

EFFECT OF POTASSIUM AND SULPHUR ON NUTRIENT UPTAKE AND ECONOMICS OF CORIANDER (*Coriandrum sativum* L.)

Abstract

A field experiment was conducted on loamy sand soil at Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during *rabi* 2021-22 to study the response of coriander (*Coriandrum sativum* L.) to potassium and sulphur. The experiment was laid out in factorial randomized block design (FRBD) consisted three level each of potassium (0, 20 and 40 kg/ha) and sulphur (0, 15 and 30 kg/ha) and replicated four times. Application of 40 kg K₂O/ha gave significantly higher potassium content and uptake in seed and straw. However, different levels of potassium on sulphur content in seed and straw of coriander was not significant. The maximum sulphur content and uptake in seed and straw was recorded with application of 30 kg S/ha but sulphur application do not influence on potassium content in seed and straw. Application of 40 kg K₂O /ha and to 30 kg S/ha gave significantly higher gross and net realizations as well as BCR. While, application of 20 kg K₂O /ha and 15 kg S/ha resulted in the higher ICBR.

Keywords: Coriander, Potassium, Sulphur, Content and Uptake

Introduction

India is the world's largest producers, consumers and exporter of seed spices and thus, known as home of spices. The seed spices are a group which denotes all those annual whose dried fruits or seeds used as spices. Gujarat and Rajasthan together contribute more than 80 per cent of the total seed spices production in the country and thus, both the states together are known as "bowl of seed spices" of India. Coriander (*Coriandrum sativum* L.) is belongs to *Apiaceae* family and originated from Mediterranean region. It is mainly cultivated for its fruits as well as leaves. The dry seeds of coriander contain 19.6 percent non-volatile oil, 24 percent carbohydrates, 5.3 percent mineral matter and 175 IU/100g vitamin A (Chaudhary, 2011). Coriander bark oil has high germicidal activity and it can be used as fungicides (Krishna, 1999). Essential oil contain linalool content which varies from 57.0-87.5 percent.

Potassium is known to play a vital role in photosynthesis and carbohydrate formation. It has also been shown that potassium plays a key role in the activation of more than 60 enzyme systems in plants. It has also a role in stomatal respiration, photosynthetic transfer, crop development etc. The high mobility of potassium permits it to move quickly from cell to cell or from older parts to newly developed tissues and storage organs (Sadanandan and Hamza, 1998). Excess potassium may lead to Mg and possibly Mn, Zn and Fe deficiency. Inadequate potassium diminishes growth and make susceptible to diseases (Sadanandan *et al.*, 1993). Constant use of straight fertilizer under intensive cropping system for fulfillment of nitrogen and phosphorus, gradually decreased the use of organic manures and cultivation of high yielding and input responsive varieties developed the deficiency of potassium in soil.

Sulphur is essential for formation of chlorophyll and synthesis of several vitamins and amino acids *i.e.*, cystine, cysteins and methionine and it also helps in photosynthesis and nitrogen

fixation (Patel *et al.*, 2013). The interactions of sulphur with other nutrients improve the quality of crops. Sulphur is involved in the sulphydryl linkages which provide the source of pungency in oil. Sulphur deficiency has been aggravated in soils due to continuous crop removal under intensive cropping system and use of sulphur free high analysis NPK fertilizers.

Material and Methods

An experiment was conducted during *rabi* seasons of 2021-22 at the Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat located between 24°-19'N latitude and 72°-19'E longitude at an altitude of 154.52 m above the mean sea level. The crop growing season experienced 7 to 15°C minimum temperature and 31 to 37°C maximum temperature. The soil of experimental site was loamy sand soil in texture (Sand 83.89 %, silt 7.18 % and clay 8.23) with the pH of 7.1. Soil had low organic carbon (0.23) and available N (158 kg/ha), P (43.42 kg/ha), K (281 kg/ha) and S (8.2 kg/ha). Four times replicated experiment consisted of three level each of potassium (0, 20 and 40 kg/ha) and sulphur (0, 15 and 30 kg/ha) was laid out in factorial randomized block design (FRBD). Furrows were opened by keeping uniform spacing of 30 cm between two rows manually. As per treatments, the entire quantity of elemental sulphur was applied before one month of sowing in previously opened furrow. According to treatment, the full dose of potassium was applied at the time of sowing in previously opened furrow in the form of Murite of potash. As per recommendation, half nitrogen and full phosphorus were applied as basal dose in the previously opened furrows to all the plots in form of urea and DAP, respectively. Remain half dose of nitrogen was applied at 30 DAS through urea as top dressing before vapsa condition at evening.

RESULTS AND DISCUSSION

Nutrient content and uptake

Effect of potassium

The application of 40 kg K₂O/ha recorded significantly higher potassium content in seed and straw. Sulphur content in seed and straw of coriander was found non-significant due to different levels of potassium. But beneficial effect of potassium was observed in sulphur content in seed. Crop fertilized with 40 kg K₂O/ha recorded significantly higher potassium and sulphur uptake by seed and straw as well as at par with application of 20 kg K₂O/ha. The higher nutrients content in seed and straw may be due to accumulation and its translocation from vegetative parts to reproductive parts at the latter stages of crop growth. Moreover, adequate supply of potash throughout the growth period might be increased potassium content in seed and straw. Marked effect of potassium application on potassium content in seed and straw as well as seed and straw yields was observed which resulted in higher removal of potassium by seed and straw. Similar results are also reported by Tripathi (2006), Tripathi *et al.* (2009) and Solanki *et al.* (2017).

Table 1: Potassium and sulphur content (%) by seed and straw of coriander as influenced by potassium and sulphur

Treatments	Potassium content (%)	Sulphur content (%)
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	Seed	Straw	Seed	Straw
[A] Levels of potassium (K)				
K ₁ : 0 kg/ha	1.170	1.830	0.225	0.274
K ₂ : 20 kg/ha	1.230	1.920	0.230	0.284
K ₃ : 40 kg/ha	1.270	1.950	0.237	0.285
S.Em.±	0.02	0.03	0.33	0.04
CD (<i>P</i> =0.05)	0.05	0.07	NS	NS
[B] Levels of sulphur (S)				
S ₁ : 0 kg/ha	1.190	1.870	0.223	0.273
S ₂ : 15 kg/ha	1.230	1.900	0.231	0.282
S ₃ : 30 kg/ha	1.250	1.930	0.238	0.289
S.Em.±	0.02	0.03	0.03	0.04
CD (<i>P</i> =0.05)	NS	NS	0.10	0.11
Interaction (K×S)	NS	NS	NS	NS
C. V. %	5.15	4.63	5.15	4.51

Table 2: Potassium and sulphur uptake (kg/ha) by seed and straw of coriander as influenced by potassium and sulphur

Treatments	Potassium uptake (kg/ha)		Sulphur uptake (kg/ha)	
	Seed	Straw	Seed	Straw
[A] Levels of potassium (K)				
K ₁ : 0 kg/ha	12.71	27.04	2.39	4.05
K ₂ : 20 kg/ha	15.40	31.05	3.05	4.58
K ₃ : 40 kg/ha	16.43	33.27	3.34	4.90
S.Em.±	0.59	0.81	0.10	0.12
CD (<i>P</i> =0.05)	1.71	2.37	0.28	0.41
[B] Levels of sulphur (S)				
S ₁ : 0 kg/ha	13.00	27.89	2.59	4.13
S ₂ : 15 kg/ha	15.32	30.71	2.99	4.56
S ₃ : 30 kg/ha	16.22	32.76	3.21	4.83
S.Em.±	0.59	0.81	0.10	0.12
CD (<i>P</i> =0.05)	1.71	2.37	0.28	0.41
Interaction (K×S)	NS	NS	NS	NS
C. V. %	13.67	9.23	11.39	9.25

Effect of sulphur

The sulphur content in seed and straw was significantly influenced by different levels of sulphur but potassium content in seed and straw were not reach the level of significance. Application of 30 and 15 kg S/ha were at par and recorded significantly higher sulphur content in seed and straw as well as potassium and sulphur uptake by seed and straw than 0 kg S/ha. This might be due to increase in availability of sulphur in the root zone increased under application of

higher levels of sulphur coupled with better metabolic activities at the cellular level probably have increased the sulphur content in seed and straw. Remarkable effect of sulphur on sulphur content in seed and straw as well as seed and straw yields were recorded which resulted in improvement in sulphur uptake by seed and straw with increase in levels of sulphur. The results were closely related with finding of Sivkumaran *et al.* (1996), Bhoja (2008) and Solanki *et al.* (2017).

Table 3: Economics of coriander as influenced by various levels of potassium and sulphur

Treatment	Gross realization (₹/ha)	Net realization (₹/ha)	BCR	ICBR
[A] Levels of potassium (K)				
K ₁ : 0 kg/ha	129960	89879	3.24	-
K ₂ : 20 kg/ha	149800	108547	3.63	1:16.94
K ₃ : 40 kg/ha	158880	116455	3.74	1:12.18
[B] Levels of sulphur (S)				
S ₁ : 0 kg/ha	134440	94087	3.34	-
S ₂ : 15 kg/ha	148720	107467	3.60	1:15.86
S ₃ : 30 kg/ha	155480	113327	3.68	1:11.68

Economics

Gross and net realizations as well BCR were increased with increase in levels potassium (0 to 40 kg K₂O/ha) and sulphur (0 to 30 kg S/ha) but rate of increase in net return was higher with increase in potassium and sulphur levels from 0 to 20 kg K₂O /ha and 0 to 15 kg S/ha as compared to 20 to 40 kg K₂O /ha and 15 to 30 kg S/ha. The increase in profitability was mainly due to increase in seed yield under adequate supply of potassium and sulphur. These finding were agreements with results reported by Bhoja (2008) and Solanki *et al.* (2017). ICBR increased with increase in potassium and sulphur levels from 0 to 20 kg K₂O /ha and 0 to 15 kg S/ha but further increase in level it was decreased. Application of 20 kg K₂O /ha and 15 kg S/ha resulted in the higher ICBR than 40 kg K₂O /ha and 30 kg S/ha.

Conclusion

Based on finding, it is concluded that coriander crop should be fertilized with 20 kg K₂O/ha and 15 kg S/ha for higher nutrient uptake and net return as well as ICBR.

REFERENCES

Bhoja S A. 2008. Effects of land configuration and different levels of potash and sulphur on growth and seed yield of coriander (*Coriandrum sativum* L.). M.Sc. (Agri.) thesis submitted to Navsari Agricultural University, Navsari.

- Sivakumaran S, Hunsigi G, Basavaraju H K and Shridhara S. 1996. Study on nutrient uptake, seed and oil yield of coriander (*Coriandrum sativum* L.) as influenced by nitrogen, phosphorus and sulphur. *Indian Agriculture*, 40 (2): 89- 92.
- Chaudhary I. 2011. Weed management in coriander (*Coriandrum sativum* L.) under varying levels of nitrogen, Ph.D. Thesis, Submitted to S.K.N. College of Agriculture, Jobner.
- Patel C B, Amin A U and Patel A L. 2013. Effect of varying levels of nitrogen and sulphur on growth and yield of coriander (*Coriandrum sativum* L.). *An International Quarterly Journal of Life Sciences*. 8 (4): 1285-1289.
- Sadanandan A K. 1993. Potassium in soils growing black pepper (*Piper nigrum* L.) and response of applied potash. In: “*Potassium for Plantation Crops*”, (Eds) Mahatim Singh and M.K. Mishra. Potash Research Institute of India, Gurgaon, Haryana. pp 75-88.
- Sadanandan A K and Hamza. 1998. Organic farming on yield and quality of spices in india (Abs.) 16th World Congress on Soil Science; Montpellier, France during 20-26 August, 1998, p 738.
- Solanki J N, Javiya P P, Savaliya N V and Hirpara D S. 2017. Response of coriander (*Coriandrum sativum* L.) to different levels of potassium and sulphur. *International Journal of Chemical Studies*, 5 (5): 1884-1887.
- Sadanandan, A K, Korikanthimath V S. and Hamza S. 1993. Potassium in Soils of cardamom (*Elallaria cardamomum* M.) Plantations. In “*Potassium for Plantation Crops*”, (Eds) Mahatim Singh and Mishra, M.K. Potash Research Institute of India, Haryana. pp. 89-101.
- Tripathi M L, Trivedi S K. and Yadav R P. 2009. Effect of irrigation and nutrient levels on growth and yield of coriander (*Coriandrum sativum* L.). *Indian Journal of Agronomy*, 54 (4): 454-458.
- Tripathi M L. 2006. Effect of potassium and sulphur levels on yield and uptake of N, P and K by coriander (*Coriandrum sativum* L.). *Crop Research*, 32 (3): 370- 371.

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