Legume Res., **36** (3) : 255 - 258, 2013

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
www.arccjournals.com / indianjournals.com

EFFECT OF POTASSIUM AND SULPHUR ON GROWTH AND YIELD OF BLACK GRAM [*VIGNA MUNGO* (L.) HEPPER] UNDER RAINFED CONDITION

N. M. Thesiya*, P. K. Chovatia and V. L. Kikani

Krishi Vigyan Kendra,
Navsari Agricultural University, Waghai-394 730, India

Received: 03-05-2012 Accepted: 11-11-2012

ABSTRACT

An experiment was conducted during the *kharif* season of the year 2003 to study the effect of potassium and sulphur on growth and yield of black gram (*Vigna mungo* L. Hepper) under rainfed condition. There was a significant effect of potash and sulphur levels on plant height, number of branches per plant, number of pods per plant, length of pod, 100-grain weight, straw yield and grain yield. Significantly the highest grain yield (9.17 q ha^{-1}) and straw (18.28 q ha^{-1}) yield was recorded under 20 kg K_2O ha^{-1}, which was at par with 40 kg K_2O ha^{-1} in case of grain yield. Application of sulphur at 30 kg S ha^{-1} (S_2) registered significantly the highest grain (9.19 q ha^{-1}) and straw (18.06 q ha^{-1}) yield. Combined application of 20 kg K_2O ha^{-1} along with 30 kg S ha^{-1} recorded significant increase in respect of yield attributes and yield.

Key words: Black gram, Grain yield, Potassium, Sulphur.

INTRODUCTION

Black gram [*Vigna mungo* (L.) Hepper] also known as urd, udid or mash is one of the important short duration pulse crop. The crop has its own importance due to high nutritional value of grains as human food and fodder as rich feed for cattle. The grains contain about 24 per cent protein on dry weight basis, which is more than twice than that of cereals. It is a good green manure and erosion resisting cover crop. The crop also improves soil fertility by symbiotic fixation of atmospheric nitrogen in root nodules.

In India, black gram occupies an area of 2.70 million hectares with a production of 0.94 million tones, which is very low and not sufficient for a remunerative cultivation. Madhya Pradesh, Maharashtra, Uttar Pradesh, Tamil Nadu, Orissa and Gujarat are the main black gram growing states of India (Rathore, 2002). Potassium and sulphur play a vital role in the nutrition of plants. Infact these are the nutrients, which are deficient in the soils. Therefore application of potassium and sulphur fertilizers becomes important both from quality as well as production point of view. No systematic work has been done on effect of potassium and sulphur on yield of black gram particularly in this region. Therefore, the present experiment was undertaken to study the effect of potassium and sulphur on growth and yield of black gram [*Vigna mungo* L. Hepper] under rainfed condition.

MATERIALS AND METHODS

A field experiment was conducted during *kharif 2003* at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh. Soil of the experimental area was medium black in texture, low in available nitrogen and medium in available phosphorus and potassium with the pH of 7.9. The treatments consisted with four K_2O levels (0,20,40 and 60 kg K_2O/ha) and four sulphur levels (0,15,30,45 kg S/ha) were tested in factorial randomized block design with three replications. Blackgram variety Type -9 was sown in rows 45 cm apart by using 20 kg seed/ ha. Nitrogen @ 20 kg/ha and Phosphorus add 40 kg/ha along with K_2O and S as per treatment were applied as basal through urea, DAP, MOP and gypsum respectively.

Growth and yield contributions characters were recorded at harvest. Seed and straw yields were harvested from net plot.

Effect of potash

Effect on growth: The data presented in Table1 revealed that application of potash caused significant variation in growth of primary branches. Application of 20 kg K_2O/ha recorded the maximum plant height and number of primary branches which was significantly higher over control (0 kg K_2O/ha). The increase in plant height could partly be attributed due to the beneficial effect of potash fertilization. Potash is known to augment cell division and cell expansion resulting in increasing positive effect on growth parameter.

Effect on yield attributes and yield: The data of the investigation revealed that the application of 20 kg K_2O ha^{-1} registered the highest number of pods per plant, length of pod, number of grains per pod, 100-grain weight and grain yield per plant. However, it was remained at par with 40 kg K_2O ha^{-1} in yield attributing characters. Further increasing the level of potash reduced the yield attributes. This trend might be attributed to the fact that the soil under experiment was medium in available potash and response was restricted to 20 kg K_2O/ha.

Grain yield of black gram influenced significantly due to different levels of potash (Table 1). Application of 20 kg K_2O ha^{-1} and 40 kg K_2O/ha did not differ significantly but these levels of K_2O recorded significantly higher grain yield over 60 kg K_2O ha^{-1} and control. Application of 20 kg K_2O ha^{-1} produced 9.17 q ha^{-1} grain yield of black gram, which was 7.76 and 6.63 per cent higher over control and 60 kg K_2O ha^{-1}, respectively. Grain yield of black gram is resultant product of yield attributing characters. Beneficial effect of potassium application on the yield attributes might have increased the grain yield. The positive effect of potash on yield might have been due to its requirement in carbohydrates synthesis. The results are in conformity with the earlier observations of Laltlanmawia *et al.* (2004).It was also observed that straw yield remarkably increased in 20 kg K_2O ha^{-1} than rest of the potash levels. The positive effect of potash on straw yield may be due to the pronounced role of potash in photosynthesis and cell elongation. More ever, higher nutrient uptake under this level resulted in higher plant height and number of primary branches per plant and ultimately helped in realization of higher straw yield.

Effect of Sulphur

Effect on growth: Plant height at harvest and number of primary branches were significantly influenced by the different levels of sulphur. Fertilizing the crop with 30 kg S/ha considerably increased the plant height at harvest (Table 1). The significantly higher numbers of primary branches per plant also recorded under application of 30 kg S ha^{-1}. 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 were in accordance with those of Srinivasan and Sankaran (2001).

TABLE 1: Effect of varying levels of potash and sulphur on growth and yield of black gram.

Treatments	Plant height (cm)	No. of branches/ plant	No. of pods /plant	Length of pod (cm)	No. of grains / pod	100-grain weight (gm)	Grain yield / plant (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
Potash (kg ha^{-1})									
$K_{0\ (00)}$	49.59	5.25	22.25	4.30	5.33	4.07	5.34	8.51	17.29
$K_{1\ (20)}$	55.45	5.67	25.26	4.83	5.90	5.19	6.83	9.17	18.28
$K_{2\ (40)}$	53.28	5.64	22.94	4.38	5.47	4.91	6.67	8.81	17.63
$K_{3\ (60)}$	53.12	5.36	23.39	4.31	5.57	4.19	6.18	8.60	17.47
C.D. (P= 0.05)	2.31	0.35	1.80	0.36	NS	0.45	0.52	0.42	0.52
Sulphur (kg ha^{-1})									
$S_{0\ (00)}$	48.92	5.06	22.14	4.26	5.14	4.14	5.08	8.56	17.14
$S_{1\ (15)}$	52.48	5.52	22.79	4.31	5.70	4.47	5.78	8.60	17.69
$S_{2\ (30)}$	56.52	5.77	25.25	4.77	5.98	5.13	8.04	9.19	18.06
$S_{3\ (45)}$	53.32	5.58	23.65	4.47	5.45	4.61	6.12	8.74	17.79
C.D. (P= 0.05)	2.31	0.35	1.80	0.36	NS	0.45	0.52	0.42	0.52
S X K interaction	Sig.	NS	Sig.	NS	NS	NS	Sig.	Sig.	NS

TABLE 2: Interaction effect of potash and sulphur on plant height, number of pods/plant,grain yield per plant and grain yield per hectors.

Level of sulphur	Level of potash				
	K_0	K_1	K_2	K_3	MEAN
Plant height					
S_0	46.24	51.65	48.31	49.50	48.92
S_1	47.82	55.42	53.68	53.00	52.48
S_2	56.55	60.24	53.32	55.98	56.52
S_3	47.77	54.50	57.80	54.00	53.52
MEAN	49.59	55.45	53.28	53.12	52.86
C.D. at 5 %	4.62				
Number of pods / plant					
S_0	19.33	24.39	20.36	24.49	22.14
S_1	19.43	24.92	20.62	26.22	22.79
S_2	27.24	28.00	24.12	21.64	25.25
S_3	23.00	23.75	26.65	21.21	23.65
MEAN	22.25	25.26	22.94	23.39	23.46
C.D. at 5 %	3.59				
Grain yield per plant.					
S_0	3.84	6.12	4.56	5.80	5.08
S_1	4.17	4.86	6.99	7.10	5.78
S_2	9.13	10.15	6.33	6.56	8.04
S_3	4.23	6.20	8.80	5.24	6.12
MEAN	5.34	6.83	6.67	6.18	6.26
C.D. at 5 %	1.03				
Grain yield/ha					
S_0	8.01	8.97	8.42	8.83	8.56
S_1	8.34	9.19	8.52	8.33	8.60
S_2	9.43	9.91	8.58	8.86	9.19
S_3	8.26	8.60	9.71	8.39	8.74
MEAN	8.51	9.17	8.81	8.60	8.77
C.D. at 5 %	0.84				

Effect on yield attributes and yield: The yield attributing characters *viz;* number of pods per plant, length of pod, number of grains per pod, 100-grain weight and grain yield per plant (Table 1) were significantly influenced by different levels of sulphur. The application of 30 kg S ha^{-1} gave highest number of pods per plant, length of pod, number of grains per pod. However, application of 45 kg S ha^{-1} remained at par with 30 kg S ha^{-1} in yield attributing characters. Increase in different yield attributing characters 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 and grain formation.

The results (Table 1) revealed that grain yield of 9.19 q ha^{-1} recorded under 30 kg S ha^{-1} was proved significantly superior to rest of the sulphur levels, which was 7.36, 6.86 and 5.15 per cent higher over 0, 15 and 45 kg S ha^{-1}, respectively. The increase in grain yield with increasing levels of sulphur might be due to vital role played by sulphur in accelerating the yield attributes *viz.*, number of pods per plant, length of pod, number of grains per pod and 100-grain weight and grain yield per plant. The results are in direct line with the observations of Srinivasan and Sankaran (2001) in black gram.

Straw yield of black gram did not differ significantly with 15, 30 and 45 kg S ha^{-1}. However, these levels produced considerably higher straw yield than control (S_0). Profound increase in plant growth characters *viz;* plant height and number of primary branches per plant with increasing sulphur levels resulted in higher fodder yield.

Interaction effect of potash and sulphur

Potassium and sulphur interaction had significant effect on plant height, yield attributes and grain yield (Table-2.). A significant increase in growth parameter of black gram was observed up to the application of 20 kg K_2O ha^{-1} along with 30 kg S ha^{-1}. This might be the synergistic effects of potash and sulphur application in increasing the plant height. The results are in conformity with the work of Menaria (2003) in soybean.

Combined application of 20 kg K_2O ha^{-1} along with 30 kg S ha^{-1} recorded significant increase in respect of yield attributes and grain yield viz, number of pods per plant, grain yield per plant and grain yield (q ha^{-1}) when application of 20 kg K_2O ha^{-1} supplied with 30 kg S ha^{-1}. This indicated the synergistic effects of potash and sulphur application in improving productivity of black gram. Similar, increase in yield due to combine application of potash and sulphur were also reported by Chanda *et al.* (2003) in mungbean.

REFERENCES

Chanda, M. S.; Arup, G.; Brahmachari, K and Pal, A. K. (2003). Effect of potassium and sulphur on mung bean in relation to growth, productivity and fertility build up of soil. *Field Crop Abstracts.* **56** (3): 304.

Laltlanmawia,L. *et al.* (2004) *J. Indian Soc. Soil Sci.* **52**: 199-202.

Menaria, B. L.; Pushpendra, S.; Nagar, R. K. and Singh, P. (2003). Effect of nutrients and microbial inoculants on growth and yield of soybean [*Glycine max* (L.) Merril]. *J.Soils and Crops.* **13** (1): 14-17.

Rathore, P. S. (2002). Techniques and management of field crop production Agrobios (India), Jodhpur: 295.

Srinivasan, K. and Sankaran, N. (2001). Sulphur management in blackgram and its effect on yield and economics. *Madras Agric. J.,* **88** (10-12): 654-656.