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Sangram Roy
M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Karishma Singh
Ph.D. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Joy Dawson
Professor and Head, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Subham Mondal
M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Sangram Roy
M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Effect of boron and iron on growth and yield of green gram (*Vigna radiata* L.)

Sangram Roy, Karishma Singh, Joy Dawson and Subham Mondal

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Abstract
A field experiment was conducted during *kharif* season of 2023 at Crop Research Farm Department of Agronomy on greengram. The treatments consisted of 3 levels of boron (1, 2 and 3 kg/ha) and 3 levels of foliar spray of iron (0.5% at 15 DAS, 0.5% at 25 DAS and 0.25% at 15 & 25 DAS) and control (N-P-K:25-50-25). The experiment was laid out in a Randomized Block Design with 10 treatments and replicated Thrice. Application of boron at 3 kg/ha with 0.25% Fe foliar spray at 15 & 25 DAS (Treatment 9) recorded maximum plant dry weight (14.45), pods per plant (14.2), seeds per pod (12.51), test weight (39.05g) and seed yield (1.37t/ha).

Keywords: Greengram, Boron, Iron, Growth

Introduction
After cereals and oilseeds, pulses are one of the most significant agricultural sectors in India. They make up around 14% of the total protein in an ordinary Indian diet and are the primary source of protein, especially for vegetarians. Given the significance of pulses, the WHO advises adults to consume 80 g of pulses daily. The availability of pulse per person in. Pulses are mostly consumed by humans, although they can also be utilized as forage and partially decomposed green manure (Pattanayak *et al*., 2008) [12]. In addition to food, pulses fix 25-55 kg ha^{-1} of atmospheric nitrogen annually (Pattanayak *et al*., 2016) [13]. It improves soil organic matter content, soil fertility, limit soil degradation and conserve the soil. The pulse crops are soil recuperative crops, hence cultivated in many cropping situations as a pure crop, intercrop and mixed crop. India is the largest producer (18.5 million tons) as well as importers of pulses which imports around 3.5 million tons annually to meet its over increasing consumption need of around 22.0 million tons. India is contributing around 25 percent of total global consumption. Among pulses chick pea, pigeon pea, green gram and black gram are produced in India. Green gram is the major pulse crop which ranks third next to gram and red gram and is the third important pulse crop of India, grown in nearly 8% of the total pulse area of the country (GOI, 2013). It is particularly significant in the nation's intensive crop production system because of its brief growing season. India contributes roughly 35–37% and 27%, respectively, to the global area and production of pulses. For every 100 grams, one greengram has 334 calories. and the following make up its chemical composition: minerals 3.5%, fat 1.3%, carbohydrate 56.6%, crude protein 24.0%, lysine 0.43%, methionine 0.10%, and tryptophan 0.04% (Kachroo, 1970) [7].
One of the vital micronutrients that promotes plant development and reproduction is Iron (Fe) (Welch, 1995) [19]. The first nutritional element to be identified as important was iron. for the survival of plants. Iron is essential for a number of metabolic processes in the plant system, including respiratory enzymes and several photosynthetic reactions. Legumes, such as green grams, also require iron for the nitrogen-fixing process and nodule development. It is not the sole necessary component needed by the rhizobium and the host bean. Because foliar chlorosis occurs when iron is deficient in the plant system, iron has been linked to the production of chlorophyll. Newly sprouting leaves turn yellowish green due to an iron deficit. However, interveinal chlorosis (green vein retention) persists. Sogai sickness is the final stage of a leaf's color change to yellow.

One of the most popular techniques for treating Fe shortage in various crops is foliar application of Fe solutions. This application technique typically gets over the issues with applying Fe to soil. According to Bera, M., and Ghosh, G.K. (2015) [3], foliar sprays of iron dramatically decreased iron-deficiency chlorosis and boosted soybean seed output. According to Atul and Singh (2017) [2], balanced fertilization of macro and micronutrients, especially in combination, is crucial for the healthy growth, development, and high yield production of agricultural plants, including green gram. Furthermore, as Boron (B) is necessary for the growth of all vascular plants, an excess or shortage of it can negatively impact a number of physiological and metabolic processes (Reid, 2007) [16]. According to Gupta (2007) [5], this non-metal element is essential for cell division, pod formation, and seed formation. Its restriction causes a noticeable decline in the nodulation, yield, growth, viability, and vigor of legumes (Quddus *et al*., 2011) [14]. Additionally, it regulates the movement of carbohydrates and the absorption of water by plants; as a result, when legumes are given insufficient amounts of B, their economic output is reduced. Raj (1985) [15] and Ross *et al*. (2006) [17].

Materials and Methods

During the *Kharif* season of 2023, field experiment was carried out in alluvial soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh. The soil of experimental plot was sandy loamy, having a nearly neutral soil reaction (pH 6.9), electrical conductivity (0.295 ds/m). The experiment was laid out in a Randomized Block Design with 10 treatments and replicated thrice. The treatment consist of 3 different levels of boron(1, 2 and 3 kg/ha) and 3 levels of foliar spray of iron (0.5% at 15 DAS, 0.5% at 25 DAS and 0.25% at 15 & 25 DAS) and control(N:P:K-25:50:25).

Plant growth parameter, plant dry weight (g/plant), were measured at 15 days intervals from germination till harvest and yield and yield attributes, such as No. of pods/plant, No. of seeds/pod, test weight(g),Seed yield(t/ha),were measured at harvest. The observed data were statistically analysed using analysis of variance (ANOVA) as applicable to Randomized Block Design.

Results and Discussion

Growth parameters

Plant dry weight: At 60 DAS, significant and highest plant dry weight (14.45 g) was recorded in treatment-9. However, the treatment-3(13.79), treatment 1(13.32) & treatment-2 (11.83) was found to be statistically at par with treatment-9(14.45).

Significant and higher plant dry weight was with application of Boron might be due to growth and development of plants, which obtained by enhanced metabolic activities and photosynthetic rate, resulting in improvement in the accumulation of dry matter at the successive growth stages. Similar result was also reported by Hiren *et al*. (2020) [6].

Yield and Yield attributes

Number of pods/plant: Significant and maximum number of Pods/plant (14.2) was recorded with treatment-9 which was superior over all other treatments. However, the treatment-3 (12.47) was found to be statistically at par with treatment-9 (14.2).

Significant and maximum number of pods/plant yield was with foliar application of iron which help in pod development. Similar result was also reported by Kumar *et al.* (2020) [9]. Further, significant and maximum number of pods/plant was with application of Boron might be due to supply of Boron in adequate amount also help in the development of floral and reproductive parts, which results in the maximum development of pods and seeds in plant. Similar result was also reported by Movalia *et al*. (2017) [11].

Number of seeds/pod

Significant and maximum number of seeds/pod (12.51) was recorded with treatment-9. However, the treatment-3 (11.12) was found to be statistically at par with treatment-9 (12.51).

Significant and maximum number of seeds/pod was with application of Boron might be due to synthesis of Boron containing amino acids, proteins, which leads to stimulating photosynthesis and seed formation and also Boron plays vital role in energy storage and transformation, carbohydrate metabolism and activation of enzymes, which results in the development of seeds in plants. Similar findings is also reported by Rukeiya *et al.* (2018) [18].

Test Weight (g)

Significant and highest test weight (39.05g) was recorded with treatment-9, which was superior over all other treatments. However, the treatment-3 (37.89), treatment-1 (36.95) and treatment-6 (36.28) was found to be statistically at par with treatment-9 (39.05).

Significant and higher test weight due to application of Boron, which is essential for nitrogen fixing nodules in legumes and in formation of chlorophyll, promotes proteins formation, amino acids and seed development. Similar result was also reported by Alam *et al.* (2016) [1].

Seed yield (t/ha)

Significant and highest seed yield (1.37 t/ha) was recorded with treatment-9. which was superior over all other treatments. However, the treatment-3(1.29 t/ha), treatment-10 (1.2 t/ha) & treatment-1 (1.21 t/ha) was found to be statistically at par with treatment-9 (1.37 t/ha).

Significant and higher seed yield was with foliar application of iron results in pod development and grain formation which increases seed yield of the crop, Similar result was also reported by Kavya *et al.* (2021) [8]. Further, significant and higher seed yield was with application of Boron might be due to overall improvement in growth and development by Boron fertilization with increased photosynthesis and greater mobilization of photosynthates towards reproductive structures leads to increase in yield of greengram. Similar result was also reported by Mecarty *et al*. (2022) [10].

Table 1: Response of Boron and Iron on growth and yield of Greengram

S. No.	Treatment Combinations	Dry weight (g/plant) 60 DAS	Pods/Plant (No.)	Seeds/Pod (No.)	Test weight (g)	Seed yield (t/ha)
1.	1 kg/ha Boron + 0.5% Fe (15 DAS)	13.32	10.47	10.11	36.95	1.21
2.	1 kg/ha Boron + 0.5% Fe (25 DAS)	11.83	8.87	6.96	33.78	1.08
3.	1 kg/ha Boron + 0.25% Fe (15 DAS & 25 DAS)	13.79	12.47	11.12	37.89	1.29
4.	2 kg/ha Boron + 0.5% Fe (15 DAS)	11.47	10.47	7.54	35.65	1.09
5.	2 kg/ha Boron + 0.5% Fe (25 DAS)	9.87	7.8	6.27	31.81	0.77
6.	2 kg/ha Boron + 0.25% Fe (15 DAS & 25 DAS)	10.85	9.6	8.70	36.28	1.03
7.	3 kg/ha Boron + 0.5% Fe (15 DAS)	11.14	9.73	8.16	35.90	1.12
8.	1 kg/ha Boron + 0.5% Fe (25 DAS)	10.91	7.73	8.33	33.91	0.87
9.	3 kg/ha Boron + 0.25% Fe (15 DAS & 25 DAS)	14.45	14.2	12.51	39.05	1.37

Conclusion

It is concluded that, application of boron at 3kg/ha along with foliar spray of iron at 0.25% at 15 DAS & 25 DAS (treatment 9) recorded highest yield attribute and yield in greengram.

References

1. Alam MS, Islam MF. Effect of zinc and boron on seed yield and yield contributing traits of mungbean in acidic soil. J Biosci Agric Res. 2016;11(02):941-946.
2. Atul Kumar Saini, Rajesh Singh. Effect of Sulphur and Iron Fertilization on Growth and Yield of Greengram [*Vigna radiata* L.]. Int. J Curr Microbiol App Sci. 2017;6(6):1922-1929.
3. Bera M, Ghosh GK. Efficiency of Sulphur Sources on green gram (*Vigna radiata* L.) In Red and Lateritic Soil of West Bengal. Int. J Plant Anim Environ Sci. 2015;5(2):109-116.
4. Government of India. Economics and Statistics of Indian Agriculture. Annual report, 2013.
5. Gupta UC. Boron. In: Barker AV, Pilbeam DJ, editors. Handbook of Plant Nutrition. CRC Press; 2007. p. 241-277.
6. Hiren Das, Surbala Devi N, Kumarjit Singh RK, Herojit Singh A, Nabachandra Singh L, Gopimohan Singh N. Influence of boron and lime on boron concentration and dry matter yield of green gram (*Vigna radiata* L.). Int. J Chem Stud. 2020;8(6):631-634.
7. Kachroo P. Pulse crops of India. ICAR; 1970. p. 148.
8. Kavya Pochampally, Singh Shikha, Hinduja Narreddy, Tiwari Dhananjay, Sruthi Saivasavi. Effect of Foliar Application of Micronutrients on Growth and Yield of Greengram (*Vigna radiata* L.). Legume Res. 2021;44(12):1460-1464.
9. Kumar R, Baba A, Singh K, Bhusan A, Kumar M. Proficiency of sulphur and iron fertilization on yield, yield attributes and economical parameters of green gram (*Vigna radiata* L.) cultivar "Subh-51". 2020;20:8557-8560.
10. Mecarty J, Dawson J, Lalrammawii C. Effect of micronutrients on growth and yield of Green gram (*Vigna radiata* L.). 2022;2967-2969.
11. Movalia Janaki A, Parmar KB, Vekaria LC. Effect of boron and molybdenum on yield and yield attributes of summer green gram (*Vigna radiata* L.) under medium black calcareous soils. Int. J Chem Stud. 2018;6(1):321-323.
12. Pattanayak SK, Rao DLN. Bulletin of Biofertilizers for Tropical Vegetables. ANP on Biofertilizers-OUAT; c2008.
13. Pattanayak SK, Sarkar A. Sustainable management of Acid soils: Technologies and their Transfer. Indian J Fertilizers. 2016;12(7):16-24 & 3.
14. Quddus MA, Rashid MH, Hossain MA, Naser HM. Effect of zinc and boron on yield and yield contributing characters of mungbean in low Ganges river floodplain soil at Madaripur, Bangladesh. Bangladesh J Agric Res. 2011;36:75-85.
15. Raj S. An Introduction to Physiology of Field Crops. Oxford and IBH Publishing Co.; 1985. p. 94-97.
16. Reid R. Identification of boron transporter genes likely to be responsible for tolerance to boron toxicity in wheat and barley. Plant Cell Physiol. 2007;48:1673-1678.
17. Ross JR, Slaton NA, Brye KR, Delong RE. Boron fertilization influences on soybean yield and leaf and seed born concentration. Agron J. 2006;98:198-205.
18. Rukeiya Begum, SK Swain, SK Mohanty. Effect of micronutrients on plant growth and yield in green gram. Int. J Chem Stud. 2018;6(2):1671-1673.
19. Welch M. Micronutrient Nutrition of Plants. Crit Rev Plant Sci. 1995;14(1):49-92.