International Journal of Plant & Soil Science

34(20): 454-457, 2022; Article no.IJPSS.87876
ISSN: 2320-7035

Influence of Potassium and Sulphur on Growth and Yield of Greengram (*Vigna radiata.* L)

Guggilla Akhil [a*ω], Victor Debbarma [a#] and Addanki Tejaswi [aω]

[a] Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj, (U.P), India.

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/2022/v34i2031175

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/87876

Original Research Article

Received 07 April 2022
Accepted 15 June 2022
Published 25 June 2022

ABSTRACT

The experiment was conducted during *Zaid* season 2021 at KVK, SHUATS, Prayagraj (U.P.) to study the influence of potassium and sulphur on growth and yield of greengram. The treatments consist of potassium 15, 25, 35 kg/ha and sulphur 10, 20, 30 kg/ha. The result reported that application of potassium 35 kg/ha + sulphur 30 kg/ha (Treatment 9) recorded significantly highest Plant height (45.77 cm), maximum number of branches (6.50), maximum number of nodules (21.73), maximum plant dry weight (9.66 g). It is also observed that the maximum grain yield (1,109.67 kg/ha) and stover yield (2,431.00 kg/ha) was obtained with the application of potassium 35 kg/ha along with sulphur 30 kg/ha. It was concluded that application of potassium and sulphur performs positively and improves growth and yield parameters of Greengram.

Keywords: Greengram; potassium; sulphur; growth and yield.

1. INTRODUCTION

Pulses are the important crops in India and the main source of vegetable protein. In India, Pulses are grown on 28.34 m h area with aproduction of 23.2 m t and the productivity is 817 kg/ha [1]. Greengram is an important conventional pulse crop of India. Its grain contains 24.20% protein, 1.3% fat, 60.4% carbohydrates, calcium and phosphorus are 118 and 340 mg per 100 g of seed [2]. In India during 2020-21, greengram is grown in about 34.35 lakh

ω M.Sc. Scholar;
 # Assistant professor;
**Corresponding author: E-mail: guggillaakhil@gmail.com;*

ha with the total production of 2.5 m t with a productivity of 548 kg/ha and contributing 10% to the total pulse production. The yield potential of this crop is very low and plagued with a number of diseases and pests. The production of pulse crop in our country including greengram is not enough to meet the domestic demand of the population. There is scope to enhance the productivity of greengram by proper agronomic practices and fertilizers. Application of nutrients for increasing and exploiting genetic potential of the crop is considered as an efficient and economic method of supplementing the nutrient requirement. Application of sulphur will enhance the nutrient availability and in turn increases the productivity [3]. Potassium is an essential macronutrient required for proper development of plants [4]. sulphur provides indirect nutritive values on soil amendment, it improves use efficiency of other essential plant nutrient, particularly nitrogen and phosphorus [5]. Keeping the points in view an experiment was conducted to study the effect of potassium and sulphur on growth and yield of Greengram.

2. MATERIALS AND METHODS

The experiment was conducted during the *Zaid* season of 2021, at Krishi Vigyan Kendra, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.) which is located at 25^{o}24'06.4'N latitude, 81^{o}51'12.1' E longitude and 98 m altitude above the mean sea level (MSL). The experiment was conducted in Randomized Block Design (RBD) with 10 treatments each replicated thrice. The size of each treatment was 3m x 3m. There are two factors which are potassium (15, 25 and 35 kg/ha) and sulphur (10, 20 and 30 kg/ha). The potassium and sulphur were supplied in the form of MOP and WDG sulphur and they are applied as basal dose at the time of sowing. The greengram variety Samrat (PDM-139) was sown on 10th April 2021 by maintaining a spacing of 30×10cm.

The treatment details are; T_1 -(K 15 kg/ha + S 10 kg/ha), T_2 -(K 15 kg/ha + S 20 kg/ha, T_3 -(K 15 kg/ha + S 30 kg/ha), T_4 -(K 25 kg/ha + S 10 kg/ha), T_5 -(K 25 kg/ha + S 20 kg/ha), T_6 -(K 25 kg/ha + S 30 kg/ha), T_7 -(K 35 kg/ha + S 10 kg/ha), T_8 -(K 35 kg/ha + S 20 kg/ha), T_9 -(K 35 kg/ha + S 30 kg/ha), T_{10} -(N 20 kg/ha + P 40 kg/ha + K 20 kg/ha) Control. The data were subjected to statistical analysis by analysis of variance method [6].

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

Plant height – Significant and highest plant height (45.77 cm) was recorded in T_9 (K 35 kg/ha + S 30 kg/ha) [Table 1]. The reason may be attributed to the fact that sulphur is involved in the formation of chlorophyll thereby promotes vegetative growth; consequently, increases plant height [7].

Branches/plant – Significant and maximum number of branches (6.50) was recorded in T_9 (K 35 kg/ha + S 30 kg/ha). However, T_8 (K 35 kg/ha+ S 20 kg/ha) was found to be statistically at par with T_9 (K 35 kg/ha + S 30 kg/ha) [Table 1]. Application of sulphur showed a profound influence on the number of branches per plant. This might be due to known role of sulphur in stimulation of cell division, photosynthetic process as well as formation of chlorophyll [3].

Nodules/plant – Significant and maximum number of nodules/plant (21.73) was recorded in T_9 (K 35 kg/ha + S 30 kg/ha). However, T_8 (K 35 kg/ha + S 20 kg/ha) and T_7 (K 35 kg/ha + S 10 kg/ha) was found to be statistically at par with T_9 (K 35 kg/ha + S 30 kg/ha) [Table 1]. Application of Sulphur showed that maximum number of nodules/plant might be due to better ferredoxin and nitrogenase activity at later stages of crop growth [8].

Dry weight/plant – Significant maximum plant dry weight (9.66 g) was recorded in T_9 (K 35 kg/ha + S 30 kg/ha). However, T_8 (K 35 kg/ha + S 20 kg/ha) was found to be statistically at par with T_9 (K 35 kg/ha + S 30 kg/ha) [Table 1]. significantly maximum plant dry weight might be due to strong exchange mechanism by application of potassium in soil, greater cell division and elongation, efficient nodulation and CO_2 assimilation. Similar findings also reported by [9].

3.2 Yield

Grain yield – Significantly highest grain yield (1,109.67 kg/ha) was recorded in T_9 (K 35 kg/ha + S 30 kg/ ha) [Table 2]. The increase in grain yield ascribed due to the reason that application of potassium along with zinc possibly increased the availability of N, P and K in soil solution and ultimately resulted in the vigorous root development, which promotes growth and development of the plant leading to higher photosynthetic activity which in turn results in better development of yield attributes and finally higher seed yield [10].

Table 1. Influence of potassium and sulphur on growth parameters of greengram

	At 60 DAS			
Treatments	**Plant height (cm)**	**Branches per plant**	**Nodules per plant**	**Dry weight per plant (g)**
T1- K 15 kg/ha + S 10 kg/ha	40.73	4.77	16.73	8.18
T2- K 15 kg/ha + S 20 kg/ha	40.47	5.20	17.53	8.29
T3- K 15 kg/ha + S 30 kg/ha	41.27	5.30	17.97	8.42
T4- K 25 kg/ha + S 10 kg/ha	41.83	5.40	18.20	8.37
T5- K 25 kg/ha + S 20 kg/ha	42.73	5.50	18.87	8.39
T6- K 25 kg/ha + S 30 kg/ha	42.87	5.60	20.77	8.44
T7- K 35 kg/ha + S 10 kg/ha	43.67	5.73	21.10	8.68
T8- K 35 kg/ha + S 20 kg/ha	44.47	6.10	21.20	9.33
T9- K 35 kg/ha + S 30 kg/ha	45.77	6.50	21.73	9.66
T10- (Control)	39.70	4.10	16.87	8.13
F test	S	S	S	S
SEm (±)	0.39	0.16	0.31	0.14
CD (P=0.05)	1.16	0.47	0.92	0.42

Table 2. Influence of potassium and sulphur on yield of greengram

At Harvest		
Treatments	**Grain yield (Kg/ha)**	**Stover yield (Kg/ha)**
T1- K 15 kg/ha + S 10 kg/ha	901.33	1,961.67
T2- K 15 kg/ha + S 20 kg/ha	917.33	1,973.33
T3- K 15 kg/ha + S 30 kg/ha	945.67	1,988.67
T4- K 25 kg/ha + S 10 kg/ha	962.67	2,035.00
T5- K 25 kg/ha + S 20 kg/ha	966.00	2,076.00
T6- K 25 kg/ha + S 30 kg/ha	973.33	2,152.67
T7- K 35 kg/ha + S 10 kg/ha	1,009.67	2,261.33
T8- K 35 kg/ha + S 20 kg/ha	1,064.33	2,374.33
T9- K 35 kg/ha + S 30 kg/ha	1,109.67	2,431.00
T10- (Control)	909.33	1,963.00
F test	S	S
SEm (±)	8.35	0.19
CD (P=0.05)	24.81	0.57

Stover yield – Significantly highest stover yield (2,431.00 kg/ha) was recorded in T_9 (K 35 kg/ha + S 30 kg/ha) [Table 2]. The positive effect of sulphur on straw yield may be due to the pronounced role of sulphur in stimulation of cell division, photosynthetic process as well as formation of chlorophyll. It also promotes the root nodules in legumes, which cause the more sulphur available during vegetative growth period and development of plant occurs. It resulted in higher plant height and number of branches per plant and ultimately helped in realization of higher straw yield [11,12].

CONCLUSION

It was concluded that application of potassium and sulphur performs positively and improves growth and yield attributes of greengram with application of potassium 35 kg/ha along with sulphur 30 kg/ha resulted in achievement of maximum grain yield (1,109.67 kg/ha) and stover yield (2,431.00 kg/ha). These findings are based on one season therefore, further trail may be required for further confirmation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. GOI. Economics and Statistics of Indian Agriculture. Annual Report, Government of India, New Delhi; 2020-21.

2. Sinha PK, Tarence T, Masih A, Sahu DP. (2018). Effect of different levels of zinc and farm yard manure on the physico-chemical properties of soil and yield of greengram. VAR. Laxmi-151. International journal of current microbiology and applied sciences. 7(02):1534- 1539.
3. Arun Raj M, Vasanthi D, David M, Mansingh I. (2018) Effect of sulphur on growth and yield of greengram. International Journal of Science, Environment and Technology. 7(5):1861-1867.
4. Regmi AP, Ladha JK, Pasuquin E, Pathak H, Hobbs PR, Shrestha LL, Gharti DB, Duveiller E. (2002). The role of potassium in sustaining yields in a long-term rice-wheat experiment in the indogangetic plains of Nepal. Biology Fertility of Soils. 36:240-247.
5. Sreedevi BP, Latha C, Sankari PH, Ram T. (2016). Sulphur application in rice- black gram cropping system changes in yield, economics and post-harvest studies. Journal of Rice Research. 9(1):20-23.
6. Gomez KA, Gomez AA. Three or more factor experiment. In: Statistical Procedure for Agricultural Research 2nd edition. 1976;139-141.
7. Kaisher MS, Ataur RM, Amin MHA, Amanullah ASM, Ahsanullah ASM. (2010). Effect of sulphur and boron on the seed yield and protein content of mungbean. Bangladesh Research Publications Journal. 3(4):1181-1186.
8. Das SK. (2017). Effect of phosphorus and sulphur on yield attributes, yield, nodulation and nutrient uptake of green gram. Legume Research. 40(1):138-143.
9. Bagadkar A, Hiwale S, Darekar N. (2020) Effect of graded levels of potassium on growth, yield and economics of greengram. Journal of Pharmacognosy and Phytochemistry. 9(4):1799-1801.
10. Chavan A, Khafi MR, Raj AD, Parmar RM. (2012). Effect of potassium and zinc on yield, protein content and uptake of micronutrients on cowpea. Agricultural Science Digest. 32(2):175-177.
11. Jat MK, Yadav PK, Tikkoo A, Yadav SS. (2022). Effect of potassium application on yield and quality of green gram on coarse textured soils of southern Haryana. Indian Journal of Experimental Biology. 60:59-63.
12. Kumawat SR, Khistriya MK, Yadav SL, Kumar M. (2014). Effect of sulphur and phosphorus on growth and yield attributes on summer green gram. International Journal of Agricultural Sciences.10(2):770-773.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/87876