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Performance of Blackgram as influenced by Soil and Foliar Application of Macro and Micro Nutrients on Plant Growth Parameters

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ABSTRACT: The present investigation on performance of black gram as influenced by soil and foliar application of nutrients on plant growth parameters was conducted in clay loam soil at our college farm, Alpine Institute of Technology, Premnagar, Dehradun (Affiliated to Hemvati Nandan Bahuguna Garhwal University, Srinagar Uttarakhand) during summer season of 2021. The trail was conducted in RBD design with three replications consisting of 8 treatments. The results revealed that, among the various treatments, maximum plant height and number of branches per plant were recorded in T_6 at 30, 45,60 and at harvest (16.88 cm, 36.43cm, 52.75 cm and 64.13cm) and (4.19, 5.23, 7.66 and 8.88) respectively.

Keywords: Blackgram, macro and micronutrients, plant height and number of braches per plant.

INTRODUCTION

Pulses are the key sources of nutrition for billions of people around the world. 2016 as the International Year of Pulses was declared by the Food and Agriculture Organization of the United Nations which aims to enhance the public awareness of the nutritional benefits of pulses as part of sustainable food production (Narpinder Singh, 2017).

In India black gram, chickpea, pigeon pea, green gram, dry pea and lentil like pulse crops are grown under a wide range of agro climatic conditions. The split form of pulses are known as dal, which are superb source of high quality protein, fibers, vitamins, minerals, essential amino acids and fatty acids. Pulses helps in improving soil health, sustainable cropping system, abiding fertility and organic matter from succeeding crops.

In India, pulses are grown in low fertile graded, neglected soils and under rainfed conditions. In World, India is the largest producer and consumer of wide variety of pulses which is dominated by tropical and subtropical crops. In India, production of pulses is 24.30 million tons (ESI, 2019) with a low productivity of 817 kg ha^{-1}. Farmers highly prefer cereals than pulses due to high risk and less profitable; hence, the production of the pulses is extremely low. India is importing 5 million tons at present, in order to meet the demand of pulses. India's Population is unprecise to be 1.68 billion by 2030 from the present level of 1.38 billion. Accordingly, the prophesy pulse requirement for the year 2030 is 39 million tons with an expected growth rate of 4.5% (FAO, 2020).

Blackgram (*Vigna mungo* L.) one of the important pulse crop, grown throughout the country. Among pulses, black gram has enlarged area from 18.7 m ha in 1971-72 to 4.6 m ha during 2020-21 with production level of 2.45 million tonnes (India stat 2021). The multiply in production is mainly accredit to additional area brought under the pulses additionally productivity from 0.5 to 1.6 t ha^{-1}. Along with this, in Northern India cultivation of pulses in summer and winter cultivation in rice fallows and also same followed in southern and coastal areas of the country to additional acreage. In India, Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Andhra Pradesh and Karnataka are major black gram producing states (Ministry of Agriculture, 2019-2020).

The aim of the experiment was to study the result of distinct dosages of micronutrients application on field emergence, plant height, no. of branches per plant of black gram. Besides major nutrients, micronutrient is also important and essential for higher productivity of Blackgram. Among the micronutrients, boron deficiency in plant is second after zinc.

MATERIAL AND METHODS

A field experiment was conducted in the Department of Agronomy at college farm, Alpine Institute of Technology, Premnagar, Dehradun (Affiliated to Hemvati Nandan Bahuguna Garhwal University, Srinagar Uttarakhand) during summer season of 2021 to study the Performance of blackgram influenced by soil and foliar application of nutrients on growth parameters of blackgram. The type of soil in the experimental field was sandy loam in texture, low in

available N, high in available P, and medium in available K. Blackgram variety PU 31 used for experimentation. The experiment was laid out in randomized block design with eight nutrient management practices T_1: Control (Untreated), T_2: RDF (25 kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25kg K_2O ha^{-1}), T_3: RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1})+ Zn(25 kg $ZnSO_4$ ha^{-1}), T_4: RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + S (20kg S ha^{-1}), T_5: RDF (25 kg N + 50 kg P_2O_5 + 25kg K_2O) + B (100 ppm as foliar application), T_6: RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20kg S ha^{-1}), T_7: RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) and T_8: RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + S (20kg S ha^{-1}) + B (100 ppm as foliar application). The observations were taken on field emergence, plant height and number of branches $plant^{-1}$ of blackgram. The data on field emergence was observed by number of seedling emerged in two rows of each replication were counted in each plot at 10 DAS.

$$\text{Field emergence (\%)} = \frac{\text{No. of seedling in two rows}}{\text{Total no. of seed sown}} \times 100$$

Height of the plant was measured from base to tip of the plant at 30, 45, 60 DAS and at maturity. The plant height will be measured with the help of meter scale and average was computed and expressed in centimeters. Randomly 5 plants were selected and calculate the average height. Total number of branches was counted from five selected plants and average number of branches $plant^{-1}$ was computated.

RESULTS AND DISCUSSION

Growth performance of blackgram is generally reported by plant height, number of branches, field emergence which is governed by environmental factors. The macro and micronutrients applications have shown significant influence on the growth parameters such as plant height and number of branches.

Field emergence (%). The soil & foliar application of macro and micro nutrients had no significant influence on field emergence of blackgram. The data was presented in the Table 1.

Table 1: Influence of different treatments on Field emergence of Black gram.

Treatment details	Field emergence (%)
T_1 : Control	28.47
T_2 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1})	28.53
T_3 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + Zn(25 kg $ZnSO_4$ ha^{-1})	28.75
T_4 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + S (20kg S ha^{-1})	28.41
T_5 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + B (100 ppm as foliar application)	28.55
T_6 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20kg S ha^{-1})	28.71
T_7 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application)	28.74
T_8 : RDF(25kg N ha^{-1} + 50 kg P_2O_5 ha^{-1} + 25 kg K_2O ha^{-1}) + S (20kg S ha^{-1}) + B (100 ppm as foliar application)	28.78
Mean	85.69
S.E (M)	0.214
C.D at 5%	N.S

Plant height. Plant height is an important parameter that reflecting the growth of the blackgram. The effect of different macro and micronutrients application has shown significant influence on plant height. The data was presented in Table 1 and Fig. 1.

Plant height at 30 DAS. Higher plant height was recorded in treatment T_6 with application of (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}), and it was at par with T_8 (25: 50: 25 kg NPK ha^{-1}) + B (100 ppm as foliar application) followed by T_4 (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}), T_7 (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application). The treatment T_1 (Control) was recorded the lower plant height compared with other treatments.

Plant height at 45 DAS. Application of macro & micro nutrients had shown significant influence on plant height at 45 DAS. Maximum plant height was observed in T_6 RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}), which was proportionate with T_8 (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) followed by T_4 (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S* ha^{-1}), T_7 (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) and the minimum plant height was observed in T_1 (Control), correlate to other treatments.

Plant height at 60 DAS. Application of (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1})- T_6 has recorded higher plant height and which was at par with application of (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) T_8 solemnized by (25: 50: 25 kg NPK ha^{-1}) + S (25 kg S ha^{-1}) T_4. The lower plant height was observed in the treatment of T_1 (Control) as compared with various treatmental combinations.

Plant height at harvest. Highest plant height was recorded at T_6 RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}), which was equal with T_8 (25: 50: 25 kg NPK ha^{-1}) + B (100 ppm as foliar application) followed by T_4 (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}), T_7 (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application). As compared with other treatments, T_1 (Control) was recorded lower plant height. Higher plant height might be due to improvement in overall vegetative growth of the crop with the combined application of Zn and S with NPK in the investigation was in conformity with those of Malla Reddy *et al*. (2007); Pandian (2014); Mir *et al*. (2014); Pradhan *et al*. (2018).

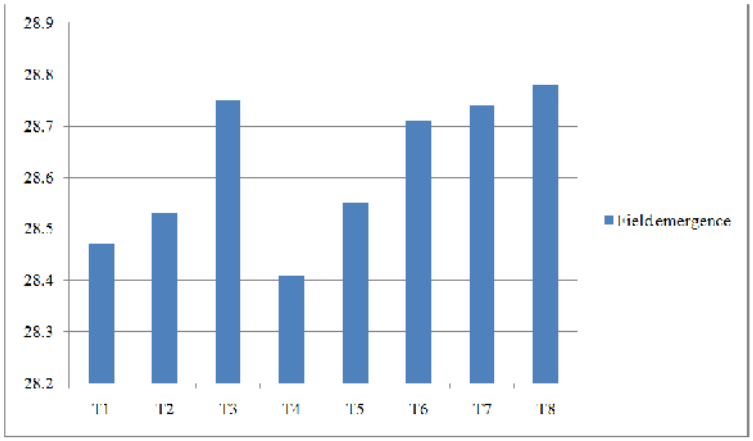

Fig. 1. Field emergence of Black gram under different treatments.

Table 2: Plant height of blackgram at growth intervals as influenced by application of macro & micro nutrients.

Treatment details	Growth intervals			
	30 DAS	45 DAS	60 DAS	Harvest
T_1: Control	10.61	27.67	37.05	46.22
T_2: RDF (25 kg N ha^{-1} + 50 kgP_2O_5 ha^{-1} + 25kg K_2O ha^{-1})	12.41	29.68	40.93	51.77
T_3: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1})	13.34	31.50	44.03	55.57
T_4: RDF + (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1})	15.14	33.24	48.24	59.95
T_5: RDF (25: 50: 25 kg NPK ha^{-1}) + B (100 ppm asfoliar application)	12.97	30.31	42.59	53.16
T_6: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1})	16.88	36.43	52.75	64.13
T_7: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application)	14.70	32.24	46.64	56.67
T_8: RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application)	16.24	34.96	49.87	61.68
Mean	14.04	32.00	45.26	56.11
SE(m)	1.01	1.51	1.99	2.83
C.D. at 5%	3.09	4.62	6.10	8.74

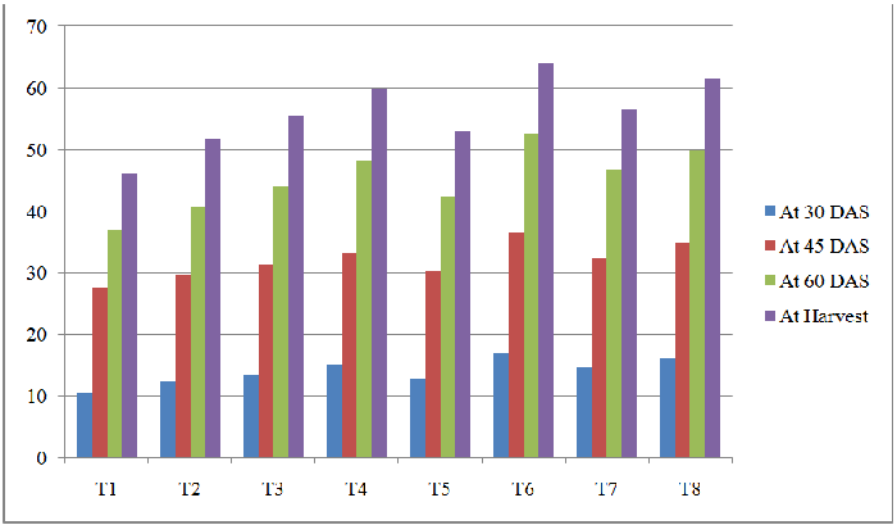

Fig. 2. Plant height of black gram at different intervals influenced by various treatments.

Number of branches plant^{-1}. Number of branches plant^{-1} of blackgram was significantly influenced due to different treatment combinations at all growth 30, 45, 60 and at harvest are presented in Table 3 and graphically supported by Fig. 2. It is evident from the data that number of branches plant^{-1} increased orderly with the advancement in growth intervals upto harvest due to soil & foliar application of macro & micro nutrients.

Number of branches plant^{-1} at 30 DAS. The application of RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}) T_6 had shown the maximum number of branches with no significant difference with RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) T_8

succeeded by RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) T_4, (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) T_7. Minimal number of branches per plant was recorded in T_1 (control), compared with other treatments.

Number of branches plant^{-1} at 45 DAS. Number of branches per plant was notably influenced by application of micronutrients. Higher number of branches was recorded with application of RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}) T_6, which was at par with application of RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) T_8 as accompanied by application of RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) T_4, RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) T_7 and the treatment T_1 (control) showed the least number of branches, as compared with other treatments.

Number of branches plant^{-1} at 60 DAS. Number of branches maximum was recorded in treatment T_6 with the application of RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}), which was equal with RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) T_8 followed by RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) T_4, RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) T_7 and obtained minimum number of branches plant^{-1} was obtained in control (T_1) treatment among all the different nutrient combinations.

Table 3: Number of branches plant^{-1} of blackgram at different intervals as influenced by the application of macro & micro nutrients.

Treatment details	Growth intervals			
	30 DAS	45 DAS	60 DAS	Harvest
T_1: Control	1.49	1.87	2.73	3.17
T_2: RDF (25 kg N ha^{-1} + 50 kgP_2O_5 ha^{-1} + 25kg K_2O ha^{-1})	2.42	3.03	4.43	5.14
T_3: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1})	3.31	4.14	6.06	7.02
T_4: RDF + (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1})	3.62	4.53	6.63	7.68
T_5: RDF (25: 50: 25 kg NPK ha^{-1}) + B (100 ppm as foliar application)	2.96	3.70	5.42	6.28
T_6: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1})	4.19	5.23	7.66	8.88
T_7: RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application)	3.41	4.26	6.23	7.22
T_8: RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application)	3.71	4.64	6.80	7.87
Mean	3.14	3.925	5.746	7.27
SE (M)	0.30	0.38	0.55	0.64
C.D. at 5%	0.92	1.15	1.69	1.96

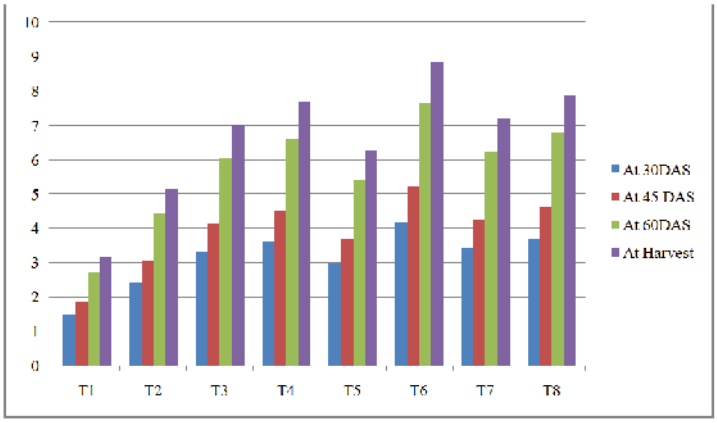

Fig. 3. Number of branches plant^{-1} at different intervals in black gram influenced by various treatments.

Number of branches plant^{-1} at Harvest. Application of RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}) T_6 was found the highest number of branches, followed by application of RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) + B (100 ppm as foliar application) T_8, RDF (25: 50: 25 kg NPK ha^{-1}) + S (20 kg S ha^{-1}) T_4, RDF (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + B (100 ppm as foliar application) T_7 and the lower number of branches was observed in T_1 (control), in relation to other treatments. The significant increase in number of branches plant^{-1} was recorded at harvest (8.88) in T_6 by the application of (25: 50: 25 kg NPK ha^{-1}) + Zn (25 kg $ZnSO_4$ ha^{-1}) + S (20 kg S ha^{-1}) which has notably greater than control T_1. The observed improvement in overall vegetative growth and more translocation photosynthesis from source to sink which helps to increase the number of branches per plant due to soil & foliar application of macro & micro nutrients to the blackgram crop. The results were in conformity with the findings of Reddy and Majumder (2004); Malla Reddy *et al*. (2007); Basavarajappa *et al*. (2013); Pandian (2014); Mir *et al*. (2014).

CONCLUSION

It was evident that, field emergence was not significantly influenced by combined application of macro and micro nutrients, but it was showed significant influence on plant height and number of branches plant^{-1} of blackgram in sandy loam soils of Dehradun.

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Conflict of Interest. None.

REFERENCES

Basavarajappa, R., Salakinkop, S. R., Hebbar, M., Basavarajappa, M. P., & Patil, H. Y. (2013). Influence of foliar nutrition on performance of blackgram (Vigna mungo L.), nutrient uptake and economics under dry land ecosystems. *Legume Research-An International Journal*, *36*(5), 422-428.

Economic Survey of India (ESI). The Economic Survey 2014-15. *The Economic Surveyof India*, New Delhi, 2015.

Kannan, P., Arunachalam, P., Prabhukumar, G. and Prabhaharan, J. (2014). Response of black gram (*Vigna mungo* L.) to multi-micronutrient mixtures under rainfed Alfisol. *Journal of the Indian Society of Soil Science*, *62*(2), 154- 160.

Malla Reddy, M, Padmaja, B., Malathi, S. and Jalapathi Rao, L. (2007). Effects of micronutrients on growth ad yield of pigeon pea. *Journal of SAT Agricultural Research*, *5*(1).

Mir, A. H., Lal, S. B., Salmani, M., Abid M. and Khan, I. (2014). Growth, yield and nutrient content of black gram (*Vigna mungo*) as influenced by levels of phosphorus, sulphur and phosphorus solubilizing bacteria. *SAARC Journal of Agriculture*, *11*(1), 1- 6.

Pradhan., U., Mahanty, S. K., Padhiary, A. K., Behera, S. and Jena, A. (2018). Effect of micronutrient application on plant gowth attribute in black gram (var. Prasad). *Journal of Pharmacognosy and Phytochemistry*, *7*(6), 642-645.

Reddy, C. C. S. and Majumder, T. K (2004). Effect of foliar spray of boron and IAA on vegetative growth and yield of black gram (*Vigna mungo* L. Hepper). *Environment and Ecology*, *22*(2), 445- 446.

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