Agriculture Update
Volume **12** | TECHSEAR-8 | 2017 | 2202-2206
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RESEARCH ARTICLE :

Effect of different fertilizers on nutrient uptake in coriander (*Coriandrum sativum* L.)

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ARTICLE CHRONICLE :
Received :
20.07.2017;
Accepted :
16.08.2017

SUMMARY : The effect of different fertilizers and their doses on nutrient uptake in coriander variety JD-1 was carried out at Horticulture complex, Department of Horticulture, JNKVV, Jabalpur (M.P.) in the year 2011-2012. Among the organic manures, the maximum nitrogen and phosphorous uptake was maximum in Poultry manure @ 5 t ha $^{-1}$ followed by Poultry manure @ 2.5 t ha $^{-1,}$ while maximum potash uptake was found in the Vermicompost @ 5 t ha $^{-1}$. Among the fertilizer levels maximum nitrogen phosphorus and potash uptake was found with 100 % RDF. In case of interaction effect, the maximum nitrogen and phosphorous uptake was in treatment T_5- Poultry manure @ 5 t ha $^{-1}$ + 100 % RDF while maximum potassium uptake was found in treatment T_9- Vermicompost @ 5 t ha $^{-1}$.

How to cite this article : Dadiga, Ashwini and Jain, P.K. (2017). Effect of different fertilizers on nutrient uptake in coriander (*Coriandrum sativum* L.). *Agric. Update,* **12** (TECHSEAR-8) : 2202-2206.

KEY WORDS :
Coriander, Manures, Fertilizers, Nutrient uptake, N.P.K.

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BACKGROUND AND OBJECTIVES

Coriander is one of the important spice crop grown throughout the world and botanically known as *Coriandrum sativum* Linn. It belongs to the family Apiaceae. It is mainly cultivated for its leaves as well as seeds. The productivity of Coriander is influenced by several factors such as soil, varieties, fertilizer management, and also various agro techniques used for growing crop. Intensive cultural practices are necessary to produce high yields and quality product. There are numerous factors that influence the nutrition in crops. These factors can be internal or genetic factors on the one hand, and external factors on the other hand. Both types play significant roles in the nutrition processes that we can observe in crops. The efficient use of fertilizers is necessary for optimum growth and yield. Hence knowledge about the availability of nutrients in the soil is very essential. To assess the availability of various nutrients in the soil and the effect of fertilizer application, foliar and soil analysis of nutrients were made through plant analysis. For scheduling a fertilizer programme, analysis of plant nutrient status has been found useful to prevent the deficiency or excess of nutrient effects in any horticultural crops. The concentration and uptake of nutrient in plant varies with the age of the crop, season, plant parts, stage of the crop and cultivars. Plant analysis serves as an elegant tool for

understanding the growth and physiology of the plant at various phases of its growth (Hartz and Hochmuth, 1996). The present investigation was carried out to find the optimum level of fertilizer doses for higher nutrient uptake of in coriander.

RESOURCES AND METHODS

The experiment was laid out at Horticulture complex, Department of Horticulture, JNKVV, Jabalpur (M.P.) in FRBD design with 12 treatments replicated thrice. Soil samples were collected randomly from plough layer depth with the help of soil sampling tube before sowing and after harvesting of crops from each plot and finally composite soil samples were made. The samples were mixed thoroughly and dried in air, crushed, sieved through 2 mm sieve. The soil samples so prepared were subjected to chemical analysis for evaluating soil fertility status following standard procedures. The soil reaction was determined from soil sample paste 1:2 (soil: water ratio) using systronics pH meter model-326. Electrical conductivity was also determined by electrical conductivity meter in 1:2 soil water suspensions at 25°C and it is expressed as dS /m (deci Seimens per meter). Organic carbon was determined by Walkley and Black (1934) wet digestion method. Organic carbon content in soil is expressed in per cent of soil (Piper, 1967). Determination of available nitrogen was done by alkaline permanganate method suggested by Subbiah and Asija (1956). The estimation of available P was done by using Olsen's extract (0.5 N sodium bicarbonates solution of pH 8.5) as referenced by Olsen *et al*. (1954). It was determined as stannous chloride reduced blue colour The extraction procedure adopted was as described by Black (1965) and developing the colour in the extract (Motiramani and Wankhede, 1964) using "UV visible Spectrophotometer". The available amount of potassium was determined by using normal neutral ammonium acetate Flame photometer (Black, 1965).

For plant analysis the plant samples for each plot were collected randomly at harvest stage. These samples were oven dried at 60ÚC temperature for about 48 hours. Grinding of oven dried plant and the wet digestion (2:1 nitric acid and perchloric acid) of plant samples were carried out. The methods adopted for the estimation of nitrogen in plant is discussed briefly as under. Nitrogen was determined by KEL plus (Classic Model), for which 0.5 g of dry plant sample was taken and digested in 200 ml tube with concentrated H_2SO_4 (20 ml) in presence of triple salt mixture consisting of potassium sulphate, copper sulphate. The digested material was transferred to distillation unit and was distilled with 40 ml of 40% sodium hydroxide solution. The distilled ammonia was collected in 4% boric acid solution. After complete distillation, the distillate was titrated against 0.01 N standard sulphuric acid. The equivalent amount of nitrogen was calculated and results were expressed as content of nitrogen in per cent. For determination of phosphorous and potassium one gram of oven dried plant sample was digested in diacid mixture consisting of concentrated nitric acid and perchloric acid in the ratio of 2.5: 1 on hot plate till clear solution was obtained. The digested material was filtered through What man filter paper No. 40 and diluted to 100ml mark. Filtrate was used for determination of Phosphorous (P) and Potassium (K). Taking the liquid from the stock solution, P content was estimated by the vanado molybdo phosphoric acid. Yellow colour method in nitric acid system as described by Jackson (1967). The K content in extract was estimated by flame photometer as described by Black (1965). The results have been expressed as content of K in per cent.

OBSERVATIONS AND ANALYSIS

Data pertaining to nitrogen, phosphorus and potassium uptake as affected by different treatments are given in below tables. The perusal of data indicate that the different treatments affected the uptake of N,P and K nutrients. Among the organic manures Poultry manure @ 5 t ha $^{-1}$ recorded maximum nitrogen uptake (47.47 kg ha^{-1}) followed by Poultry manure @ 2.5 t/ ha (42.55 kg ha^{-1}) while, the minimum nitrogen (34.08 kg ha^{-1}) uptake was recorded in FYM @ 10 t ha $^{-1}$. Among the RDF levels, the maximum nitrogen uptake was observed in 100% RDF. While, the minimum in 50 % RDF. Among the interaction effect, the maximum (51.96 kg ha^{-1}) nitrogen uptake by coriander plants was recorded in the treatment combination of T_5 (Poultry manure @ 5 t ha $^{-1}$ + 100 % RDF) followed (46.03 kg ha^{-1}) by T_9 (Vermicompost @ 5 t ha $^{-1}$ + 100 % RDF). Whereas, the minimum (30.70 kg ha^{-1}) nitrogen uptake was recorded in treatment combinations of T_4 (FYM @ 10 t ha $^{-1}$ + 50 % RDF). Quite similar results were illustrated by Channabasavanna (2002); Kumar *et al*. (2002), Usman *et al.* (2003); Salem and Awad (2005) and Tripathi (2006). The phosphorus uptake was markedly influenced

due to different treatments. Poultry manure @ 5 t ha $^{-1}$ (31.63 kg ha^{-1}) had higher phosphorus uptake, followed by FYM @ 20 t ha $^{-1}$ (28.85 kg ha^{-1}) and Poultry manure @ 2.5 t ha $^{-1}$(28.70 kg ha^{-1}). However, the minimum (26.20 kg ha^{-1}) was found in Vermicompost 2.5 @ t/ha. Among the fertilizer levels the maximum phosphorus uptake (30.92) was found in 100% RDF, while the minimum in 50 % RDF (26.10). Among the treatment

Table 1: Effect of different treatments on nitrogen uptake by crop plants kg ha^{-1}

Organic manures	RDF 100 %	RDF 50 %	Mean
FYM @ 20 t/ha	40.56	34.85	37.72
FYM @ 10 t/ha	37.45	30.70	34.08
Poultry manure @ 5 t/ha	51.96	42.97	47.47
Poultry manure @ 2.5 t/ha	45.67	39.44	42.55
Vermicompost @ 5t/ha	46.03	37.13	41.58
Vermicompost@ 2.5 t/ha	41.73	37.86	39.80
Mean	43.91	37.16	40.53
	OM	RDF	OM × RDF
S.E. ±	0.440	0.254	0.623
C.D. (P=0.05)	1.291	0.745	1.826

Table 2: Effect of different treatments on phosphorus uptake by crop plants kg ha^{-1}.

Organic manures	RDF 100 %	RDF 50 %	Mean
FYM @ 20 t/ha	31.25	26.44	28.85
FYM @ 10 t/ha	29.46	25.49	27.48
Poultry manure @ 5 t/ha	34.90	28.35	31.63
Poultry manure @ 2.5 t/ha	30.26	27.14	28.70
Vermicompost@5t/ha	30.54	25.92	28.23
Vermicompost2.5@t/ha	29.12	23.28	26.20
Mean	30.92	26.10	28.51
	OM	RDF	OM × RDF
S.E. ±	0.440	0.254	0.623
C.D. (P=0.05)	1.292	0.746	1.827

Table 3 : Effect of different treatments on potassium uptake by crop plants kg ha^{-1}

Organic manures	RDF 100 %	RDF 50 %	Mean
FYM @ 20 t/ha	161.04	150.73	155.89
FYM @ 10 t/ha	156.29	147.67	151.98
Poultry manure @ 5 t/ha	158.46	151.27	154.87
Poultry manure @ 2.5 t/ha	154.34	149.91	152.13
Vermicompost@5t/ha	164.83	157.42	161.13
Vermicompost2.5@t/ha	160.36	154.58	157.47
Mean	159.22	151.93	155.58
	OM	RDF	OM × RDF
S.E. ±	0.422	0.244	0.597
C.D. (P=0.05)	1.24	0.714	1.750

Table 4 : Chemical properties of experimental field at initial stage

Sr. No.	Soil component	Analytical value	Sr. No.	Soil component	Analytical value
1.	Electrical conductivity (ds m^{-1})	0.13	4.	Available nitrogen (kg ha^{-1})	253
2.	Soil (pH)	6.93	5.	Available phosphorus (kg ha^{-1})	135
3.	Organic carbon (g ha^{-1})	6.8	6.	Available potassium (kg ha^{-1})	336

Table 5 : Changes in soil properties over their initial status as influenced by different treatments after completion of crop cycle

Treatments	Soil pH	EC(ds m^{-1})	OC (g kg^{-1})	Available nutrient (Kg ha^{-1})		
				N	P	K
T_1	7.02	0.19	4.5	190	8.6	350
T_2	6.94	0.15	5.5	207	12.5	542
T_3	7.16	0.11	4.1	181	9.1	331
T_4	7.26	0.17	4.7	193	9.9	282
T_5	7.02	0.17	5.2	202	10.4	400
T_6	6.88	0.18	5.8	216	8.9	289
T_7	6.87	0.10	4.5	190	9.6	249
T_8	6.92	0.13	4.7	193	9.9	267
T_9	7.14	0.17	6.2	230	8.9	315
T_{10}	6.98	0.17	3.7	169	9.7	235
T_{11}	7.14	0.15	5.9	219	10.1	256
T_{12}	7.02	0.17	7.2	266	18.0	232

combinations, treatment T_5 (Poultry manure @ 5 t ha^{-1} + 100 % RDF) had higher phosphorus uptake (34.90 kg ha^{-1}) followed by T_1 (FYM @ 20 t ha^{-1} + 100 % RDF) (31.25 kg ha^{-1}). While the lowest (23.28 kg ha^{-1}) phosphorus uptake was recorded by treatment T_{12} (Vermicompost @ 2.5 t ha^{-1}+50 %RDF). The present findings corroborated the best results of Channabasavanna (2002), Salem and Awad (2005) and Tripathi (2006).The different treatments varied significantly for potassium uptake. Among the organic manures maximum potassium (161.13) uptake was found under Vermicompost @ 5 t/ ha followed by Vermicompost @ 2.5 t $ha^{-1.}$ Among the fertilizer levels the maximum potassium uptake (159.22) was found in 100% RDF, while the minimum in 50 % RDF (151.93). Among the treatment interactions the maximum potassium uptake (164.83 kg ha^{-1}) was found under treatment T_9 (Vermicompost @ 5 t ha^{-1} + 100 % RDF) followed by (161.04 kg $ha^{-1)}$ treatment T_1 (FYM @ 20 t ha^{-1} + 100 % RDF). However, the lowest (147.67 kg ha^{-1}) potassium uptake was found under the treatment T_4 (FYM @ 10 t ha^{-1} + 50 % RDF). Channabasavanna (2002), Salem and Awad (2005) and Tripathi (2006) observed similar result. Plants with higher yield remove high N, P and K from the soil. A positive relationship was observed between uptake of the major nutrients and yield, probably through better uptake of N, P and K and their utilization in protein synthesis. Deora and Singh (2008) revealed that the application of fertilizer significantly increased the N, P, K contents and there uptake by crop. Similar findings were elaborated by Sadanandan and Hamza (2006) in black pepper.

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