IMPACT OF DIFFERENT INPUT SOURCES ON NUTRIENT UPTAKE OF CORIANDER

ABSTRACT

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 uptake (47.47 kg ha^{-1}) was observed in poultry manure @ 5 t ha^{-1}, while the minimum nitrogen uptake (34.08 kg ha^{-1}) in FYM @ 10 t ha^{-1}. The maximum phosphorus uptake (31.63 kg ha^{-1}) was found in poultry manure @ 5 t ha^{-1}, while it was minimum (26.20 kg ha^{-1}) in vermicompost @ 2.5 t ha^{-1}. Potassium uptake was maximum (16.11 kg ha^{-1}) in vermicompost @ 5 t ha^{-1}, while it was minimum (15. 19 kg ha^{-1}) in FYM @ 10 t ha^{-1}. With regard to fertilizer levels maximum nitrogen (43.91 kg ha^{-1}), phosphorus (30.92 kg ha^{-1}), and potash (15.92 kg ha^{-1}) uptake was found with 100 % RDF. While it was minimum (37.16 kg ha^{-1}, 26.10 kg ha^{-1} and 15.13 kg ha^{-1} respectively) with 50 % RDF. In case of interaction effect, the maximum nitrogen (51.96 kg ha^{-1}) and phosphorous (34.90 kg ha^{-1}) uptake was in treatment T5-Poultry manure @ 5 t ha^{-1} + 100 % RDF while maximum potassium uptake (16.48 kg ha^{-1}) was found in Vermicompost @ 5 t ha^{-1}. However, the lowest (14.76 kg ha^{-1}) potassium uptake was found with FYM @ 10 t ha^{-1} + 50 % RDF .

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is native to the European-Mediterranean area and was cultivated in China in the 1st century BC. Recently, it has been widely cultivated as a valuable herb all over the world. The rapid life cycle of some coriander genotypes allow them to be cultivated in the wide range of geographical

areas throughout the world. It is one of the most commonly used spices and possesses nutritional and medicinal properties . All parts of the coriander plant are edible, but the fresh leaves and the dried seeds are the parts most traditionally used in cooking. Its Fresh aerial part of coriander, containing proteins, vitamins, minerals (like calcium, phosphorus, and iron), fibers and carbohydrates, is used as vegetable, while both the leaves and seeds contain essential oil, rich in varying components, which provides typical flavor, when added to the food products and acts as preservative. Since the coriander seeds have strong and typical scent, they are appreciated worldwide as basic ingredients of many traditional foods, particularly curry powder . Coriander fruits (seeds) contain 10 to 27.7% oil and up to 2.6% essential oil, which may be used in many industrial purposes. The essential oil and various extracts from coriander fruits have anti-bacterial , antioxidant , anti-diabetic, anti-cancerous and antimutagenic activities. It can also act as a sedative or for relief of nervousness. Coriander oil main use is in masking foul medicines, especially purgatives, where it has anti-griping qualities. The quality of coriander is mainly determined by the essential oil content and its composition. Coriander fruit contains oils with a high concentration of monounsaturated fatty acids]. The oils with different fatty acid compositions are important for human consumption and for industrial uses; oleic, linoleic and petroselinic acids are the main components of fatty acids in coriander. Linalool is the main volatile compound in coriander seeds, typically constituting more than 50% of the total essential oil . Oils with a high proportion of oleic acid are more stable than other vegetable oils and they are recommended in the diet to reduce the risk of cardiovascular diseases in humans. On the other hand, linoleic acid is preferred by industries when oil hydrogenation is required and it is an essential fatty acid in the human diet. Petroselinic acid can be broken down into adipic (C6) and lauric (C12:0) acids by oxidative cleavage. Adipic acid is used for the manufacture of a wide range of

polymers including high-grade engineering plastics. Lauric acid is used as a raw material for soaps, emulsifiers, detergents, and softeners .

The key to making sense of the coriander market is to realize the capacity of specific producer countries to market. India is a significant producer of coriander, but early sixties almost all the production was staying in the country for domestic consumption. Later, the India started the export of coriander seeds and exported about 21000 metric tons of coriander seeds all over the world. Pakistan produces the coriander seeds up to its domestic demand and sometimes imports from India to meet out the deficit. Production in Eastern Europe is also known to be substantial, but very little information is available. Major producers are India, Morocco, Canada, Pakistan, Romania and the former Soviet Union whereas Iran, Turkey, Egypt and Israel China, Burma and Thailand are minor producer of the coriander seeds. The United States, Canada, Argentina and Mexico are producers in the Americas. The large-seeded coriander is mainly produced in Canada.

Access to enough food for healthy and productive life is the biggest challenge facing mankind in this millennium. In our country, the preoccupation of around 70% of population in subsistence farming makes it clear that agricultural improvement is the crucial need of today, which will lead to augmentation of food production for alleviating hunger. Agriculture improvement is an "engine of change" that catalyses many improved economic and social changes. In addition, it has role in creating overall stability through suitable development. It carries further importance in view of shrinking land resources. Out of the 328.73 million hectares total geographical area of the country, only 141.16 million ha is available for cultivation to sustain more than a billion populations. Generally, farmers use only chemical fertilizers with little or no organic manure for individual crop without considering cropping pattern for the whole year. As a result, large amount of

fertilizers are being misused every year. Moreover, less or no use of organic manure impairs soil physical, chemical, and biological properties. Nitrogenous fertilizers have very little residual effects on the few crops, as it is lost through leaching, volatilization and denitrification. But phosphorous, potassium, fertilizers might have residual effects for the subsequent crops. Thus, the fertilizer requirements for the succeeding crops in the cropping pattern may be considerably reduced if the residual benefit is taken into account. On the other hand, organic manure improves soil health and productivity. The present study was undertaken to find out optimum level of organic manures and fertilizer doses for higher nutrient uptake of coriander plant.

MATERIAL METHOD

The field experiment was conducted at Horticulture complex Deptt of Horticulture, JNKVV, Jabalpur, Madhya Pradesh during the winter seasons (Rabi) of 2012-2013. The experiment consisted of 12 treatments T1- FYM @ 20 t/ha + 100 % RDF , T2-FYM @ 20 t/ha + 50 % RDF, T3-FYM @10 t/ha + 100 % RDF, T4-FYM @ 10 t/ha + 50 % RDF, T5-Poultry manure @ 5 t/ha + 100 % RDF , T6-Poultry manure @ 5 t/ha + 50 % RDF, T7- Poultry manure @ 2.5 t/h + 100 % RDF, T8- Poultry manure @ 2.5 t/ha + 50 % RDF, T9-Vermicompost @ 5 t/ha + 100 % RDF, T10-Vermicompost @ 5 t/ha + 50 % RDF, T11-Vermicompost @ 2.5 t/ha +100% RDF, T12-Vermicompost @ 2.5 t/ha +50 % RDF. The Design of experiment was Asymmetrical Factorial RCBD with three replications.The experimental soil was medium black with good drainage, uniform texture with medium fertility status having 6.8 (g ha^{-1}) organic carbon, $KMn0_4$ extractable N-253 kg ha-^{l}, Olsen's P_20_5-10.5 kg ha and 1 N ammonium acetate extractable K_20-336 kg ha-^{l} with 6.93 ph.

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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. 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). Electrical conductivity was also determined by electrical conductivity meter in 1:2 soil water suspensions at 25^{o}C and it is expressed as dS /m (deci Seimens per meter). The soil reaction was determined from soil sample paste 1:2 (soil: water ratio) using systronics pH meter model-326. Organic carbon was determined by Walkley and Black (1934) wet digestion method. Organic carbon content in soil is expressed in percent of soil (Piper, 1967).

For analyzing nutrient content in plant, the plant samples for each plot were collected randomly at harvest stage. These samples were oven dried at 60˚ C 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. 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

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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 Whatman 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.

Table-1. Chemical properties of experimental field at initial stage (0-15 cm depth).

S. No.	Soil component	Analytical value	Method
1	Electrical conductivity ($ds\ m^{-1}$)	0.13	Solu-bridge method (Black,1965)
2	Soil (pH)	6.93	1:2.5 (soil: water) suspension using glass electrode pH meter. (Jackson,1967)
3	Organic carbon ($g\ ha^{-1}$)	6.8	Walkley and Black's titration method (Walkley and Black ,1934)

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4	Available nitrogen (kg ha^{-1})	253	Alkaline permagnate method (Subbiah and Asiji,1956)
5	Available phosphorus (kg ha^{-1})	13.5	Olsen's method (Jackson,1967)
6	Available potassium (kg ha^{-1})	336	Neutral normal ammonium acetate using Flamephotometer. (Jackson,1967)

RESULT AND DISCUSSION.

NITROGEN UPTAKE.

Nitrigen uptake is effected by different level of organic manures, fertilizers levels and treatment interaction and the variation nitrogen uptake is showen in table 2. 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 T5- (Poultry manure @ 5 t ha^{-1} + 100 % RDF) followed (46.03 kg ha^{-1}) by T9- (Vermicompost @ 5 t ha^{-1} + 100 % RDF). Whereas, the minimum (30.70 kg ha^{-1}) nitrogen uptake was recorded in treatment combinations of T4- (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).

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PHOSPHORUS UPTAKE.

Phosphorus uptake in coriander is markedly influenced by different level of organic manures, fertilizers levels and treatment interaction and the variation phosphorus uptake is showen in table 2. Among the organic manures, poultry manure @ 5 t ha $^{-1}$ had higher phosphorus uptake(31.63 kg ha^{-1}), 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 kg ha^{-1}) was found in 100% RDF, while the minimum in 50 % RDF (26.10 kg ha-^{1}). Among the treatment combinations, treatment T5 (Poultry manure @ 5 t ha $^{-1}$ + 100 % RDF) had higher phosphorus uptake (34.90 kg ha^{-1}) followed by T1 (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 T12- (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).

POTASSIUM UPTAKE .

Potassium uptake is effected by different level of organic manures, fertilizers levels and treatment interaction and the variation potassium uptake is showen in table 2. Among the organic manures maximum potassium uptake (16.11 kg ha^{-1}) was found under vermicompost @ 5 t/ ha followed by vermicompost @ 2.5 t ha $^{-1}$ (15.74 kg ha^{-1}), while minimum potassium uptake (15.19 kg ha^{-1}) was found in FYM @ 20 t ha $^{-1}$. Among the fertilizer levels the maximum potassium uptake (159.22 kg ha^{-1}) was found in 100% RDF, while the minimum 15.193) in 50 % RDF. Among the treatment interactions the maximum potassium uptake (16.483 kg ha^{-1}) was found under treatment T9- (Vermicompost @ 5 t ha $^{-1}$ + 100 % RDF) followed by treatment T1- (FYM @ 20 t ha $^{-1}$ + 100 % RDF) (16.10 kg ha$^{-1)}$.

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However, the lowest (14.76 kg ha^{-1}) potassium uptake was found under the treatment T4 -(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.

Table .2 Nitrogen, phosphorus and potassium up take as influenced by various organic manures , fertilizer levels and interaction effect.

ORGANIC MANURES	NITROGEN UPTAKE.			PHOSPHORUS UPTAKE.			POTASSIUM UPTAKE .		
	100% RDF	50% RDF	MEAN	100% RDF	50% RDF	MEAN	100% RDF	50% RDF	MEAN
FYM @ 20 t/ ha	40.56	34.85	37.72	31.25	26.44	28.85	16.10	15.07	15.59
FYM @ 10 t/ ha	37.45	30.70	34.08	29.46	25.49	27.48	15.63	14.77	15.20
PM @ 5 t/ ha	51.96	42.97	47.47	34.90	28.35	31.63	15.85	15.13	15.49
PM @ 2.5 t/ ha	45.67	39.44	42.55	30.26	27.14	28.70	15.43	14.99	15.21
VC @ 5 t/ ha	46.03	37.13	41.58	30.54	25.92	28.23	16.48	15.74	16.11
VC @ 2.5 t/ ha	41.73	37.86	39.80	29.12	23.28	26.20	16.04	15.46	15.75
MEAN	43.91	37.16	40.53	30.92	26.10	28.51	15.92	15.19	15.56
	(OM)	(RDF)	(OM) X (RDF)	(OM)	(RDF)	(OM) X (RDF)	(OM)	(RDF)	(OM) X (RDF)

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SEm±	0.952	0.550	1.346	1.227	0.708	1.735	0.420	0.243	0.595
CD @ 5%	2.792	1.612	3.949	3.598	2.077	5.086	1.233	0.712	1.744

FYM- Farmyard manure, PM- Poultry manure, VC- Vermicompost , OM- organic manures, RDF- recommended dose of fertilizers.

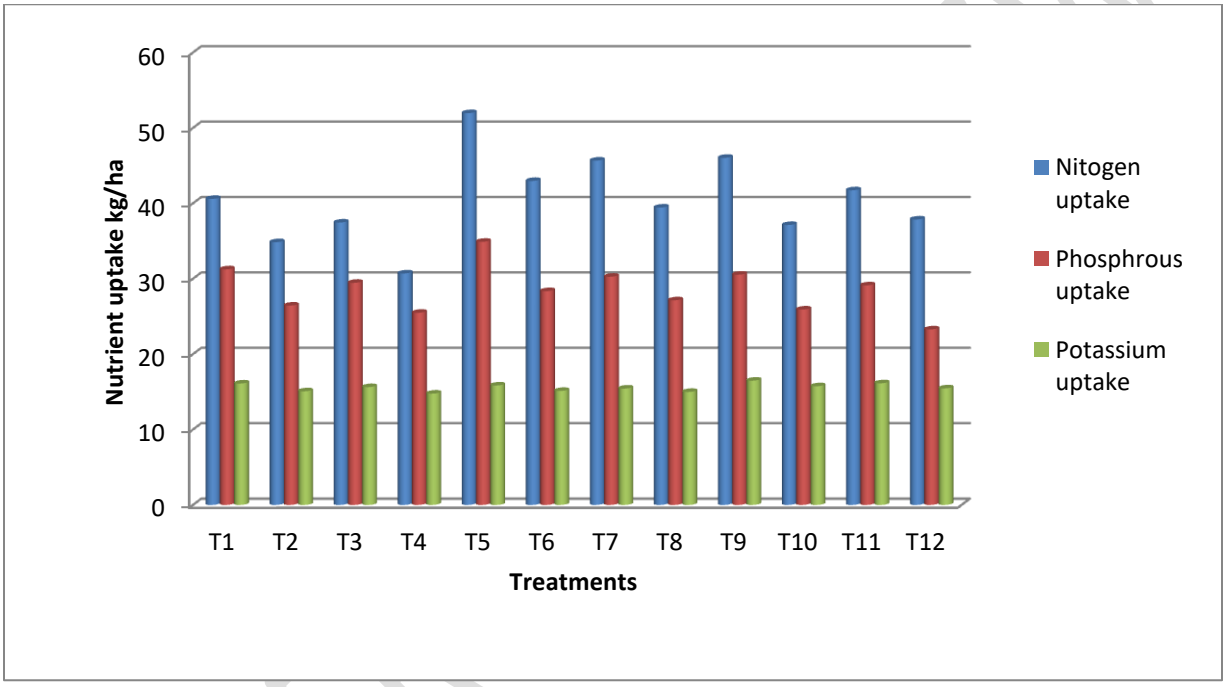

Fig 1. Representing nitrogen, phosphrous and potassium uptake with regard to different treatments.

SOIL PROPERTIES

The soil properties like Electrical conductivity , Soil (pH), Organic carbon , available nutrients like nitrogen, phosphrous and potassium after the compition of crop cycle were also influenced due to various level of organic manures, fertilizers levels and treatment interaction over the initial status of soil. The changes in soil properties due to different treatments is shown in table 3.

Table. 3. Change in soil properties over initial stage as influenced by different treatment combinations.

Treatments	Soil (pH),	Electrical conductivity ($ds\ m^{-1}$)	organic carbon ($g\ ha^{-1}$)	Available nutrients ($kg\ ha^{-1}$)		
				N	P	K
T1- FYM @ 20 t/ha + 100 % RDF	7.02	0.19	4.5	190	8.6	350
T2-FYM @ 20 t/ha + 50 % RDF	6.94	0.15	5.5	207	12.5	542
T3-FYM @10 t/ha + 100 % RDF	7.16	0.11	4.1	181	9.1	331
T4-FYM @ 10 t/ha + 50 % RDF	7.26	0.17	4.7	193	9.9	282
T5-Poultry manure @ 5 t/ha + 100 % RDF	7.02	0.17	5.2	202	10.4	400
T6-Poultry manure @ 5 t/ha + 50 % RDF	6.88	0.18	5.8	216	8.9	289
T7- Poultry manure @ 2.5 t/h + 100 % RDF	6.87	0.10	4.5	190	9.6	249
T8- Poultry manure @ 2.5 t/ha + 50 % RDF,	6.92	0.13	4.7	193	9.9	267
T9-Vermicompost @ 5 t/ha + 100 % RDF.	7.14	0.17	6.2	230	8.9	315

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T10-Vermicompost @ 5 t/ha + 50 % RDF.	6.98	0.17	3.7	169	9.7	235
T11-Vermicompost @ 2.5 t/ha +100% RDF.	7.14	0.15	5.9	219	10.1	256
T12-Vermicompost @ 2.5 t/ha +50 % RDF	7.02	0.17	7.2	266	18.0	232

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