in order in the crop period. Experimental data collected was subjected to statistical analysis by adopting Fisher's method of analysis of variance (ANOVA) as outlined by Gomez and Gomez (1984). Critical Difference (CD) values were calculated wherever the 'F' test was found significant at 5 percent level.

## 3. RESULTS AND DISSCUSSION

### 3.1 Growth Parameters

#### 3.1.1 Plant height (cm)

The data revealed that significantly and higher plant height (47.6 cm) was observed in treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 6 [Boron (100ppm) + NAA (50ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

"The significant and higher plant height was with application of Zinc (100ppm) may be due to its effect in the metabolism of growing plants, which may effectively explain the observed response of zinc application", Similar results was recorded by Khalil and Prakash [16]. "Further, the application of NAA (50ppm) as foliar spray promoted the growth of the plant by increasing plasticity of the cell wall followed by hydrolysis of starch to sugars and lowers the water potential of cell resulting in the entry of water into cell causing elongation. These results were in conformity with those of" [17].

#### 3.1.2 Number of branches/plant

The data revealed that treatment 3 [Zinc (100ppm) + NAA (50ppm)] recorded maximum number of branches/plant (9.0) which was superior to all the treatments and the treatment 6

[Boron (100ppm) + NAA (50ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

"Application of zinc (100ppm) as foliar spray showed influence on number of branches/plant it improves the uptake of nutrients from soil that might have helped in enhancing higher number of branches due to increased cell division and other metabolic processes", results were in conformity with [18]. Further, maximum number of branches/plant might be due to foliar application of NAA (50ppm) promoting the apical dominance, cell elongation and shoot development. These findings were similar to Shashikumar et al. [19].

### 3.1.3 Number of leaves/plant

The significantly and higher number of leaves/plant (13.60) was recorded in treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 6 [Boron (100ppm) + NAA (50ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were found to be statistically at par to the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

The highest number of leaves/plant with the application of NAA(50ppm) this might be due to it increases rate of photosynthetic activity, accelerated transport and efficiency of utilizing photosynthetic products, thus resulting in cell elongation and rapid cell division in the growing portion of the plant, ultimately increases number of leaves/plant. A similar result was reported by Sarker et al. [20] in rice and Singh and Jambukiya [21].

### 3.1.4 Plant dry weight (g)

Results revealed that treatment 3 [Zinc (100ppm) + NAA (50ppm)] recorded significantly higher plant dry weight (7.40 g). However, no treatment was statistically at par with the treatment 3.

"Maximum plant dry weight was Significantly influenced by the application of zinc(100ppm) being an essential constituent of several enzymes and also involved in nitrogen metabolism, cellular proteins and nucleic acid synthesis and encouraged the meristematic activities of greengram and increased uptake of all nutrients helped in better dry matter production" similar findings was reported by [22]. Further, maximum plant dry weight might be due to the application of NAA helps in translocation of stored photo assimilates towards the development of reproductive organs followed by amount of total dry matter as an indication of overall efficiency of utilization of resources and better light interception. These results were in conformity with those of Rajesh et al. [23].

### 3.1.5 Number of nodules/plant

Data found that significantly higher number of nodules/plant (7.60) was obtained in the treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 6 [Boron (100ppm) + NAA (50ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were found to be statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

Application of Zn(100ppm) showed that maximum number of root nodules/plant the increased in nodulation might be due to the enhanced rooting system .Similar results was reported by Pavadai et al. [24] in black gram. Foliar applied nutrients play a vital role in acceleration the root growth, contributing to better absorption of nutrients from the soil. The present findings are within the close proximity of Sridhar et al. [9].

### 3.1.6 Crop growth rate (g/m$^2$/day)

The data recorded that during 45-60 DAS no significant difference among all the treatments. However highest Crop Growth Rate (4.96g/m$^{2/}$day) was observed in treatment 3 [Zinc (100ppm) + NAA (50ppm)].

### 3.1.7 Relative growth rate (g/g/day)

The data revealed that During 45-60 DAS, treatment 7 [Manganese (50ppm) + NAA (30ppm)] recorded significantly higher Relative Growth Rate (0.0367g/g/day), though there was significant difference among the treatments.

The significant and higher relative growth rate with the foliar application of NAA might be due to improved photosynthetic efficiency brought on by thicker leaves that retain chlorophyll and efficiently transport photosynthates. Similar result was reported by Singh and Jambukiya [21].

## 3.2 Yield Parameters

### 3.2.1 Number of pods/plant

The data revealed that significant higher number of pods/plant (29.6) was recorded in Treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 6 [Boron (100ppm) + NAA (50ppm)] was statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

"The significant and maximum number of pods/plant with the application of zinc (100ppm) was due to the fact that zinc enhanced the formation of flowers into pods" observations were consistent with those of [3]. "Further, foliar application of NAA (50ppm) resulted in the higher number of pods/plant this might be due to NAA brought substantial improvement in number of filled pod/plant of green gram and it helps in reduction in flower and fruit drop which resulted in retention of greater number of pods" [25].

### 3.2.2 Number of seed/pod

The data showed that Treatment 3 [Zinc (100ppm) + NAA (50ppm)] recorded significantly higher Number of seeds/pod (10.53). However, treatment 6 [Boron (100ppm) + NAA (50ppm)] was statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

The significant and increase in number of seeds/pod with the application of zinc (100ppm) might be due to involvement of zinc in seed setting [3]. Further, the increase in seeds/pod with foliar application of NAA (50 ppm) might be due to its ability to divert more flow of assimilates towards the developing seeds [14].

### 3.2.3 Test weight (g)

Significant and highest Test weight (30.00)was recorded in Treatment 3 [Zinc (100ppm) + NAA (50ppm)].However, treatment 6 [Boron (100ppm) + NAA (50ppm)] was statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

The maximum test weight observed with application of Zn(100ppm) might be due to greater mobilization of photosynthesis to the developing seeds [8]. Further, maximum test weight was observed with application NAA (50 ppm) might be due to greater mobilization of metabolites from leaves to pods. This result was corroborated by Singh et al. [21].

### 3.2.4 Seed yield (t/ha)

Significant and higher seed yield (1.24 t/ha) was obtained in Treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 2 [Zinc (100ppm) + NAA (40ppm)], treatment 6 [Boron (100ppm) + NAA (50ppm)], treatment 5[Boron (100ppm) + NAA (40ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

The higher and significant seed yield obtained with application of Zn (100 ppm) may be due to more photosynthetic activity, uptake of nutrients, photosynthate translocation from leaves to pods the conclusions were in agreement with [22]. Further, increase in seed yield with application of NAA (50 ppm) might be due to it enhances the growth parameters and there by increased the photosynthetic rate and translocation of metabolites to the reproductive pods. Similar results were reported by Mahesh et al. [26].

### 3.2.5 Stover yield (t/ha)

The data revealed that Treatment 3 [Zinc (100ppm) + NAA (50ppm)] recorded significantly higher stover yield (2.83 t/ha). However, treatment 2 [Zinc (100ppm) + NAA (40ppm)], treatment 6 [Boron (100ppm) + NAA (50ppm)], and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were statistically at par with the treatment 3 [Zinc (100ppm) + NAA (50ppm)].

The significant and higher stover yield was obtained with application of zinc(100ppm) might be due to its direct influence on auxin production which in turn enhanced the elongation processes of plant development. These results were in conformity with those of Praveena et al. [3].

### 3.2.6 Harvest index (%)

Significant and highest higher harvest index (30.3%) was recorded in Treatment 3 [Zinc (100ppm) + NAA (50ppm)]. However, treatment 2 [Zinc (100ppm) + NAA (40ppm)], treatment 5 [Boron (100ppm) + NAA (40ppm)], treatment 6 [Boron (100ppm) + NAA (50ppm)], treatment 8 [Manganese (50ppm) + NAA (40ppm)] and treatment 9 [Manganese (50ppm) + NAA (50ppm)] were statistically at par with the treatment 3 [ Zinc (100ppm) + NAA (50ppm)].

Significant and higher harvest index was observed with application of zinc (100ppm) might be due to adequate supply of nutrients at critical stages without physiological stress and fulfilment of the demand of the crop by higher assimilation and translocation of photosynthesis from leaves to pods. Similar result was reported by Muthal et al. [27]. Increase in harvest index with application of NAA (50ppm) might be due to growth of plant and improvement in biochemical parameters and rate of cell division, cell elongation and dry matters portioning in the plant. The conclusion followed those of [21].

**Table 1. Influence of micronutrients and naphthalene acetic acid on growth attributes of greengram**

| S. No. | Treatments | Plant height (cm) | Number of branches/ Plant | Number of leaves/ plant | Plant Dry weight (g) | Number of Nodules/ plant | CGR ($g/m^2$/day) | RGR (g/g/day) |
|---|---|---|---|---|---|---|---|---|
| 1. | Zinc (100ppm) + NAA (30ppm) | 44.7 | 8.00 | 11.80 | 6.00 | 6.20 | 4.87 | 0.0304 |
| 2. | Zinc (100ppm) + NAA (40ppm) | 45.5 | 8.60 | 12.60 | 6.80 | 7.00 | 4.89 | 0.0261 |
| 3. | Zinc (100ppm) + NAA (50ppm) | 47.6 | 9.00 | 13.60 | 7.40 | 7.60 | 4.96 | 0.0239 |
| 4. | Boron (100ppm) + NAA (30ppm) | 44.6 | 8.00 | 11.60 | 5.80 | 6.00 | 4.88 | 0.0318 |
| 5. | Boron (100ppm) + NAA (40ppm) | 44.9 | 8.40 | 12.40 | 6.60 | 6.80 | 4.87 | 0.0271 |
| 6. | Boron (100ppm) + NAA (50ppm) | 47.0 | 8.93 | 13.53 | 7.20 | 7.40 | 4.69 | 0.0231 |
| 7. | Manganese (50ppm) + NAA (30ppm) | 44.3 | 7.80 | 11.00 | 5.20 | 5.40 | 4.89 | 0.0367 |
| 8. | Manganese (50ppm) + NAA (40ppm) | 44.8 | 8.20 | 12.00 | 6.20 | 6.40 | 4.89 | 0.0293 |
| 9. | Manganese (50ppm) + NAA (50ppm) | 46.0 | 8.80 | 13.27 | 7.00 | 7.20 | 4.88 | 0.0252 |
| 10. | Control N P K (25:50:25 Kg/ha) | 42.5 | 7.60 | 10.60 | 3.80 | 5.07 | 2.66 | 0.0253 |
| | **F-test** | S | S | S | S | S | NS | S |
| | **Sem±** | 0.39 | 0.15 | 0.15 | 0.04 | 0.13 | 0.11 | 0.0008 |
| | **CD at 5%** | 1.15 | 0.45 | 0.45 | 0.13 | 0.40 | -- | 0.0025 |

**Table 2. Influence of Micronutrients and Naphthalene acetic acid yield attributes and yield of greengram**

| S No | Treatments | Number of pods/ plant | Number of Seeds/ Pod | Test Weight (g) | Seed yield (t/ha) | Stover yield (t/ha) | Harvest index (%) |
|---|---|---|---|---|---|---|---|
| 1. | Zinc (100ppm) + NAA (30ppm) | 23.2 | 8.80 | 27.00 | 0.91 | 2.46 | 26.9 |
| 2. | Zinc (100ppm) + NAA (40ppm) | 26.2 | 9.60 | 28.20 | 1.04 | 2.59 | 28.1 |
| 3. | Zinc (100ppm) + NAA (50ppm) | 29.6 | 10.53 | 30.00 | 1.24 | 2.83 | 30.3 |
| 4. | Boron (100ppm) + NAA (30ppm) | 23.0 | 8.40 | 26.80 | 0.85 | 2.40 | 26.1 |
| 5. | Boron (100ppm) + NAA (40ppm) | 24.2 | 9.20 | 27.80 | 1.01 | 2.56 | 28.1 |
| 6. | Boron (100ppm) + NAA (50ppm) | 29.0 | 10.27 | 29.40 | 1.20 | 2.73 | 30.1 |
| 7. | Manganese (50ppm) + NAA (30ppm) | 22.4 | 8.20 | 26.20 | 0.81 | 2.36 | 25.4 |
| 8. | Manganese (50ppm) + NAA (40ppm) | 23.4 | 9.00 | 27.60 | 0.97 | 2.52 | 27.7 |
| 9. | Manganese (50ppm) + NAA (50ppm) | 27.6 | 10.00 | 28.60 | 1.10 | 2.65 | 28.4 |
| 10. | Control N P K (25:50:25 Kg/ha) | 22.0 | 8.00 | 25.40 | 0.77 | 2.32 | 24.4 |
| | **F-test** | S | S | S | S | S | S |
| | **Sem±** | 0.28 | 0.11 | 0.24 | 0.07 | 0.08 | 1.04 |
| | **CD at 5%** | 0.84 | 0.33 | 0.72 | 0.22 | 0.25 | 3.10 |

**Table 3. Influence of Micronutrients and Naphthalene acetic acid on Economics of greengram**

| S No | Treatments | Total cost of cultivation (INR/ha) | Gross Returns (INR/ha) | Net returns (INR/ha) | B:C ratio |
|---|---|---|---|---|---|
| 1 | Zinc (100ppm) + NAA (30ppm) | 27399.00 | 63750.00 | 36351.00 | 1.33 |
| 2 | Zinc (100ppm) + NAA (40ppm) | 27404.00 | 72525.00 | 45121.00 | 1.65 |
| 3 | Zinc (100ppm) + NAA (50ppm) | 27411.00 | 86085.00 | 58674.00 | 2.14 |
| 4 | Boron (100ppm) + NAA (30ppm) | 27402.00 | 59700.00 | 32298.00 | 1.18 |
| 5 | Boron (100ppm) + NAA (40ppm) | 27407.00 | 70500.00 | 43093.00 | 1.57 |
| 6 | Boron (100ppm) + NAA (50ppm) | 27414.00 | 83295.00 | 55881.00 | 2.04 |
| 7 | Manganese (50ppm) + NAA (30ppm) | 27394.00 | 57000.00 | 29606.00 | 1.08 |
| 8 | Manganese (50ppm) + NAA (40ppm) | 27399.00 | 67800.00 | 40401.00 | 1.47 |
| 9 | Manganese (50ppm) + NAA (50ppm) | 27406.00 | 76575.00 | 49169.00 | 1.79 |
| 10 | Control N P K (25:50:25 Kg/ha) | 27369.00 | 54300.00 | 26931.00 | 0.98 |

### 3.3 Economics

The result showed that Maximum gross return (86,085.00 INR/ha), net return (58,674.00 INR/ha) and benefit cost ratio (2.14) was recorded in treatment 3 [Zinc (100ppm) + NAA (50ppm)] as compared to other treatments [28].

Higher net returns, gross returns and benefit cost ratio was obtained with application of Zinc (100ppm) and NAA(50ppm) might be due to despite the additional input cost involved, the substantial yield increment obtained and also it may be due to higher production and productivity in terms of yield. Similar result was reported by Shashikumar et al. [19] in black gram.

## 4. CONCLUSION

Based on the above findings it can be concluded that application of Zinc 100ppm at 25 DAS along with NAA 50ppm at 15 and 30DAS as foliar spray has performed better in growth parameters and yield attributes of green gram (*PDM139-Samrat*) and also proven profitable. Since the findings are based on one season, further trails are needed to confirm the results.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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