

Original Research Article

Comment [D1]:

EFFECT OF POTASSIUM AND SULPHUR ON GROWTH, YIELD AND PRODUCTIVITY OF CORIANDER (*Coriandrum sativum* L.)

Abstract

A field experiment “Response of coriander (*Coriandrum sativum* L.) to potassium and sulphur” was conducted at S D Agricultural University, Gujarat during *rabi* season 2021-22 on loamy sand soil. The experiment comprised of 9 treatment combinations. Application of 40 kg K₂O/ha significantly influenced the growth *viz.*, plant height at 60, 90 DAS and at harvest, number of primary, secondary, tertiary branches per plant and yield attributes *viz.*, number of umbels per plant, seed yield per plant, 1000 seed weight as well as seed and straw yields. The maximum seed and straw yields were recorded under application of 30 kg S/ha. Similar response trend was also observed in growth and yield attributes.

Keywords: - Coriander, Potassium, Sulphur, Growth and Yield

Introduction

Coriander (*Coriandrum sativum* L.) is belongs to *Apiaceae* family and originated from Mediterranean region. It is commonly known as "Dhania" or "Dhana". It is one of the earliest seed spices and leafy vegetable crop used by mankind. The aromatic odour in coriander is due to the presence of essential oil ranges from 0.1 to 1.3 percent in dry seeds. Coriander powder and its essential oil are considered as natural food preservatives including antibacterial, antifungal and antioxidant properties (Bhat *et al.*, 2014). Potassium (K) improves quality and yield of spices (Sadanandan, 1993). 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). 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.

Comment [D2]: delete

Material & method

A study was conducted during *rabi* season of 2021-22 at the Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. The experiment comprises of 9 treatment combinations (Table 1). 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 having 0.23 % organic carbon, 7.10 pH, 158, 43.42, 281 and 8.2 kg/ha available N, P, K and S, respectively. “Gujarat coriander 3” was sown on 18 November 2021 at 30 cm using seed rate of 15 kg/ha and was harvested on 15 March 2022. As per treatments, the entire quantity of elemental sulphur was applied before one month of sowing

Comment [D3]: Table 1 is showing results and not treatment combinations.

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.

Comment [D4]: Further explanation

Results & discussion

Effect of potassium

Among the different treatments, significantly superiority of 40 kg K₂O/ha overall growth significantly enhanced plant height at 60, 90 DAS and at harvest, primary, secondary, tertiary branches per plant. This might be due to the high availability of potassium enhances root development by producing more branching and lateral root (Egilla *et al.*, 2001). Moreover, during initial stage better nutritional environment also enhance the vegetative growth. These finding were in line with Ali *et al.* (2015) and Bhuva (2017). The yield attributing characters *viz.*, number of umbels per plant, seed yield per plant, 1000-seed weight, seed and straw yields recorded highest under 40 kg K₂O/ha were at par with 20 kg K₂O/ha except in case of number of umbellate per umbel and number of seeds per umbellate where 40 and 20 kg K₂O/ha were not differ remarkably. These might be due to potassium plays an important role in cell division and cell elongation in meristamatic cells, maintenance of turgor pressure, stomatal activity, photosynthetic transfer leading to development of better root and shoot growth, ensuring timely and uniform ripening of the crop. Thus, adequate supply of potassium might be responsible for profuse vegetative growth in terms of plant height and number of branches per plant which resulted in higher yield. Similar finding were also reported by Bhoya (2008), Bhuva (2017), Solanki *et al.* (2017) and Davara *et al.* (2019). The harvest index was not remarkably influenced by levels of potassium.

Table 1: Effect of various levels of potassium and sulphur on plant height (cm) and number of branches per plant of coriander

Comment [D5]: Every table starts on a new page and should be one per page

Treatments	Plant height (cm)				Number of branches per plant		
	30 DAS	60 DAS	90 DAS	At harvest	Primary	Secondary	Tertiary
[A] Levels of potassium (K)							
K ₁ : 0 kg/ha	10.48	38.26	67.43	83.34	4.46	7.50	12.88
K ₂ : 20 kg/ha	11.21	42.64	72.95	89.70	5.05	8.69	14.32
K ₃ : 40 kg/ha	11.50	44.17	74.75	92.40	5.29	9.05	15.06
S.Em.±	0.29	1.32	1.79	1.99	0.11	0.19	0.31
CD (P=0.05)	NS	3.84	5.22	5.81	0.33	0.55	0.89
[B] Levels of sulphur (S)							
S ₁ : 0 kg/ha	10.66	38.56	67.53	83.94	4.56	7.71	12.97
S ₂ : 15 kg/ha	11.14	42.76	73.34	90.03	5.07	8.55	14.48
S ₃ : 30 kg/ha	11.40	43.75	74.26	91.97	5.18	8.98	14.82
S.Em.±	0.29	1.32	1.79	1.99	0.11	0.19	0.31

CD ($P=0.05$)	NS	3.84	5.22	5.81	0.33	0.55	0.89
Interaction (K×S)	NS	NS	NS	NS	NS	NS	NS
C. V. %	9.17	10.95	8.65	7.79	7.84	7.72	7.54

Table 2: Effect of various levels of potassium and sulphur on yield attributes and yield of coriander

Treatments	No. of umbels per plant	No. of umbellates per umbel	No. of seeds per umbellate	Seed yield per plant (g)	1000-seed weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)
[A] Levels of potassium (K)								
K ₁ : 0 kg/ha	14.61	5.83	5.46	3.50	12.55	1083	1498	42.53
K ₂ : 20 kg/ha	16.63	6.21	5.84	3.87	13.48	1249	1617	43.21
K ₃ : 40 kg/ha	16.83	6.31	6.13	4.18	13.99	1324	1706	43.57
S.Em.±	0.33	0.16	0.15	0.12	0.29	36	40	0.31
CD ($P=0.05$)	0.95	NS	NS	0.35	0.85	107	116	NS
[B] Levels of sulphur (S)								
S ₁ : 0 kg/ha	14.84	5.96	5.65	3.48	12.58	1121	1492	42.72
S ₂ : 15 kg/ha	16.37	6.11	5.77	3.97	13.67	1240	1615	43.37
S ₃ : 30 kg/ha	16.85	6.28	5.01	4.09	13.77	1296	1694	43.23
S.Em.±	0.33	0.16	0.15	0.12	0.29	36	40	0.31
CD ($P=0.05$)	0.95	NS	NS	0.35	0.85	107	116	NS
Interaction (K×S)	NS	NS	NS	NS	NS	NS	NS	NS
C. V. %	7.08	8.92	8.80	11.54	7.68	10.41	8.59	2.52

Effect of sulphur

Application of 30 kg S/ha gave significantly higher plant height, primary, secondary, tertiary branches per plant. These may be due to adequate application of sulphur improved over all nutritional environment of the *Rhizosphere* as well as plant system and more advantageous for better root and shoot growth which resulted in profuse vegetative growth in terms of plant height and number of branches per plant. These findings were corroborated by the results reported by Pratap *et al.* (2003) and Kumar (2018). The maximum number of umbels per plant, seed yield per plant, 1000-seed weight, seed and straw yields recorded when crop received 30 kg S/ha and was at par with 15 kg S/ha but significantly superior over 0 kg S/ha. However, number of umbellate per umbel and number of seeds per umbellate were not differed remarkably due to application of different levels of sulphur. Adequate application of sulphur helps in stimulating photosynthesis and synthesis of sulphur containing amino acids, proteins, chlorophyll as well as increased carbohydrates metabolism. Which resulted in profuse vegetative growth, *i.e.*, plant height and number of branches per plant as well as yield attributes *i.e.*, number of umbels per plant, seed yield per plant and test weight consequently increased seed and straw yield. These findings were in accordance with reported by Patel *et al.* (2013), Solanki *et al.* (2017) and Kedir (2021). Sulphur levels was not influenced remarkably on harvest index.

Comment [D6]: Recast

Regression analysis of coriander yield and nutrient level

The relationship between data of coriander yield and nutrients level was developed by regression analysis taking Y dependent variable and X (nutrients level). The regression equation was $Y = 10.98 + 0.060X$ ($R^2 = 0.95$) for potassium and $Y = 11.31 + 0.058X$ ($R^2 = 0.95$) for sulphur level. The coefficient of determination was ($R^2 = 95\%$) for both the parameters.

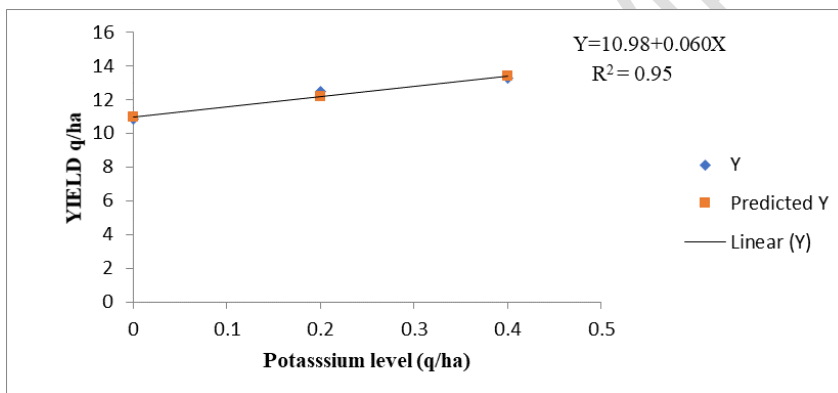


Fig 1 : Graphical representation of yield vs potassium level.

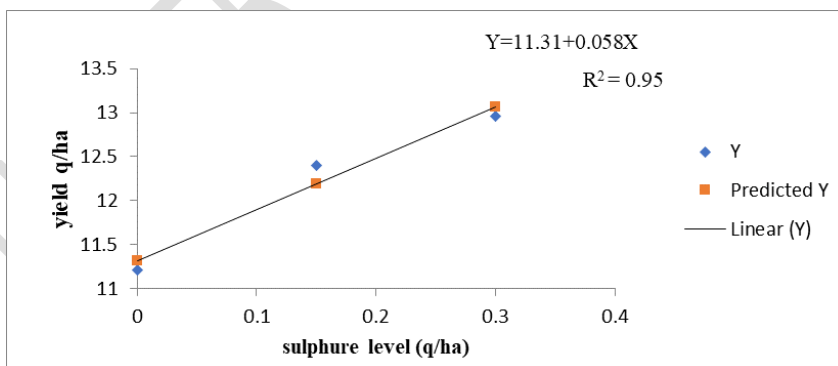


Fig 2: Graphical representation of yield vs sulphure level.

Conclusion

Based on finding, it is concluded that coriander crop should be fertilized with 20 kg K₂O/ha and 15 kg S/ha for obtaining higher growth and yield.

Comment [D7]: Conclusion not comprehensive.

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