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Effect of micronutrients on plant growth and yield in green gram

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Abstract
Green gram is one of the main pulse crops in india. Green gram is the major source of protein and fibre. It is eaten both in raw form (sprouted green gram) and cooked form (dal). The use of micronutrients in crop production is gaining importance now a day. An investigation was undertaken during *Rabi* 2013-14 in the department of Seed Science and Technology, O.U.A.T, Bhubaneswar to find out the response of micronutrients application on plant growth, yield in green gram cv.PDM-11. Five different micronutrients *viz.* zinc, boron, molybdenum, manganese and cobalt were applied in different concentrations, singly and in combination consisting of ten treatments namely, soil application of Zn (10 & 25kg zinc sulphate; zinc chelate @500g/ha) and B (5 & 10 kg borax/ha), seed treatment of Mo (Ammonium molybdate @ 5g/kg) and Co (Cobalt nitrate @1g/kg), foliar spray of Mn (Manganese dioxide @ 0.5%), mixture of all micronutrients and a control. Applications of 25kg $ZnSO_4$/ha, 10 kg borax/ha and micronutrients mixture resulted in enhancement of plant growth and yield characteristics *viz*. plant height, number of branches, pods, seeds and seed weight. The highest seed yield of 854.7kg/ha was obtained with application of micronutrients mixture followed by the application of borax @ 10kg/ha (830.50kg).Moderate effects were observed with application of Zn and Mo in respect of these traits. In general, applications of Zn, B and Mo in combinations were found effective in enhancing yield in this crop.

Keywords: Micronutrients, Greengram, plant growth, yield and seed weight

Introduction
Next to cereals, Pulses play a vital role in agriculture as these provide proteins, minerals, vitamins, rich vegetables and fodder. As the legume crops have self-nitrogen fixing capacity, their contribution has an added advantage in the present day of fertilizer crisis in the country. Pulses form the second largest source of dietary protein. Pulses are also considered as important source of minerals, micro and macro nutrients as well as health promoting secondary metabolites and considered poor man's only source of protein. *Vigna radiata*, commonly known as green gram or *mung* bean is the most widely distributed species among the six Asiatic *Vigna* species. It has diploid chromosomes no 2n=22. Micronutrient deficiency in Indian soils has emerged as one of the major constraints to crop productivity. While zinc, iron, boron and manganese deficient areas are vast, copper and molybdenum deficiency has also been observed in many districts of the country.

Materials and Methods
The present investigation has been planned to identify the most effective micronutrients application with regard to higher yield. The plots for field experiment were selected in the Central Research Station, Orissa University of Agriculture and Technology, Bhubaneswar. The experiment was carried out in medium land with well drained sandy loam soil and the chemical properties of the soil were analysed in the Department of Soil Science and Agricultural chemistry OUAT having pH (5.4) and Low status of Zn and B.
The crop was grown in *Rabi*, 2013-14 using PDM-11 variety of green gram in a plot size 8.0' × 8.5' with spacing of 30cm ×10cm. The experiment was laid in randomized block design with three replications. Appropriate production technology was adopted to raise the crops. Fertilizer was applied @ 25kg N, 50kg $P_2O_5$and 30kg K_2O along with 10 cartloads of FYM per hectare before sowing of seeds. The pods of different treatments stage and seeds after threshing were sun dried. Observations were recorded on five plant growth characteristics *viz.* days to initiation and 50 % flowering, plant height, number of primary and secondary branches

per plant, two seed characteristics *viz.*, number of seeds per pod and 1000-seed weight, two yield parameters *viz.* seed yield per plant and per hectare. There were ten treatments involving five micronutrients (Zn, Mo, B, Mn & Co) applied along with a control. Foliar application of manganese was made at 20 and 30 days after sowing while other micronutrients were applied before sowing of the crops.

Observation data recorded in various field were subjected to statistical analysis following the principle and procedure outlined by Panse and Sukhatme (1978). Square root transformations of the data were made (Gomez and Gomez, 1984), where ever necessary. The significance of difference between any two means was tested through computation of critical difference (CD).

Table 1: Identification of most effective micronutrients application

Sl. No.	Treatment symbol	Micronutrients	Name of the salt used	Concentration/ Dose of Application	Mode of application
1	T_1	Control	-	-	-
2	T_2	Zinc (Zn)	Zinc sulphate	10kg/ha	Soil application
3	T_3	Zinc (Zn)	Zinc sulphate	25kg/ha	-do-
4	T_4	Boron(B)	Borax	5kg/ha	-do-
5	T_5	Boron(B)	Borax	10kg/ha	-do-
6	T_6	Molybdenum(Mo)	Ammonium molybdate	5g/kg seed	Seed treatment
7	T_7	Cobalt(Co)	Cobalt nitrate	1g/kg seed	-do-
8	T_8	Manganese(Mn)	Manganese dioxide	0.5%	Foliar spray
9	T_9	Zinc(Zn)	Zinc chelate	500g/ha	Soil application
10	T_{10}	Mixture	All the micronutrients	*	All the methods

*$ZnSO_4$@25kg/ha + Borax @ 10 kg/ha + Ammonium molybdate @ 5g/kg seed + Cobalt nitrate @ 1g/kg seed + Manganese dioxide @ 0.5% spray.

Result and Discussion

Plant growth parameters

In the present investigation, observations were recorded on various plant growth characteristics namely days to initiation and 50 percent flowering, plant height, number of primary and secondary branches per plant.

Days to initiation of flowering

The days to flower initiation in plants among different treatments ranged from 45 to 55 days after sowing. Among the micronutrients applied, zinc and molybdenum resulted in late flowering while boron, cobalt and manganese resulted in early flowering as compared to the control. The flowering behaviour in plants applied with mixture of all micronutrients is similar to the control plants.

Days to 50% flowering

The days to flowering in 50 percentage plants in different treatments ranged from 62 to 69 days after sowing with an overall mean value of 64.6 days. Among the treatments, application of zinc and molybdenum alone resulted in late flowering while all other micronutrients either singly or in combinations resulted in early flowering in comparison to the control.

Application of boron has been reported to enhanced reproductive growth in tomato (Smiranova *et al.*, 1989), number of flowers and productive flowers per plant in brinjal (Kuruppaiah, 2005) [7] and pollen viability and seed set in sunflower (Krudnak *et al.*, 2013) [6].

Plant Height

As revealed from the results the mean plant height indicating positive effects of all the micronutrients in influencing height of plant in green gram. However, among the treatments, significantly higher effects were observed with the application of zinc (29.96 cm) and molybdenum (29.19 cm) alone or in combinations (29.45 cm) in comparison to the other treatments.

Applications of zinc, boron and micronutrients mixture have been reported to increase the plant height of tomato (Lalit Bhatt, 2004; Tamilselvi, 2005) [8, 15], brinjal (Kiran *et al.*, 2010) [5]. Increase in plant height may be attributed to the role of zinc and boron in auxin synthesis (Basabarajeswari *et al.*, 2008) [2].

Primary Branches

The micronutrients application which significantly increased this character were manganese (5.20) boron (5.0), cobalt (5.15) and their mixture (5.15). Though application of zinc chelate and zinc sulphate at higher dose of 25kg per hectare enhance this character, their effects were found non-significant.

Secondary Branches

All the micronutrients were found to have enhancing effect on this character. However, the maximum effect was found with application of borax @ 5.0kg per hectare (8.20) closely followed by micronutrients mixture (8.03), manganese (7.10) and cobalt (6.96). Application of zinc sulphate was also found to have moderate enhancing effect on this character.

Significant increase in number of branches per plant has been reported by application of boron (Basabarajeswari*et al.*, 2008) [2], zinc (Natesh *et al.*, 2005; Kiran *et al.*, 2010 [5] and Mohanty *et al.*, 2013) [10] and micronutrients mixture (Hatwar *et al.*, 2003) [4] in different crops.

Seed Characteristics

Number of seeds per pod

Among the treatments except cobalt, application of all other micronutrients had enhancing effect on this character. However, the maximum effect was observed with application of molybdenum (9.11) closely followed by micronutrients mixture (9.03). Application of higher doses of zinc (T_2) and boron (T_5) were also found effective giving 8.98 and 8.95 seeds per plant, respectively. Positive effect of application of micronutrients viz. molybdenum, boron and zinc in increasing the number of seeds per pod has been reported in green gram (Singh, 2011) [14]. The micronutrients might have enhancing role in seed setting that resulted in improvement in number of seeds per pod.

1000-seed weight

Seed weight is an important quality attribute. Although this character is genetically control, the growing condition exerts

considerable influence on its expression. Among various treatments which significantly enhanced seed weight in green gram were application of micronutrients mixture (26.61 g) followed by zinc sulphate @25kg per hectare (25.99g) as compared to the control (24.49g). Greater mobilisation of photosynthes to the developing seeds by application of micronutrients might be the reason for increase in seed weight. A number of earlier workers (Bachpai *et al.,* 2001; Singh, 2011) [1, 14] reported similar types of effect in tomato, brinjal, french bean and green gram respectively.

Seed Yield

Seed yield is an important consideration in any study relating to commercial cultivation as well as seed production of a crop. Yield potential of green gram cv. PDM-11 in the present investigation has been assess in terms of both plant and plot basis.

The average per plant seed yield ranged from 2.230g (T_1) to 3.088 g (T_{10}) with an overall mean value of 2.652 g. Similarly, the per hectare seed yield values among the treatments ranged from 617.25kg (T_1) to 854.72 kg (T_{10}) with an overall mean value of 741.08 kg. The results indicated that application of all the micronutrients either singly or in combination had enhancing effect on seed yield in green gram. However, the maximum increase in seed yield was observed with application of micronutrients mixture followed by borax @10 kg per hectare and molybdenum. All other treatments were found to have moderate to low effects in enhancing seed yield in this crop.

The result of the present investigation is in agreement with the findings of a number of workers in a number of crops. (Dordas *et al.,* 2007 [3]; Kumar *et al.,* 2007; Ramu *et al.,* 2007 [12]; Shil *et al.,* 2007 [13]; Pathak and Pandey, 2010; Nasir *et al.,* 2011 [11]; Manna *et al.,* 2013 [9]; Kumar *et al.,* 2013)

Conclusion

In the present investigation, it was apparent that application of micronutrients enhanced plant height, number of branches and days to flowering. Among the treatments, Zn, B, Mo and their mixture had produced significant enhancing effect on yield attributes including seed yield.

References

1. Bajpai S, Chouhan SVS. Effect of zinc, boron and manganese on yield of okra (*Abelmoschus esculentum*). Indian J. Agric. Sci., 2001; 71(5):332-333.
2. Basavrajeswari C, Patil RM, Hosamani PS, Ajjappalavara BH, Naik RPS Mitha, Ukkund. Effect of foliar application of micronutrients on growth, yield components of Tomato (*Lycopersicon esculentum* Mill.). Karnataka J Agric. Sci. 2008; 21(33):428-430.
3. Dordas C, Apostolides GE, Goundra O. Boron application affects seed yield and seed quality of sugar beets. Journal of Agricultural Science. 2007; 145(4):377-384.
4. Hatwar GP, Gondane SM, Urkade SM, Ahukar OV. Effect of micronutrients on growth and yield of chilli. Soils and Crops. 2003; 13(1):123-125.
5. Kiran JV, Yakaranchal BS, Raikar SD, Ravikumar GH, Deshpande VK. Seed yield and quality of brinjal as influenced by crop nutrition. Indian J Agric. Res, 2010; 44(1):1-7.
6. Krudnak A, Wonprasaid A, Machikowa T. Boron Affects Pollen Viability and seed set in sunflowers. African Journal of Agricultural Research. 2013; 89(2):162-166.
7. Kuruppaiah P. Folair application of micronutrients on growth, flowering and yield characters of brinjal cv. Annamalai. Plant Archives. 2005; 5(2):605-608.
8. Lalit Bhatt, Srivastava BK, Singh MP. Studies on the effect of foliar application of micronutrients on growth, yield and economics of tomato (*Lycopersicon esculentum* Mill.). Prog. Hort. 2004; 36(2):331-334.
9. Manna A, Hembram AK, Mandel AB. Effect of foliar application of boron on seed yield in wheat. Abstracts of paper, XII National seed seminar held at UAS Bengaluru, 2013, 30.
10. Mohanty SK, Sahoo LP, Dash S. Effect of bio-fertilizer and micronutrients on vegetative and reproductive growth behaviour and seed yield in tomato. Abstracts of paper, XII National seed seminar held at UAS Bengaluru, 2013, 41.
11. Nasir M, Khalatbari M, Farahani HM. Zn-foliar application influence on quality and quality features in Phaseolus vulgaris under different levels of N and K fertilizers. Advances in Environmental Biology, 2011; 5(5):839-846.
12. Ramu YR, Reddy DS. Effect of micronutrient management on growth, yield, quality and economics of hybrid maize. Crop Research Hisar. 2007; 33(1/3):46-49.
13. Shil NC, Noor S, Hossain MA. Effect of boron and molybdenum on the yield of chickpea. J. Agric. Rural dev. 2007; 5(1&2):17-24.
14. Singh BC. Effect of some micronutrients application on seed yield and quality in green gram. Thesis submitted to Orissa University of Agriculture and Technology. 2011, 50.
15. Tamil Selvi PRM, Nainar P. Studies the effect of foliar application of micronutrients on growth and yield of tomato. South Indian Hort. 2005; 53(1-6):46-51.