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Influence of organic and inorganic source of fertilizers on growth, yield and economics of coriander (*Coriandrum sativum* L.)

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Abstract

A field experiment on "Influence of organic and inorganic sources of fertilizers on growth, yield and economics of coriander (variety RCr-480) cultivation under semi arid conditions" was conducted at Adaptive Trial Centre, Ajmer during *rabi* season (November-April) of 2010-11. The experiment was conducted with eight treatments (absolute control and varying proportion of organic and inorganic sources of nutrients viz., 100 % recommended dose of inorganic fertilizers (60:45:0), 100 % RDF through farm yard manure, 100 % RDF through poultry manure, 100 % RDF through vermicompost, 50 % RDF through fertilizers + 50 % RDF through farm yard manure, 50 % RDF through fertilizers + 50 % RDF through poultry manure and 50 % RDF through fertilizers + 50 % RDF through vermicompost) in completely randomized block design with three replications. Results revealed that, RDF through fertilizers and combinations of different organic and inorganic sources produced significantly higher grain yield over absolute control. Recommended dose of nutrients (100%) applied through fertilizers exhibited highest vegetative growth and yield attributes with maximum yield (1024 kg ha^{-1}), net returns (Rs. 59556 ha^{-1}) and benefit cost ratio (3.66), closely followed by 50 % RDF through fertilizers + 50 % RDF through vermicompost.

Key words : B:C ratio, coriander, growth, inorganic fertilizer, organic manure, Recommended Dose of Fertilizers, yield

Introduction

Coriander (*Coriandrum sativum* L.) is an important seed spice crop mainly grown in *rabi* season and belongs to family Apiaceae. India is the largest producer of coriander. It is prominently cultivated in Rajasthan, Andhra pradesh, Gujrat and Madhya pradesh with scattered pockets in Tamil Nadu, Odisha, Karnataka, Haryana, Uttar Pradesh and Bihar. Rajasthan occupies the premiere position in production and acreage and contributes about 40 percent to the total production of coriander in India. The tender leaves, stem and fruits of coriander have a pleasant aromatic flavour and thus is indispensable food adjunction in Indian cookery. The seeds are also used as condiment. The medicinal properties of coriander are many used in Indian Ayurvedic and Unani medicinal preparation. Coriander crop responds well to the application of both organic manures and inorganic fertilizers (Munnu Singh, 4). Organic manures supply the major nutrients, micronutrients, besides improving soil health (Palaniappan and Anndurai, 5). Inadequate and imbalanced application of nutrients is one of major factors for low yield and poor quality. Exclusive application of inorganic fertilizers creates deleterious effect on soil fertility due to limitation of one or more nutrients including micro nutrients and poor soil health leading to decline in productivity. No single source of nutrient is capable of supplying plant nutrients in adequate amount and balanced proportion. The conjunctive (integrated) application of organics with inorganic sources of nutrients reduces the dependence on chemical inputs and it not only acts as a source of nutrients but also provides micro nutrients as well as modifies the soil physical behavior and increases the efficiency of applied nutrients (Pandey *et al.,* 6 & Parihar *et al.,* 10).Keeping these facts in view, the present study was undertaken to evaluate the effect of organic and inorganic sources of nutrients on growth, yield and economics of coriander cultivation.

Materials and methods

A field investigation was carried out to study the influence of organic and inorganic sources of fertilizers on growth, yield and economics of coriander during *rabi* season of 2010-11 at research farm of Adaptive Trial Centre, Tabiji, Ajmer (Rajasthan), India. The soils of the experimental field was sandy loam having organic carbon (0.26), available nitrogen (142 kg ha^{-1}) and available P_2O_5

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(21 kg ha^{-1}) and available K_2O (178 kg ha^{-1}) with 8.2 pH and 0.32 dSm^{-1} electrical conductivity.

The investigation comprised of eight treatments (T_1- Absolute control- No nutrition, T_2- 100 % recommended dose of fertilizers (RDF) (60:45:0 kg NPK ha^{-1}), T_3- 100 % RDF through farm yard manure, T_4- 100 % RDF through poultry manure, T_5- 100 % RDF through vermicompost, T_6- 50 % RDF through fertilizers + 50 % RDF through farm yard manure, T_7- 50 % RDF through fertilizers + 50 % RDF through poultry manure and T_8- 50 % RDF through fertilizers + 50 % RDF through vermicompost) was laid in completely randomized block design (CRBD) with three replications. Full dose of nitrogen and phosphorus and organic manures as per treatments were applied manually through DAP, urea, FYM, poultry manure and vermicompost at the time of sowing. Prior to sowing, seeds were cleaned and splited to two halves.The coriander variety RCr-480 was sown manually on 2th, December 2010 in furrows opened at 30 cm row spacing using 10 kg seed ha^{-1}. Standard agronomic and plant protection practices were adopted for raising healthy crop. Data on growth and yield attributes were taken from 10 tagged plants. Biological and economic yields were taken from net plot. To ascertain the economic feasibility of different treatments, economics of the treatments was worked out by calculating parameters like cost of cultivation, gross returns, net returns and benefit cost ratio using the prevailing price of inputs and output in the local market. Statistical analysis was performed as per methods suggested by Panse & Sukhatme (7).

Results and discussion

Effect on vegetative growth and yield attributes

The higher values of growth and yield attributes *viz.,* plant height, number of primary and secondary branches, umbels per plant, umbellates per umbel, seeds per umbel and test weight of coriander seeds were recorded with the application of recommended dose of fertilizers (RDF) through chemical fertilizers *i.e.*, 60:45:0 kg N, P_2O_5 & K_2O ha^{-1} (Table 1). Application of RDF through fertilizers increased plant height, number of primary and secondary branches, umbels per plant, umbellates per umbel, seeds per umbel and 1000-seed weight to the magnitude of 54.58, 51.75, 66.68, 66.70, 51.45, 53.07 and 40.56 per cent, respectively higher than that of absolute control. However, performance of this treatment (T_2) was at par with treatment T_8 (50% RDF through fertilizers and 50% through vermicompost), T_7 (50% RDF through fertilizers and 50% through poultry manure) and T_6 (50% RDF through fertilizers and 50% through FYM). Application of recommended dose of nitrogen and phosphorus through inorganic fertilizers enhanced the availability of nutrients, which resulted in increased photosynthetic activity and translocation of photosynthates from source to sink and this might be the cause of higher growth and yield attributes. Adequate supply of nitrogen and phosphorus play vital role in various metabolic processes which resulted in increased flowering and fruiting thereby improving umbels per plant due to favourable effect of these nutrients on growth parameters. Seed yield of a crop is a function of yield attributes such as umbels per plant, umbellates per umbel, number of seeds per umbellate and test weight. Increase in yield attributes due to increasing levels of N and P had direct and positive effect on seed, straw and biological yields of fennel. Patel *et al.* (9) also recorded higher yield attributes when RDF was applied through inorganic fertilizers in fennel. While Sherin and Ahuja (11) recorded maximum yield and yield attributes of cluster bean with vermicompost @ 2.5 t ha^{-1} +75 % NPK.

Effect on yield and harvest index

Results of the investigation (Table 2) showed that application of RDF through inorganic sources had direct positive effect on seed yield, biological yield and harvest index of coriander crop. Seed as well as and biological yields ha^{-1} and harvest index were significantly higher with the application of RDF through chemical fertilizers over absolute control (without nutrients). Application of 100% RDF through inorganic fertilizers increased seed yield, biological yield and harvest index by 120.68, 82.67 and 20.82 per cent, respectively over absolute control and the seed and biological yield for T_2 treatment (100% RDF through inorganic fertilizers were at par with T_8 (application of 50% RDF through fertilizers and 50% through vermicompost) T_7 (50% RDF through fertilizers and 50% through poultry manure,T_6 (50% RDF through fertilizers and 50% through FYM) and T_5 (100 % RDF through vermicompost). Bhati *et al.*(1) recorded similar findings at higher level of N, P and K in fennel. Patel *et al.* (8) also reported higher yield with RDF applied through fertilizers in fennel, Jat and Choudhary (2) reported significant increase in fenugreek seed yield with 100% inorganic nitrogen. Mohamed and Abdu (3) observed higher yield of fennel from poultry manure than FYM. While Munnu Singh (4) recorded maximum biomass, seed and oil yield in coriander with the application of 7.5 t vermicompost + 25 % recommended dose of NPK fertilizers.

Economic anaylisis

Perusal of analysis of data (Table 2) showed that application of 100 % RDF through inorganic sources fetched maximum gross returns (Rs. 81920 ha^{-1}), net returns (Rs. 59556 ha^{-1}) and B: C ratio (3.66) followed by application of 50% RDF through fertilizers and 50% through vermicompost-T_8 (B: C ratio 3.11) and 50% RDF through fertilizers and 50% through poultry manure-T_7 (B: C ratio 2.92).

Conclusion

It can be concluded from this study that application of 100% RDF through chemical fertilizers (T_2) gave maximum yield (10.24 qha^{-1}) of coriander and fetched maximum net returns (Rs. 59556/ha) and B: C ratio (3.66). For sustainable production and soil health point of view the combined application of 50 % RDF through fertilizers + 50% RDF through organic manures (vermin compost/ poultry manure/FYM) is also a suitable alternative, where the yields obtained (9.76, 9.52 and 9.26 qha^{-1}, respectively) were at par with that of the treatment T_2.

Table 1. Effect of different source of nutrients on growth and yield attributes of coriander

Treatment	Plant height (cm)	No. of primary branches plant^{-1}	No. of secondary branches plant^{-1}	No. of umbels plant^{-1}	No. of umbellate umbel^{-1}	No. of seeds umbellate^{-1}	Test weight (g)
T_1-Control (Absolute)	62.44	4.56	9.18	26.54	4.12	5.54	6.04
T_2-100 % RDF through fertilizers (60:45:0)	96.52	6.92	15.32	44.24	6.24	8.48	8.49
T_3-100% RDF through FYM	82.12	6.10	12.64	37.11	5.92	7.78	7.94
T_4-100% RDF through poultry manure	80.42	5.95	12.34	36.72	5.84	7.42	7.84
T_5-100% RDF through vermicompost	85.25	6.04	12.79	36.24	5.91	7.58	7.90
T_6-50% RDF through fertilizers + 50% RDF through FYM	88.12	6.21	13.45	37.88	5.96	7.74	7.97
T_7-50% RDF through fertilizers + 50% RDF through poultry manure	89.45	6.34	14.11	39.14	6.02	7.92	8.05
T_8-50% RDF through fertilizers + 50% RDF through vermicompost	91.55	6.54	14.28	40.64	6.12	8.08	8.12
CD at 5%	8.24	0.62	1.42	4.12	1.06	1.24	0.78
CV%	9.56	8.42	9.51	8.27	9.14	9.94	9.78

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Table 2. Effect of different sources of nutrients on yield and economics of coriander

Treatment	Seed yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest index (%)	Gross returns (Rs)	Cost of cultivation (Rs)	Net returns (Rs)	Returns due to treatment (Rs)	B: C ratio
T_1-Control (Absolute)	4.64	26.54	17.48	37120	20830	16290	-	1.78
T_2-100 % RDF through fertilizers (60:45:0)	10.24	48.48	21.12	81920	22364	59556	44800	3.66
T_3-100% RDF through FYM	8.57	41.85	20.47	68560	29830	38730	31440	2.30
T_4-100% RDF through poultry manure	8.17	40.25	20.29	65360	29730	35630	28240	2.20
T_5-100% RDF through vermicompost	8.33	41.12	20.25	66640	27805	38835	29520	2.39
T_6-50% RDF through fertilizers + 50% through FYM	9.26	44.64	20.74	74080	26097	47983	36960	2.84
T_7-50% RDF through fertilizers + 50% through poultry manure	9.52	45.38	20.98	76160	26047	50113	39040	2.92
T_8-50% RDF through fertilizers + 50% through vermicompost	9.76	46.34	21.06	78080	25085	52995	40960	3.11
CD at 5%	1.55	5.23	0.76					
CV %	10.34	7.14	2.14					

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