Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 1741-1743
Received: 01-08-2020
Accepted: 05-09-2020

AK Jain
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

AK Singh
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Pavan Shukla
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

VK Singh
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Uday Kumar
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Beerendra Singh
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Subodh Kumar
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Corresponding Author:
AK Jain
Assistant Professor, V.K.S. College of Agriculture, Dumraon, Bihar, India

Evaluation of growth, yield and protein content of summer green gram (*Vigna radiata* L.) under different levels of sulphur

AK Jain, AK Singh, Pavan Shukla, VK Singh, Uday Kumar, Beerendra Singh and Subodh Kumar

Abstract
This study was conducted at the farmer's field during summer season 2018 under supervision of V.K.S. College of Agriculture Dumraon-Bihar to evaluate the growth, yield and protein content of summer Green Gram (*Vigna radiata* L.) under different levels of sulphur. The experiment was conducted in randomized block design with nine treatments as levels of sulphur 0, 5, 10, 15, 20, 25, 30, 35 and 40 Kg per ha along with recommended dose of fertilizer in the crop with three replications. Grain yield (1040 kg/ha) was found significantly higher under 30 kg per ha sulphur (T_7). Protein content in seed increased significantly with increasing levels of sulphur up to 30 kg.

Keywords: Growth, yield, protein content and sulphur levels

Introduction
Green gram is one of the most important pulse crops. It is mostly grown in Kharif season and in some part of India spring/summer crop is also cultivated, whereas irrigation facility is available. However, the productivity of green gram is very low due to unbalance use of fertilizer. Leguminous crops like green gram have a high sulphur (Singh and Sharma, 2016) [9] requirement due to their many functions in plant growth. Green gram is utilized in many foods products. The sprouted seeds are consumed as salad which is rich in vitamins, particularly ascorbic acid, niacin, riboflavin and thiamine. Green gram grain is having easily and high digestible protein content. Sulphur plays an important role in growth and development of crops. It plays an important role in the formation of S-containing amino acids like cystine (27% S), cysteine (26% S), methionine (21% S), which act as building blocks in the synthesis of proteins. It has role to play in increasing chlorophyll formation and aiding photosynthesis. Sulphur also plays a role in the activation of enzymes, nucleic acids and forms a part of biotin and thiamine. In recent years, an increased frequency of sulphur deficiency has been observed in crops and S may become a factor limiting yield and quality of crops. Green gram, one of the important pulse crops, is sensitive to the deficiencies of sulphur. So far, inadequate information is available regarding the effect of S on green gram in Zone III B of Bihar condition. This study was, therefore conducted to evaluate the effect of S on the growth, yield and quality of green gram.

Materials and Methods
Field experiment was conducted at the farmer's field. It is situated at 25.51°N latitude and 84.15°E longitude. The present investigation was carried out at Karuaj, Bihar, during summer season of the year 2018. Variety of green gram is used in experiment SML-668 which was released and notified in India and evaluated at Indian Institute of Pulses Research, Kanpur. This is a short duration variety and matured only 65-70 days. The soil of the experimental field was loam in texture having pH 7.1, organic C 0.46%, available N 195 kg ha^{-1},Available phosphorus 17.8 (Kg/ha), available K 140 kg ha^{-1} and available S 12.52 kg ha^{-1}. The experiment was conducted in Randomized Block Design with nine treatments as levels of sulphur 0, 5, 10, 15, 20, 25, 30, 35 and 40 Kg per ha along with recommended dose of fertilizer in the crop and three replications. A basal dose of 20 kg N and 60 kg P_2O_5 ha^{-1} for green gram was applied uniformly in all the plots. Full dose of P was applied at the time of sowing. Sulphur was applied as per treatments at the time of sowing. Green gram was sown on April 10, 2018 and harvested on June, 18 2018. Grain and straw yields of the crop were recorded at maturity. The growth and yield attributes were recorded at harvest. Treatment wise full dose of S through elemental sulphur as basal dressing.

At harvest seed and straw yield were recorded. In order to determine protein in seeds Kjeldahl's digestion and distillation procedure was followed to determine nitrogen in seeds. Then the protein content of the seed was determined by multiplying the nitrogen content of seed by 6.25.).N (Kjeldahl method), P & S (Spectrophotometer), K (flame photometer) in the soil determine by these methods.

Results and Discussion

Growth, Yield attributes

The plant height was significantly influenced by the application of sulphur along with recommended dose of fertilizers at all stages of crop. The highest plant height of 36.53 cm was recorded in the treatment that received 30 kg sulphur ha^{-1} along with recommended dose of fertilizers (T_7) at maturity. However, it was found to be at par with application of sulphur @25 kg ha^{-1} with recommended dose of fertilizers (35.77). The lowest plant height of 32.13 cm was observed in RDF without Sulphur (T1). This might be due to known 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. These results are in accordance with those of Yadav (2004) [6], Srivastava *et al*. (2006) [7] and Arun Raj *et al*. (2018) [12] with respect to plant height in green gram.

Number of pods per plant

Significantly higher pods per plant was found under 30 kg per ha and at par with 25 & 35 Kg per ha sulphur. This might be due to more availability of sulphur during these vegetative and reproductive stages of the crop. Sulphur is a part of amino acid (Cystine), which helps in chlorophyll formation, photosynthetic process and activation of enzymes (Mitra *et al*., 2006) [8] and Arun Raj *et al*. (2018) [12].

Number of seeds per pod

The higher number of seeds per pod showed significant difference with application of sulphur at different level along with recommended dose of fertilizer. The higher number of seeds per pod was recorded in the treatment that received 30 kg of sulphurha^{-1} along with recommended dose of fertilizer (7.0) and it was followed by the application of 25 kg sulphur ha^{-1}along with recommended dose of fertilizer (6.70), as compared to without sulphur (5.07). This might be due to activation of enzymes by application sulphur Kumar and Singh (2017) [10].

Grain yield (kg ha^{-1}), Stover Yield (kg ha^{-1}) and Protein Content

The significantly higher grain yield of green gram was recorded in the treatment that received application of sulphur 30 kg ha^{-1} along with recommended dose of fertilizer (1040 kg ha^{-1}) over rest of the treatments. However, it was at par with treatment that received application of sulphur @ 25 & 35 kg ha^{-1}along with recommended dose of fertilizer (1031.67 & 991.33kg ha -1) and lowest in recommended dose of fertilizer without use of sulphur (683.00 kg ha^{-1}). This might 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 as well as highest harvest index and test weight were found under T_7. Similar type of observations was also reported by Singh *et al*. (1999) [14] and Sharma and Singh (1997) [4] and also results corroborated with the findings of Das (2017) [11] in green gram. Stover yield was found non-significant. Sarkar and Pal (2003) [5] also reported test weight and seed yield increased significantly with increasing rates of S and were higher under irrigated conditions. Bansal (1991) [1] also noticed response of sulphur in green gram in reference to yield and yield attributes.

Significantly higher protein was observed in 30 kg per ha sulphur applied along with RDF (T_7) in Table 1. similar result also reported by Ram & Katiyar (2018) [13] due to increase amino acid content by the application of sulphur.

Table 1: Effect of Sulphur on Growth, Yield attributes Yield and Protein Content of Green Gram

Treatment	Plant height (cm)	No. of pods per Plant	No. of Seeds Per Pod	Grain Yield (kg/ha)	Stover Yield (kg/ha)	Test weight (gm)	Harvest Index	Protein Content (%)
T_1-RDF Without S	32.13	9.13	5.07	683.00	1688.33	3.43	28.59	17.80
T_2-T_1+5 Kg S	33.33	11.53	5.77	928.00	1742.67	4.27	34.74	18.83
T_3- T_1+10 Kg S	34.07	12.17	6.10	984.67	1730.33	4.33	36.27	19.90
T_4- T_1+15 KgS	34.73	12.50	6.37	997.67	1676.67	4.37	37.32	20.93
T_5- T_1+20 KgS	34.97	13.23	6.63	1002.33	1702.67	4.57	37.06	21.70
T_6- T_1+25KgS	35.77	13.60	6.70	1031.67	1664.33	4.73	38.28	22.37
T_7- T_1+30KgS	36.53	13.90	7.00	1040.00	1651.00	5.20	38.65	23.07
T_8- T_1+35KgS	35.27	13.43	6.37	991.33	1707.67	4.70	36.71	22.07
T_9- T_1+40KgS	34.30	13.37	6.30	986.00	1722.00	4.67	36.36	21.80
SEm±	0.33	0.17	0.17	43.45	30.59	0.15	1.13	0.38
CD	0.99	0.50	0.52	131.37	N/A	0.44	3.42	1.16

Note: RDF- 20 Kg/ha Nitrogen +60 kg/ha Phosphorus

Conclusion

Based on the findings of experiment the above study, it is summarized that application of sulphur @30 kg ha^{-1}along with recommended dose of fertilizer in green gram in Zone IIIB of Bihar can be recommended to get profitability higher yield besides improving the quality of green gram.

References

1. Bansal BN. Effect of levels of sulphur on the yield and composition of soyabean, green gram, black gram and cowpea. Madras Agric. J. 1991;78(5-8):188-190.
2. Krishna. Effect of sulphur and zinc application on yield, S and Zn uptake and protein content of mungbean. Legume Res. 1995;18(2):89-92.
3. Singh U, Yadav DS. Studies on S and Zn nutrition on moong (Phaseolus radiatus) in relation to growth

attributes, seed protein yield S and Zn uptake. Legume Res. 1997;20:224-226.
4. Sharma and Singh. Greengram response to P and S. Indian Journal of Agronomy. 1997;42:650-652.
5. Sarkar B, Pal AK. Response of blackgram (*Vigna mungo* L.) to irrigation, potassium and sulphur. Environment and Ecology. 2003;21:906-909.
6. Yadav SS. Growth and yield of green gram (*Vigna radiata* L.) as influenced by phosphorus and sulphur fertilization. Haryana J. Agron. 2004;20(1/2):10-12.
7. Srivastava AK, Tripathi PN, Singh AK, Singh R. Effect of Rhizobium inoculation, sulphur and zinc levels on growth, yield, nutrient uptake and quality of summer green gram (*Phaseolus radiatus* L.). Indian J agric. Sci. 2006;2(1):190-192.
8. Mitra AK, Banerjee K, Pal AK. Effect of different levels of phosphorus and sulphur on yield attributes, seed yield, protein content of seed and economics of summer green gram. Res. Crops. 2006;7(2):404-405.
9. Singh H, Sharma AK. Response of Lucerne to sulphur application in alluvial soil. Annals of Plant and Soil Research. 2016;18(3):298-299.
10. 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.
11. Das SK. Effect of phosphorus and sulphur on yield attributes, yield, nodulation and nutrient uptake of green gram [*Vigna radiata* L.]. Legume Research. 2017;40(1):138-143.
12. ArunRaj M, Vasanthi D, David Israel Mansingh. Effect of Sulphur on Growth and Yield of Greengram [*Vigna radiata* L]. International Journal of Science, Environment and Technology. 2018;7(5):1861-1867.
13. Surendra Ram, TPS Katiyar. Response of sulphur and zinc on yield, quality and nutrient uptake of summer mungbean (*Vigna radiata* L.). Journal of Pharmacognosy and Phytochemistry; c2018. p. 3243-3245.
14. Singh B, Al-Haddad K, Chandra A. A review of active filters for power quality improvement. IEEE transactions on industrial electronics. 1999 Oct;46(5):960-71.