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

Abstract

A field experiment was conducted during *rabi* 2021-22 at Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat on loamy sand soil 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 K_2O/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 K_2O /ha and to 30 kg S/ha gave significantly higher gross and net realizations as well as BCR. While, application of 20 kg K_2O /ha and 15 kg S/ha resulted in the higher ICBR.

Keywords: Coriander, Potassium, Sulphur, Content and Uptake

Introduction

The largest producer, consumer and exporter of seed spices worldwide is India, which is sometimes referred to as the "home of spices." All annuals whose dried fruits or seeds are used as spices are referred to as "seed spices" in this group. Together, Gujarat and Rajasthan produce more than 80% of the nation's entire supply of seed spices, earning them the moniker "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.

It is well recognized that potassium is essential for the production of carbohydrates and for photosynthesis. Additionally, research has demonstrated that potassium is crucial for the activation of more than 60 enzyme systems in plants. Additionally, it plays a part in crop development, photosynthetic transfer, and stomatal respiration. 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 fullfillment 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 necessary for the synthesis of various vitamins, including cystine, cysteins and methionine as well as for the creation of chlorophyll. It also aids in photosynthesis and nitrogen fixation (Patel *et al*., 2013). Sulfur interacts with other nutrients to enhance the quality of crops. Sulphur is a component of the sulphyhydryl bonds that give oil its pungent flavor. Due to continual crop removal under an intense cropping strategy and the use of sulphur-free high analysis NPK fertilizers, sulphur shortage in soils has gotten worse.

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^{o}-19'N latitude and 72^{o}-19'E longitude at an altitude of 154.52 m above the mean sea level. The crop growing season experienced 7 to 15^{o}C minimum temperature and 31 to 37^{o}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 K_2O/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 K_2O/ha recorded significantly higher potassium and sulphur uptake by seed and straw as well as at par with application of 20 kg K_2O/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 (%)	
	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 (*P*=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 (*P*=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 (*P*=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 (*P*=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), Bhoya (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 K_2O/ha) and sulphur (0 to30 kg S/ha) but rate of increase in net return was higher with increase in potassium and sulphur levels from 0 to 20 kg K_2O /ha and 0 to 15 kg S/ha as compared to 20 to 40 kg K_2O /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 Bhoya (2008) and Solanki *et al.* (2017). ICBR increased with increase in potassium and sulphur levels from 0 to 20 kg K_2O /ha and 0 to 15 kg S/ha but further increase in level it was decreased. Application of 20 kg K_2O /ha and 15 kg S/ha resulted in the higher ICBR than 40 kg K_2O /ha and 30 kg S/ha.

Conclusion

Based on finding, it is concluded that coriander crop should be fertilized with 20 kg K_2O/ha and 15 kg S/ha for higher nutrient uptake and net return as well as ICBR.

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Conflicts of Interest

There were no any conflicts of interest exist during the experiment.

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