Original Research Article

Influence of potassium and sulphur on growth and yield of greengram (*Vigna radiata.* L)

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 higher Plant height (45.77 cm), maximum number of branches (6.50), number of nodules (21.73), dry weight (9.66 g/plant). 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.
Key words: Greengram, potassium, sulphur, growth and yield.

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 a production of 23.2 m t and the productivity is 817 kg/ha (GOI 2020-21). Greengram (*Vigna radiata* L.) 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 (Sinha *et al*., 2018). In India during 2020-21, greengram is grown in about 34.35 lakh 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 nutrient 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 (ArunRaj *et al*., 2018). Potassium is an essential macronutrient required for proper development of plants (Regmi *et al.,* 2002). sulphur provides indirect nutritive values on soil amendment, it improves use efficiency of other essential plant nutrient, particularly nitrogen and phosphorus (Sreedevi *et al.,* 2016). Keeping the points in view an experiment was conducted to study the effect of potassium and sulphur on growth and yield of Greengram.

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 K and S were supplied in the form of MOP and WDG sulphur are applied as basal at the time of sowing. The greengram variety Samrat (PDM-139) was sown on 10 April 2021 by maintaining a spacing of 30cm × 10cm. Harvesting was done by taking 1m^2 area from each plot.

The treatment details are as follows, 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 (Gomez and Gomez, 1976).

Results and Discussion:

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 (Kaisher *et al*., 2010)

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 (ArunRaj *et al.,* 2018).

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 (Das 2017).

Dry weight/plant – Significant maximum dry weight/plant (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 dry weight/plant 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 (Bagadkar *et al.,* 2020).

Yield:

Grain yield – Significant and maximum 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 seed 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 (Chavan *et al*., 2012).

Stover yield - Significant and maximum 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 (Kumawat *et al*., 2014)

Conclusion:

It was concluded that application of potassium and sulphur performs positively and improves growth and yield parameters of Greengram. The 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.

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

Treatments	At 60 DAS			
	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.

Treatments	At Harvest	
	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

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