Int.J.Curr.Microbiol.App.Sci (2019) *8*(6): 2351-2355

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 8 Number 06 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.806.280

Nutrient Content, Uptake, Quality of Chickpea (*Cicer arietinum* L.) and Fertility Status of Soil as Influenced by Fertilization of Potassium and Sulphur

A.S. Jadeja*, A.V. Rajani, S.C. Kaneriya and D.V. Hirpara

Department of Agricultural Chemistry and Soil Science, Junagadh Agricultural University, Junagadh 362-001 (Gujarat), India

**Corresponding author*

Keywords

Cicer arietinum, Potassium, Sulphur

Article Info

Accepted:
17 May 2019
Available Online:
10 June 2019

ABSTRACT

An field experiment was conducted at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *rabi* season of 2014-15 to evaluate soil application of potassium and sulphur on nutrient content, uptake, quality and yield parameter of chickpea (*Cicer arietinum* L.) under south Saurashtra region of Gujarat. The experiment comprising of four levels of potassium *viz.*, 0, 40, 60 and 80 kg K_2O ha^{-1} and sulphur *viz.*, 0, 20, 40, 60 kg S ha^{-1} and experiment was laid out in Factorial Randomized Block Design and replicated thrice. The results revealed that the content and uptake nutrient, yield of chickpea were significantly influenced by the various levels of potassium and sulphur. The application of potassium 60 and 80 kg K_2O ha^{-1} and sulphur 40 and 60 kg S ha^{-1} significantly increased the content, uptake, quality and yield of chickpea.

Introduction

India is one of the major pulses growing country of the world, accounting roughly for one third of total world area under pulse cultivation and one fourth of total world production. Pulses occupy a key position in Indian diet and meet about 30 per cent of the daily protein requirement. Among the pulses; chickpea is a most important *Rabi* crop with high acceptability and wider use. India is the largest producer of chickpea in the world sharing 71.08 and 71.51 per cent of total area (11.55 m ha) and production (10.46 m tonnes), respectively (Singh, 2011).

The medium black calcareous soils of Saurashtra region in Gujarat are tended to decline in available potassium due to intensive cropping and gradually shifted towards negative K balance. The decreasing K availability in calcareous soil because of dominant black clay might be due to Ca^{+2} which limits the chances of K absorption. Simultaneously, the balance application of potassium not only gave higher yield but also improved the quality of economic produced. Sulphur plays an important role in enhancing the productivity and quality of chickpea. The importance of S in balance plant nutrition is realized with an increasing S deficiency in several areas due to intensive cropping and focus on high yielding varieties. In Gujarat, 17% of soils are deficient in available sulphur (Golakiya and Shobhana, 2000). No work has been carried out on the effect of potassium and sulphur in chickpea in Saurashtra region. The potassium increases yield and quality of chickpea whereas, sulphur enhancing the productivity and quality of chickpea. Therefore, an experiment planned to know the effect of potassium and sulphur on content and uptake of nutrient, quality, yield of chickpea and post-harvest soil fertility.

Materials and Methods

The experiment was conducted at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *rabi* season of 2014-15. The soil of the experimental field was clayey in texture and alkaline in reaction (pH of 8.06 and EC of 0.41 dS m^{-1}). The soil was low in available nitrogen (244.20 kg ha^{-1}), medium in available phosphorus (28.80 kg ha^{-1}), medium in available potassium (218.45 kg ha^{-1}), medium in available sulphur (10.64 ppm), medium in iron (5.24 ppm), high in zinc (0.74 ppm), high in manganese (17.87 ppm) and high in copper (1.26 ppm). The experiment comprised of total sixteen treatment combinations in which four levels of potassium (0, 40, 60 and 80 K_2O kg ha^{-1}) and four levels of sulphur (0, 20, 40 and 60 S kg ha^{-1}) were laid out in Randomized Block Design having factorial concept with three replications. The fertilizer application was done with fixed doses of nitrogen at 20 kg ha^{-1} and phosphorus at 40 kg ha^{-1}. Potassium and sulphur application was done according to the treatments. The nutrients of N, P, K and S were applied by using sources of Urea, DAP, MOP and Cosavate (WG 90% S), respectively. The chickpea variety "Gujarat Gram-3" was planted in second week of October with spacing of 45 m × 10 m and seed rate of 60 kg ha^{-1}. The crop was raised with all the standard package of practices and protection measures also timely carried out as they required. The experimental data recorded for growth parameters, yield attributes and yield parameters were statistically analyzed for level of significance.

Results and Discussion

Effect of potassium levels on nutrient content, uptake and yield of chickpea

Potassium content and uptake by seed of chickpea increased significantly due to successive levels of potassium. Significantly maximum K content (1.330 %) and uptake (27.53 kg ha^{-1}) by seed of chickpea were recorded with 60 kg K_2O ha^{-1}. It was showed superiority over rest of treatment. But the K content (1.577 %) and uptake (83.10 kg ha^{-1}) by stover of chickpea were significantly found in 60 kg K_2O ha^{-1} and 80 kg K_2O ha^{-1}, respectively. This was at par with 80 kg K_2O ha-1 and 60 kg K_2O ha^{-1}. Potassium is a third major plant nutrient because of the large amount in which it is absorbed by plants and its significant place for the production of high yield. This nutrient plays an essential role in plant growth and metabolism. It regulates the major functions of enzymes involved in photosynthesis, metabolism of carbohydrate and protein. Similar results have also been reported by Mondal *et al.,* (2005) and Mallarino and Higashi (2009).

A perusal of data (Table 1) revealed that different levels of potassium exerted their significant influence on 100-seed weight. Application of 60 kg K_2O ha^{-1} recorded significantly the higher 100-seed weight (23.57 g) which was remain statistically at par with 80 kg K_2O. Seed yield affected significantly by potassium levels up to the 60 kg ha^{-1} and beyond that level the differences were remained on par (Table 1).

Table.1 Effect of levels of potassium and sulphur on nutrient content and uptake, quality, yield of chickpea and after harvest fertility status of soil

Treatments	Potassium content (%)		Potassium uptake (kg ha^{-1})		Sulphur content (%)		Sulphur uptake (kg ha^{-1})		Protein content in seed	Available Potassium (kg ha^{-1})	Available Sulphur (ppm)	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	100 seed weight (g)
	Seed	Stover	Seed	Stover	Seed	Stover	Seed	Stover						
Potassium levels (kg K_2O ha^{-1})														
K_0–Control	1.253	0.791	21.60	36.99	0.410	0.428	6.99	20.41	24.32	225.70	12.81	1704	4757	22.26
K_1 – 40	1.281	1.249	25.02	64.89	0.419	0.400	8.16	20.65	24.44	230.21	13.11	1948	5172	22.68
K_2 – 60	1.330	1.577	27.53	82.98	0.421	0.440	8.79	23.37	24.52	246.75	13.91	2086	5262	23.57
K_3 – 80	1.297	1.510	26.37	83.10	0.425	0.411	8.63	22.49	24.39	246.59	13.85	2037	5515	23.20
S.Em±	0.018	0.031	0.95	2.33	0.005	0.013	0.25	0.77	0.05	3.98	0.39	59.86	168.16	0.26
C.D. at 5%	0.053	0.09	2.74	6.74	NS	NS	0.72	2.23	0.13	11.48	NS	172.89	485.68	0.76
Sulphur levels (kg S ha^{-1})														
S_0 – Control	1.261	1.267	22.84	61.82	0.413	0.343	7.51	16.27	24.35	223.48	11.28	1810	4808	22.39
S_1 – 20	1.296	1.276	24.55	65.26	0.420	0.409	7.90	20.63	24.33	225.17	12.79	1889	5075	22.21
S_2 – 40	1.307	1.323	27.02	71.77	0.431	0.470	8.82	25.07	24.53	231.35	15.00	2060	5359	23.60
S_3 – 60	1.296	1.259	26.12	69.13	0.417	0.458	8.34	24.95	24.35	232.26	14.61	2015	5464	23.50
S.Em±	0.018	0.031	0.951	2.33	0.005	0.013	0.25	0.77	0.05	3.98	0.39	59.89	168.16	0.26
C.D. at 5%	NS	NS	2.74	6.74	0.015	0.038	0.72	2.23	0.13	NS	1.13	172.89	485.68	0.76
Interaction (K x S)														
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	4.69	8.42	13.11	12.06	4.29	10.88	10.65	12.30	0.676	14.68	10.06	10.67	11.25	3.67

The highest seed yield (2086 kg ha^{-1}) was obtained with 60 kg ha^{-1} K_2O, which might be due to better attributed to more number of pods per plant and number of seeds per pod. Similar result was concluded by Samiullah and Khan (2003). While, minimum seed yield (1704 kg ha^{-1}) was observed with no potash fertilizer. These results are in agreement with those of Ali *et al.*, (2008) and Ganga *et al.*, (2014).

Effect of sulphur levels on nutrient content, uptake and yield of chickpea

Fertilization of sulphur significantly increased sulphur content and uptake by seed and stover of chickpea. Maximum content (0.425 & 0.440 %) and uptake (8.79 & 23.37 kg ha^{-1}) of aulphur by seed and stover of chickpea were recorded with 40 kg S ha^{-1}. Similar result was also concluded by Kaya *et al.*, (2009), Bhatt and Jain (2012) and Poonia *et al.*, (2013). Likewise, application of 40 kg S ha^{-1} recorded significantly 100-seed weight (23.60 g), which was statistically at par with 60 kg S ha^{-1}. Application of 40 kg S ha^{-1} recorded significantly the highest seed yield (2060 kg ha^{-1}), which was remained at par with 20 kg S ha^{-1} and 60 kg S ha^{-1}. However, application of 60 kg S ha^{-1} recorded significantly the highest stover yield (5464 kg ha^{-1}). This result also in conformity with those of Patel *et al.*, (2013) and Bohra (2014).

Effect of potassium and sulphur levels on after harvest soil fertility of status

The increasing levels of potassium up to 60 kg K ha^{-1} significantly increase available potassium in soil after harvest. However it remained at par with 80 kg K ha^{-1}. The application of 40 kg S ha^{-1} significantly increased available sulphur after harvest in soil over control. This could be due to the fact that ample supply of potassium and sulphur in soil provides a congenial environment in rhizosphere for microbial population and mineralization through its "energy currency' functions. Besides, on addition of fertilizer to the soil, there might be a sort of triggering action on native soil K, resulting in increased availability. Similar findings were reported by Meena and Ram (2013)) and Patel *et al.*, (2014).

It can be concluded that nutrient content and uptake, quality and yield parameter of chickpea (*cv*. GJG-3) and after harvest soil fertility status of soil should be increased with potassium 60 kg K_2O ha^{-1} or 80 kg K_2O ha^{-1} and sulphur 40 kg S ha^{-1} or 60 kg S ha^{-1} in medium black calcareous soils of South Saurashtra region of Gujarat.

References

Ali, A., Malik, M.A., Ahmad, R., Atif, T.S. 2008. Response of chickpea to potassium fertilizer. *Pak. J. Agric. Sci*., 33(1-4): 44-45.

Bohra, R.K.J.S. 2014. Effect of NPKS and Zn application growth, yield, economics and quality of chickpea. *Archives. Agro. and Soil Sci.*, 60(9): 1193-1206.

Ganga, N., Singh, R.K., Singh, R.P., Choudhury, S.K. and Upadhyay, P.K. 2014. Effect of potassium level and foliar application of nutrient on growth and yield of late sown chickpea. *J. Environment & Ecology*, 32: 273-275.

Golakiya, B.A. and Shobhana, H.K. 2000. "*Gujarat nikhetan man Gandhak*". *Department of Agricultural Chemistry and Soil Science*, SSGA, pp. 6-7.

Hirpara, D.V., Sakarvadia, H.L., Savaliya, C.M., Ranpariya, V.S., and Modhavadiya V.L. 2017. Effect of different levels of boron and molybdenum on growth and yield of summer groundnut (*Arachis hypogaea* L.) under medium black calcareous soils of south Saurashtra region of Gujarat.

International Journal of Chemical Studies, 5(5): 1290-1293.

Jadeja, A.S., Rajani, A.V., Foram, Chapdiya, Kaneriy A, S.C. and Kavar, N.R. 2016. Soil application of potassium and sulphur and effect on growth and yield components of chickpea (*Cicer arietinum* L.) under south Saurashtra region of Gujarat. *International Journal of Science, Environment and Technology*, 5 (5): 3172 – 3176.

Mallarino, A. P and Higashi, S. L. 2009. Assessment of potassium supply for cowpea by analysis of plant parts. *Soil Sci. Society of America J*., 73(60)*: 2177-2183.*

Meena, B. S. and Ram, 2013. Effect of integrated nutrient management on productivity, soil fertility and economics of chickpea (*Cicer arietinum* Linn.) varieties in vertisols. *Ann. Agric. Res.*, 34(3): 325-330.

Mondal, S. S., Mandal, P., Saha, M., Bag, A. M., Nayak, S. and Sounda, G. 2005. Effect of potassium and sulphur on the productivity, nutrient uptake and quality of chickpea. *J. of Crop and Weed*, 2: 64-66.

Patel, H. K., Patel, P. M., Suthar, J. V. and Patel, M. R. 2014. Yield, quality and post-harvest nutrient status of chickpea influenced by application of sulphur and phosphorus fertilizer management. *Inter. J. of Sci. and Res. Publications*, Vol 4, Issue 7.

Patel, H.R., Patel, H.F., Maheriya, V.D. and Dodia, I.N. 2013. Response of chickpea (*Cicer arietinum* L.) to sulphur and phosphorus fertilization with and without biofertilizer application. *Inter. J. Life Sci.*, 8(1): 149-152.

Singh, N.P. 2011. Project Co-ordinators report 2010-11, AICRP on chickpea (*Cicer arietinum* L.), IIPR, Kanpur.

How to cite this article:

Jadeja, A.S., A.V. Rajani, S.C. Kaneriya and Hirpara, D.V. 2019. Nutrient Content, Uptake, Quality of Chickpea (*Cicer arietinum* L.) and Fertility Status of Soil as Influenced by Fertilization of Potassium and Sulphur. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 2351-2355.
doi: https://doi.org/10.20546/ijcmas.2019.806.280