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INFLUENCE OF POTASH (MOP) AND (SOP) ON QUALITY CHARACTERS OF GREEN GRAM (*VIGNA RADIATA* L. WILCZEK) *CV.* VBN 2

P.K. Karthikeyan*, G. Poovizhi Sindhu and R. Bhuvaneswari

Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Chidambaram– 608 002 (Tamil Nadu), India.

Abstract

A pot experiment was conducted to study the effect of potash in the form of MOP and SOP on quality characters of green gram *cv.* VBN 2. The treatments used *viz.,* T_1 - Absolute control, T_2 - control N, P, (-K), T_3 - 10 kg of K_2O ha^{-1}, T_4 - 20 kg of K_2O ha^{-1}, T_5-30 kg of K_2Oha^{-1},T_6-40kg of K_2Oha^{-1}, T_7-10kg of $K_2SO_4ha^{-1}$, T_8-20kg of $K_2SO_4ha^{-1}$, T_9 - 30 kg of $K_2SO_4ha^{-1}$, T_{10} - 40 kg of K_2SO_4 ha^{-1}. The results found that application of T_{10} - 40kg of K_2SO_4 ha^{-1} recorded higher values for quality characters *viz.,* protein (%), vitamin C (mg/100g), starch content (%) respectively over control.

Keywords: Quality characters, Muriate of potash (MOP), Sulphate of potash (SOP), Green gram.

Introduction

Pulses are the main source of protein particularly for vegetarians and contribute about 14% of the total protein of average Indian diet. Production of pulses in the county is far below the requirement to meet even the minimum level per capita consumption. The per capita availability of pulses in India has been continuously decreasing which is 32.52 g day^{-1} against the minimum requirement of 80g day^{-1} per capita prescribed by Indian Council of Medical Research (ICMR) Therefore, it is necessary for agricultural scientists to evolve strategy to increasing production of pulses to meet the protein requirements of increasing population of the country (Kantwa *et al.,* 2019). Green gram (*Vigna radiata* L. Wilczek) also known as mungbean is a self-pollinated leguminous crop which is grown during *kharif* as well as summer seasons in arid and semi-arid regions of India. It is tolerant to drought and can be grown successfully on drained loamy to sandy loam soil in areas of erratic rainfall. Green gram is an excellent source of protein (24.5%) with high quality of lysine (460mg/g N) and tryptophan (60mg/g N). It contains also remarkable quantity of ascorbic acid and riboflavin (0.21mg /100g) and minerals (3.84g/100g). Potassium is required for improving the yield and quality of different crops because of its effect on photosynthesis, water use efficiency and plant tolerance to diseases, drought and cold as well for making the balance between protein and carbohydrates. (Kumar *et al.,* 2008).

***Author for correspondence :** E-mail : karthikeyan37@hotmail.com

Materials and Methods

The pot experiment was conducted to study the effect of potash on quality characters of green gram. The experiment was laid out in a Randomized Block Design (RBD) with three replications. The treatments are as follows:T_1 - Absolute control, T_2 - control N, P, (-K), T_3 - 10kg of K2Oha^{-1}, T_4 - 20kg of K_2Oha^{-1}, T_5-30kg of K_2Oha^{-1}, T_6-40kg of K_2Oha^{-1}, T_7-10kg of $K_2SO_4ha^{-1}$, T_8-20kg of $K_2SO_4ha^{-1}$, T_9 - 30 kg of $K_2SO_4ha^{-1}$, T_{10} - 40 kg of K_2SO_4 ha^{-1}.

Arecommended dose of fertilizer was applied to the crop sat different days after sowing (DAS). The following quality characters *viz.,* protein(%), vitamin C(mg/100g), starch content (%) were observed and collected data. The data were analyzed statistically suggested by Gomez and Gomez (1984).

Results and Discussion

The pot experiment (*Rabi* season) was conducted in the pot culture yard of the Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University to study the effect of potassium

Table 1: Effect of potassium on protein content (%), vitamin C (mg/100g), starch content (%) of greengram VBN-2.

	Treatments	Protein content (%)	Vitamin C mg/100g	Starch content (%)
T_1	Absolute Control	18.10	5.10	25.60
T_2	control N, P_2O_5 and (-K)	20.10	7.02	36.42
T_3	10 kg of K_2O ha^{-1}	20.89	7.79	40.73
T_4	20 kg of K_2O ha^{-1}	21.67	8.54	44.95
T_5	30 kg of K_2O ha^{-1}	22.45	9.28	49.13
T_6	40 kg of K_2O ha^{-1}	23.34	10.14	53.97
T_7	10 kg of K_2SO_4 ha^{-1}	20.99	7.88	41.26
T_8	20 kg of K_2SO_4 ha^{-1}	21.75	8.61	45.36
T_9	30 kg of K_2SO_4 ha^{-1}	22.57	9.40	49.79
T_{10}	40 kg of K_2SO_4 ha^{-1}	23.40	10.20	54.30
	SEd	0.28	0.28	1.49
	CD (0.05)	0.57	0.55	3.08

Table 2: Effect of potassium on protein content (%), vitamin C (mg/100g), starch content (%) of green gram VBN-2.

	Treatments	Protein content (%)	Vitamin C mg/100g	Starch content (%)
T_1	Absolute Control	18.00	5.60	25.12
T_2	control N, P_2O_5 and (-K)	20.94	7.30	37.47
T_3	10 kg of K_2O ha^{-1}	22.11	7.97	41.85
T_4	20 kg of K_2O ha^{-1}	23.26	8.63	46.12
T_5	30 kg of K_2O ha^{-1}	24.40	9.29	50.22
T_6	40 kg of K_2O ha^{-1}	25.71	10.05	54.96
T_7	10 kg of K_2SO_4 ha^{-1}	22.26	8.06	42.46
T_8	20 kg of K_2SO_4 ha^{-1}	23.37	8.70	46.67
T_9	30 kg of K_2SO_4 ha^{-1}	24.57	9.39	50.71
T_{10}	40 kg of K_2SO_4 ha^{-1}	25.80	10.10	55.20
	SEd	0.46	0.23	0.44
	CD (0.05)	0.84	0.48	0.94

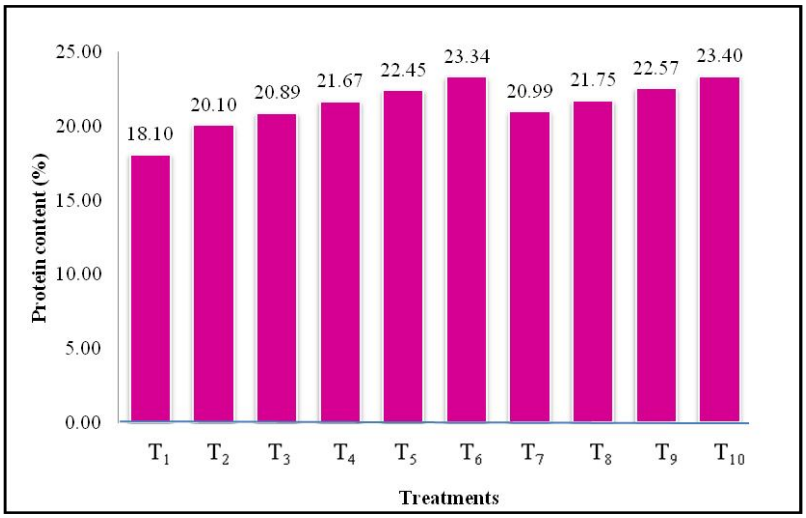

Fig. 1: Effect of potassium on protein content (%) of greengram VBN-2(Pot culture).

(MOP and SOP) on the quality of green gram VBN-2.

Effect of potassium on protein content (%), vitamin C (mg/100g), starch content (%) of greengram VBN-2 (Table 1):

The results due to the application of different levels of muraite of potash and sulphate of potash on quality parameters especially in green gram grain VBN 2 were furnished in table 1. Protein content, vitamin C and starch content has been increased by the usage of potassium in the forms of MOP and SOP. The treatments T_1 recorded the lowest protein content, vitamin C and starch content of 18.10%, 5.10 mg/100g and 25.60% the treatment T_{10} recorded the highest protein content, vitamin C and starch content of 23.40%, 10.20 mg/100g and 54.30%. However the treatment T_6 which recorded 23.34%, 10.14 mg/100g and 53.97% was on par with treatment T_{10}. The treatments T_9 and T_5 recorded protein content, vitamin C and starch content of 22.57%, 9.40 mg/100g, 49.79% and 22.45%, 9.28 mg/100g, 49.13% respectively which were found to be statistically similar. Further the treatments T_8 and T_4 recorded protein content, vitamin C and starch content of 21.75%, 8.61 mg/100g, 45.36% and 21.67%, 8.54 mg/100g, 44.95% which were on par with each other. It was followed by treatments T_7 and T_3 recorded a protein content, vitamin C and starch content 20.99%, 7.88 mg/100g, 41.26% and 20.89%, 7.79 mg/100g, 40.73% which were statistically on par. The treatment T_2 recorded a protein content, vitamin C and starch content20.10%, 7.02 mg/100g, 36.42 % at harvest.

Effect of potassium on protein content (%), vitamin C (mg/100g), starch content (%) of greengram VBN-2 (Table 2):

MOP and SOP forms potassium application resulted in significant increase in protein content, vitamin C and starch content. The treatments T_1 recorded the lowest protein content, vitamin C and starch content of 18.00%, 5.60 mg/100g and 25.12% the treatment T_{10} recorded the highest protein content, vitamin C and starch content of 25.80%, 10.10 mg/100g and 55.20%. However the treatment T_6 which recorded 25.71%, 10.05 mg/100g and

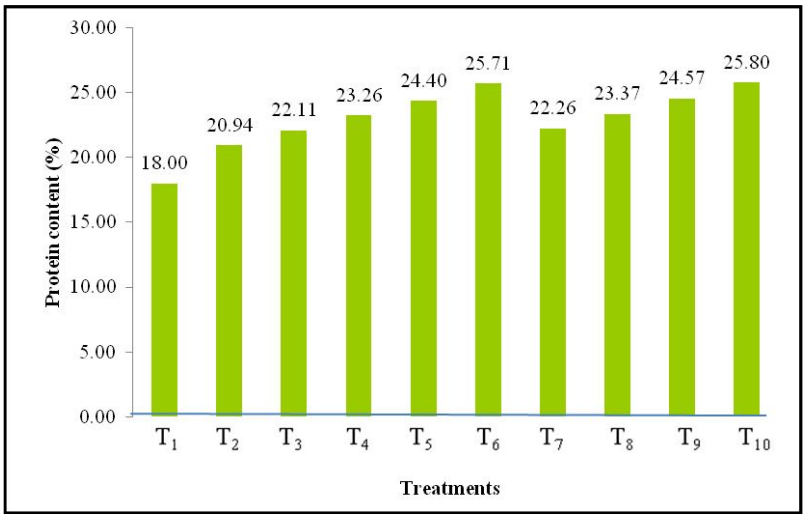

Fig. 2: Effect of potassium on protein content (%) of greengram VBN-2 (Field trial).

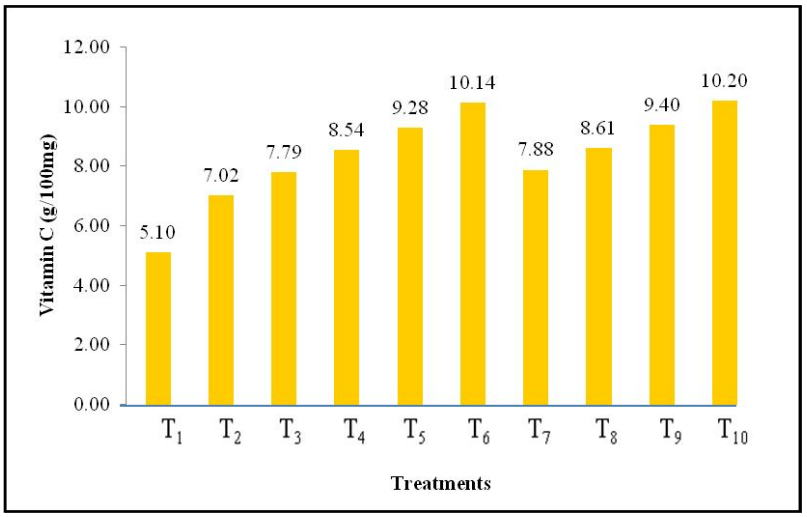

Fig. 3: Effect of potassium on Vitamin C (mg/100g) of greengram VBN-2 (Pot culture).

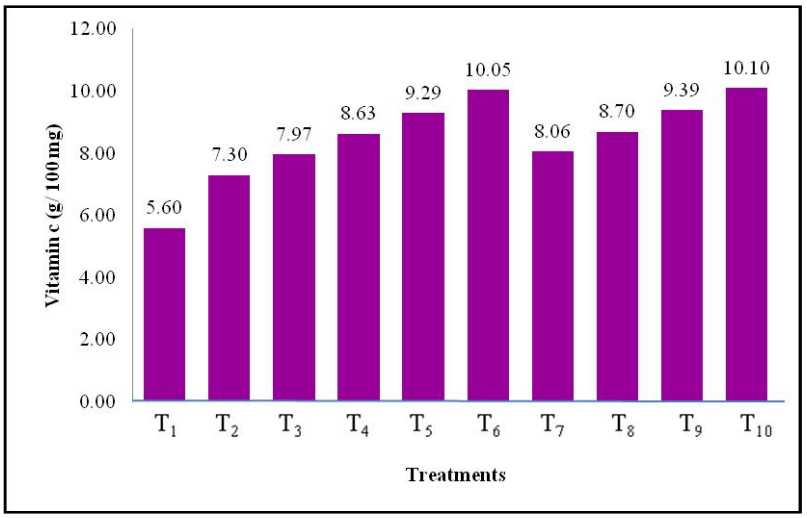

Fig. 4: Effect of potassium on vitamin C (mg/100g) of greengram VBN-2 (Field trial).

54.96% was on par with treatment T_{10}. The treatments T_9 and T_5 recorded protein content, vitamin C and starch content of 24.57%, 9.39 mg/100g, 50.71% and 24.40%, 9.29 mg/100g, 50.22 % respectively which were found to be statistically similar. Further the treatments T_8 and T_4 recorded protein content, vitamin C and starch contentof23.37%, 8.70 mg/100g, 46.67% and 23.26%, 8.63 mg/100g, 46.12% which were on par with each other. It was followed by treatments T_7 and T_3 recorded a protein content, vitamin C and starch content of 22.26%, 8.06 mg/100g, 42.46% and 22.11%, 7.97 mg/100g, 41.85%. Both the treatments T_7 and T_3 were statistically on par. The treatment T_2 recorded a protein content, vitamin C and starch content 20.94%, 7.30 mg/100g and 37.47% at harvest.

Potassium status of south Indian soils varies considerably depending on parent material, texture, and management practices. The pattern and extent of pulse crop response to K fertilizer depends on yield potential, soil K status, genotype, and supply of critical inputs such as irrigation and other nutrients. Higher K responses in pulses compared to cereal or oilseed crops and postulated that well branched root systems of cereal and oilseed crops might exploit soil K more efficiently than pulse crop root systems. Similar findings concluded by Ali and Srinivasarao (2001), Srinivasarao *et al.,* (2003), Tiwari and Tiwari (1999).

Application of muriate of potash and shlphate of potash on quality parameters in greengram VBN- 2:

The application of potassium 40 kg ha^{-1} MOP and 40 kg ha^{-1} SOP recorded statistically significant quality parameters such as significant protein content , significant vitamin c content and significant starch content compared to control and lower doses of muraite of potash and sulphate of potash.

The protein content recorded due to application of 40 kg SOP ha^{-1} was 30% higher compared to absolute control in field experiment. Similarly in pot experiments the 40 kg SOP ha^{-1} recorded a protein content of 23.4 which was 23% higher compared to absolute control (Fig. 1, 2).

As potash has synergistic effect on

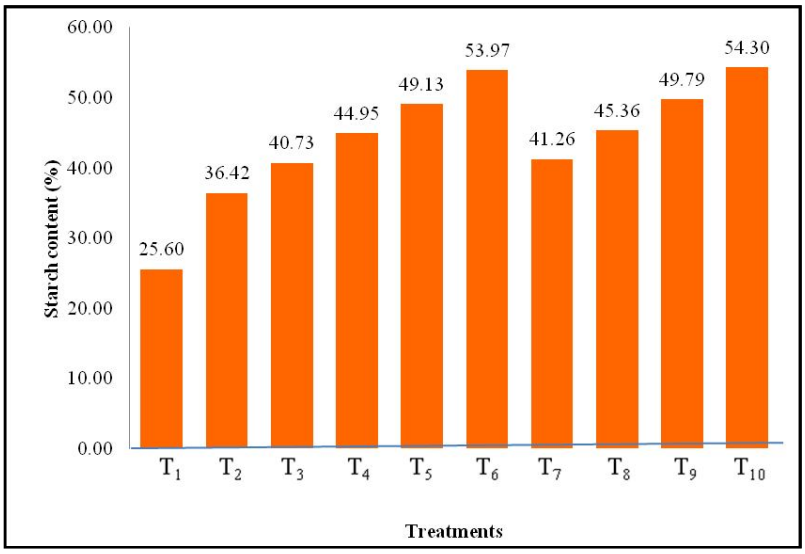

Fig. 5: Effect of potassium on starch content (%) of greengram VBN-2 (pot culture).

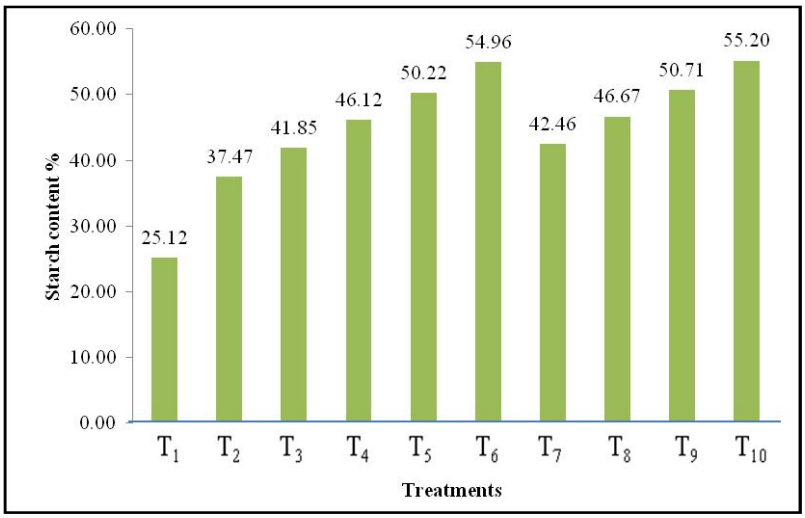

Fig. 6: Effect of potassium on starch content (%) of greengram VBN-2 (Field trial).

nitrogen uptake, facilitates protein synthesis and activates different enzymes, protein content increased significantly with each increase in potassium level. Similar results were concluded by Asgar *et al.,* (2006), Hussain *et al.,* (2011) and Srinivasarao *et al.,* (2003).

K^+ is known to play a key role in the transporting essential ingredients in proteins to the site of protein synthesis and stimulation of NO^-_3 uptake and transport, could have encouraged protein synthesis Tak *et al.,* (2013). Protein yield is the function of protein content and grain yield. Since, variation in protein content has genetic and bio chemical limitation, the protein yield is more influenced by grain yield and thus followed almost trend similar to grain yield. Singh (2017) and Singh and Sharma (2016) are also reported similar results. The Vitamin C recorded due to the application of 40 kg SOP ha^{-1} was 45% higher compared to absolute control in field experiment. Similarly in pot experiments @ 40 kg SOP ha^{-1} recorded a vitamin C content which was 50 % higher compared to absolute control. (Fig. 3, 4). Vitamin C is a water soluble vitamin, an essential nutrient improved synthesis of collagen, synthesis of norepinephrine, synthesis of L-carnitine, protection against free radicals (Wood and Grusak, 2007).

Starch is the major storage carbon reserve in pulse seeds providing structural support. The starch content recorded due to the application of 40kg SOP ha^{-1} was 54% higher compared to absolute control in field experiment. Similarly in pot experiments the 40 kg SOP ha^{-1} recorded the highest starch content which was 53% higher compared to absolute control (Fig. 5, 6). Significantly highest total carbohydrates content as a result of foliar nutrition could be attributed to the mode of action of potassium in enhancing the enzyme carbohydrates transformation. Similar results are reported by Doss *et al.,* (2013).

Conclusion

Pot experiment was conducted at pot culture yard, Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar during Dec-Feb 2016-2017 (*Rabi*) to study the effect of potassium (MOP and SOP) on growth, yield and quality of greengram. A field experiment was conducted under farmer's field at Thenavaraiyanallur, Tiruvarur Taluk, Tiruvarur during Mar-May (2017) with different levels of potassium. The same treatments were followed for both pot and field experiments. Quality parameters were recorded at harvest stage. The data collected from all this was subjected to statistical analysis to find out the influence of treatments by following standard procedures. The inferences drawn and conclusions arrived are briefly summarized.

Application of potassium in the form of muriate of potash and sulphate of potash significantly increased protein, vitamin C, starch content. Sulphate of potash at 40kg $ha^{-1}$was on par with 40kg ha^{-1} MOP muriate of potash in quality parameters over the absolute control in both pot and field experiments. It is concluded that application of 40kg ha^{-1} of sulphate of potash recorded the highest quality parameters in greengram var VBN-2.

Which was comparable with application of 40kg ha^{-1} of muraite of potash. Since the cost of sulphate of potash fertilizer is higher and the benefit cost ratio due to the application of sulphate of potash is higher finally it can be concluded that application of muraite of potash results in better yield and also gives higher benefit cost for the farmer.

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