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Economic Analysis of Coriander (*Coriandrum sativum* L.) under Varied Agro Climatic Conditions of Kashmir

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ABSTRACT

An experiment to assess the "Economic analysis of Coriander (Coriandrum sativum L.) var. Shalimar Dhania-1 under varied agro climatic Kashmir conditions" was carried out in randomized complete block design (RCBD) at Vegetable Experimental Farm ,Division of Vegetavle Sciences, SKUAST-K .The experiment comprised of ten treatments viz., T_1 (40 kg nitrogen ha^{-1} through urea), T_2 (70 kg nitrogen ha^{-1} through urea), T_3 (100 kg nitrogen ha^{-1} through urea), T_4 (50% nitrogen of T_1 through urea + 50% nitrogen of T_1 through FYM), T_5 (50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through FYM), T_6 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through FYM), T_7 (50% nitrogen of T_1 through urea + 50% nitrogen of T_1 through vermicompost), T_8 (50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through vermicompost), T_9 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost), T_{10} (Control-no chemical fertilizer/organic manure) and three replications .Data revealed that in general integration of organics with inorganic source of nitrogen (urea) exhibited a significant influence on various growth and yield attributes as compared to sole application of various levels of nitrogen through urea. Maximum values for growth parameters viz., number of lateral branches $plant^{-1}$ (8.50), leaf area (19.50 cm^2) ,leaf yield (17.00 g $plant^{-1}$) and total leaf yield (85.00 q ha^{-1}) were recorded by treatment, T_9 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost). With regards to relative economics of different treatments, maximum B:C ratio of 2.66 was recorded in treatment T_8 (50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through vermicompost) while treatment T_9 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost) recorded a B:C ratio of 2.47.

Key words: *Coriander, FYM, Vermicompost, Yield, Economics, Shalimar Dhania-1*

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an annual herb and is known for its both green leaves and dried seeds. It belongs to family Apiaceae and is native to Southern Europe and Mediterranean region .Precisely, Italy is presumed as the native place of coriander[14].Coriander is used as a natural flavoring agent in food industry and is rich source of vitamin C (12 mg/100g), vitamin A (10,460 I.U./100g) and dietary fibre (10.40 mg/100g).

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The leaves and seeds contain 52.10 g/100g and 54.99 g/100g carbohydrates, 21.93g/100g and 12.37g/100g proteins and 1246 mg/100g and 709 mg/100g calcium, respectively[1]. Dried seeds are major ingredients of curry powder and used in pickle making.

During the year 2014-15, area under spices in India was 3163 thousand ha with an annual production of 5908 thousand tones amounting to productivity of 1.87 tonnes ha^{-1} [2]. India is one of the largest producers as well as consumers of coriander in the world. Annually, it is grown in about 5,52,300 hectares area producing about 4,62,620 tonnes[3]. In India coriander is prominently cultivated in Rajasthan, Andhra Pradesh, Gujrat, Madhya Pradesh and in some scattered pockets of Tamil Nadu, Odissa, Karnataka, Haryana, Uttar Pradesh, Bihar and Jammu and Kashmir. The productivity of coriander is influenced by several factors such as soil, variety, fertilizer management and various agro-techniques. Nutrients play a vital role in functioning of normal physiological processes during growth and development of plants. However, for obtaining economic yield, balanced supply of nutrients is one of the key factors .The inadequate and imbalanced application of nutrients is one of the major factors for low yield and poor quality. The conjunctive application of organics with inorganic source of nutrients reduces dependence on chemical inputs and provides micronutrients as well as modifies soil physical behavior and efficiency of applied nutrients[9]. Integrated supply of nutrients through combination of organic and inorganic sources is becoming increasingly important to protect the environment, quality of soil and human health. Adequate soil nitrogen availability is necessary to achieve better plant growth and yield. However, excessive levels can decrease plant growth and development. Hence, accurate nitrogen application is required. To have consistently higher yield of quality produce of the leafy type coriander varieties, standardization of nitrogen requirement is very much pertinent, which can be achieved by use of both organic and inorganic fertilizers. Coriander is an important seed spice grown as a winter crop in Kashmir. The crop responds well to the application of both organic manures and inorganic fertilizers[12]. Although agro climatic conditions of Kashmir valley are quite congenial for the cultivation of coriander crop but acreage as well as production of this crop is still low. One of the reasons for this low production and acreage may be non judicious use of fertilizers to raise this crop. The study on effect of organic and integrated nutrient management practices can be helpful in increasing yield of coriander under local agro climatic conditions of Kashmir.

MATERIAL AND METHODS

The experiment "Economic analysis of Coriander (*Coriandrum sativum* L.) var. Shalimar Dhania-1 under varied agro climatic Kashmir conditions" was carried out at Experimental Field of the Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar. The experimental site is situated at 34.1^o North latitude and 74.89^o East longitude with an altitude of 1587 meters above mean sea level. The climate was temperate with moderately hot summers and very cold winters. The average annual precipitation and mean monthly meteorological data collected during the growing season recorded at Meteorological Observatory, Division of Agronomy and is depicted below.One variety of coriander crop Shalimar Dhania-1 was tested. Urea and organic manures *viz*. Farmyard manure (FYM) and vermicompost were used as sources of nitrogen. The experiment was laid out in randomized complete block design with 10 treatments viz., $T_{1:}$ 40 kg Nitrogen ha^{-1} through urea ,$T_{2:}$ 70 kg Nitrogen ha^{-1} through urea, T_3 : 100 kg Nitrogen ha^{-1} through urea, T4: 50% Nitrogen of T_1 through urea + 50% Nitrogen of T_1 through FYM , $T_{5:}$ 50% Nitrogen of T_2 through urea + 50% Nitrogen of T_2 through FYM, T_6 : 50% Nitrogen of T_3 through urea + 50% Nitrogen of T_3 through FYM $T_{7:}$ 50% Nitrogen of T_1 through urea +

50% Nitrogen of T_1 through vermicompost , $T_{8:}$ 50% Nitrogen of T_2 through urea + 50% Nitrogen of T_2 through vermicompost , $T_{9:}$ 50% Nitrogen of T_3 through urea + 50% Nitrogen of T_3 through vermicompost , $T_{10:}$ Control (No chemical fertilizer/organic manure) and three replications .total number of plots were 30,each with plot size of : 2.0 m × 2.0 m = 4.0 m^2 .planting was made at a spacing of 20 cm × 10 cm.Thirty plots of 2.0m × 2.0m size were prepared as per layout specifications to accommodate 200 plants $plot^{-1}$, planted in 10 rows with 20 plants row^{-1}. Organic manures FYM, vermicompost and half dose of urea were applied at the time of sowing and half dose of urea, 30 days after germination. The economics of different cultural practices, inputs and returns for coriander under each treatment was worked out to find the most effective and economical treatment.

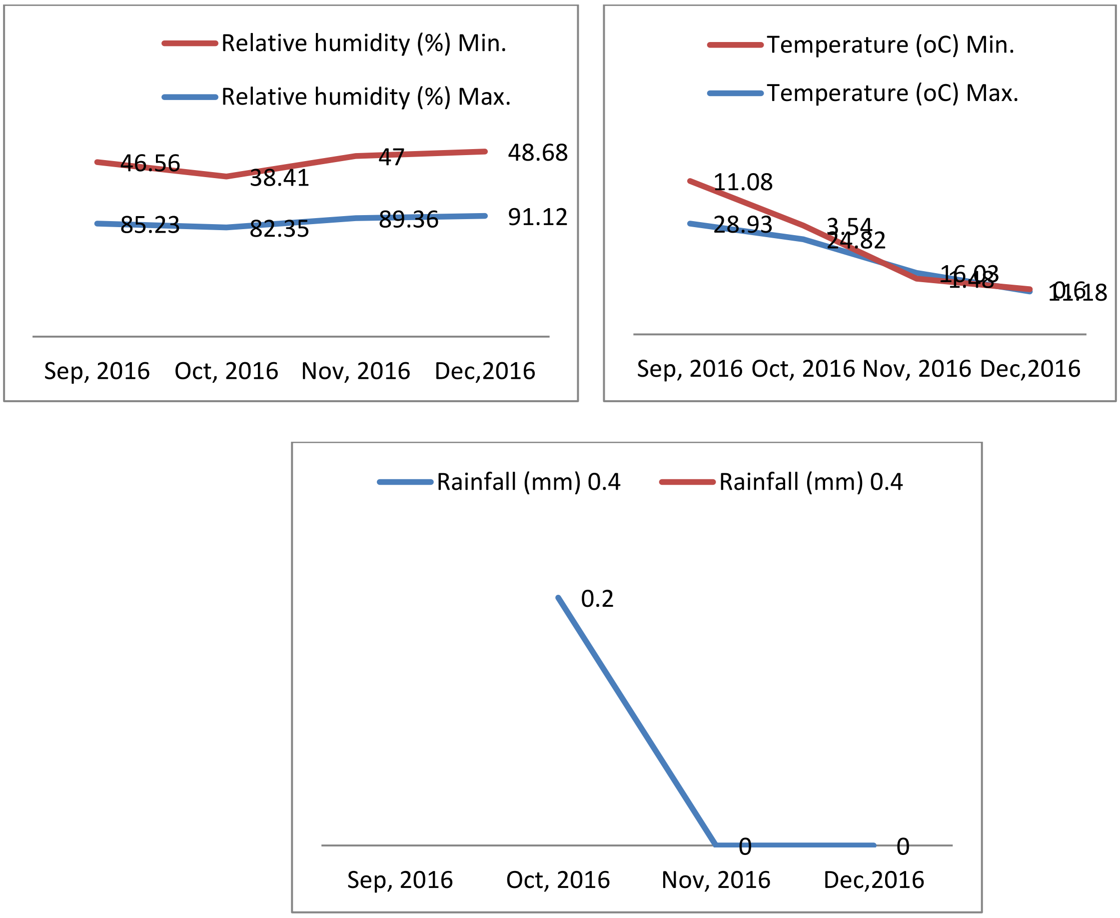

Fig. showing mean monthy temperature, relative humidity and rainfall distribution throughout the growing season

RESULT AND DISCUSSION

Treatment-wise comparative economics of production was worked out for coriander. Table 1a revealed that the maximum net returns of Rs. 103826.33 was obtained from treatment, T_9 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost) with benefit cost ratio of 2.47 followed by treatment, T_8 (50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through vermicompost) with net returns of Rs. 101147.30 and maximum B:C ratio of 2.66. However treatment, T_8 was followed by treatment, T_3 (100 kg nitrogen ha^{-1} through urea) recording B:C ratio of 2.53. Lowest B:C ratio of 1.20 was recorded in treatment, T_{10} (Control).

Table 1a: Cost of cultivation of coriander (ha^{-1})

Cost involved on variable and fixed factors		₹ha^{-1}
A	Preparatory tillage (3 ploughings at ₹ 1000.00 ha^{-1})	3000.00
	Clod breaking/leveling (10 labourer days at ₹ 225.00 labour^{-1})	2250.00
	Preparation of beds/channels (20 labourer days at ₹ 225.00 labour^{-1})	4500.00
	Sowing of seed (10 labourer days at ₹ 225.0 labour^{-1})	2250.00
Total A		**12000.00**
B	Irrigation (8 labourer days at ₹ 225.0 labour^{-1})	1800.00
C	Cultural operations (three hand weedings/hoeings 35labourer days at ₹ 225.0 labour^{-1})	7875.00
D	Harvesting, and related operations (8 labourer days at ₹ 225.00 labour^{-1})	1800.00
Total (B+C+D)		**11475.00**
Total (A+B+C+D)		**23475.00**
	Incidental charges at 5% of the working capital	1173.75
	Total labour component involved in total cost of cultivation	24648.75
	Cost of seed at ₹ 350 kg^{-1} for 10 kg seed ha^{-1}	3500.00
Variable cost (labour + cost of seed)		28148.75
Land rent at ₹ 900 kanal^{-1}		18000.00
Land tax		80.0
Depreciation of implements		800.0
Total		**18880.00**
Interest at 6.5% on fixed factor		1227.2
Total fixed cost (18880+ 1227.2)		20107.2

Table 1b: Treatment-wise comparative economics of cost of cultivation of coriander (ha basis)

Treatments		Fixed cost (₹)	Variable cost (₹)	Cost involved on		Total added cost (₹)	Total variable cost (₹)	Total cost of cultivation (₹)	Pooled yield (q ha^{-1})	Gross returns (₹)	Net returns (₹)	B:C Ratio (₹)
				Fertilizer (₹)	Manures (₹)							
T_1	40 kg nitrogen ha^{-1} through urea	20107.20	28148.75	477.4	-	477.4	28626.15	48733.35	47.85	95700	46966.65	1.96
T_2	70 kg nitrogen ha^{-1} through urea	20107.20	28148.75	835.45	-	835.45	28984.20	49091.40	61.40	122800	73708.60	2.50
T_3	100 kg nitrogen ha^{-1} through urea	20107.20	28148.75	1193.5	-	1193.5	29342.25	49449.45	62.50	125000	75550.35	2.53
T_4	50% nitrogen of T_1 through urea + 50% nitrogen of T_1 through FYM	20107.20	28148.75	238.7	20000	20238.7	48387.45	68494.65	55.00	110000	41505.35	1.60
T_5	50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through FYM	20107.20	28148.75	417.72	35000	35417.72	63566.47	83673.67	69.30	138600	54926.33	1.65
T_6	50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through FYM	20107.20	28148.75	596.75	50000	50596.75	78745.50	98852.70	70.00	140000	41147.30	1.42
T_7	50% nitrogen of T_1 through urea + 50% nitrogen of T_1 through vermicompost	20107.20	28148.75	238.7	8000	8238.70	36387.45	56255.95	63.50	127000	70744.05	2.30
T_8	50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through vermicompost	20107.20	28148.75	417.72	14000	42566.47	70715.22	62673.67	83.25	166500	103826.33	**2.66**
T_9	50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost	20107.20	28148.75	596.75	20000	20596.75	48745.5	68852.70	85.00	170000	101147.30	2.47
T_{10}	Control	20107.20	28148.75	-	-	-	-	48255.95	29.00	58000	9744.05	1.20

Gross returns = yield x cost of coriander Net Returns = Gross Returns - Total cost of cultivation Cost of coriander q^{-1} @ Rs 20 kg^{-1} = Rs2000per quintal

B:C ratio = Gross Returns/Total Cost of cultivation

The results showed that various yield parameters i.e, leaf yield plant^{-1} and leaf yield ha^{-1} were significantly influenced due to different levels of nitrogen. Among integration of organic manures (vermicompost) with urea, maximum leaf yield g plant^{-1} (17.00), leaf yield q ha^{-1} (85.00) were observed in treatment, T_9 (50% nitrogen of T_3 through urea + 50% nitrogen of T_3 through vermicompost) followed by treatment, T_8 (50% nitrogen of T_2 through urea + 50% nitrogen of T_2 through vermicompost). In sole treatments of urea application treatment, T_3 (100 kg nitrogen ha^{-1} through urea) recorded higher values, leaf yield plant^{-1}, leaf yield ha^{-1} viz. 12.50 and 62.50 respectively. Increased fresh leaf yield could be attributed to better vegetative growth in terms of plant height, number of branches and plant spread due to the application of balanced nutrients in integrated sources which promotes better photosynthetic activity resulting in increased carbohydrate synthesis and better plant growth. Similar results were obtained by Mehta *et al*.[8], and Choudhary *et al*.[5], in fenugreek.

Vermicompost is also beneficial in improving the soil environment which in turn encourages proliferous root growth, resulting in better absorption of moisture, nutrients and thus producing higher biomass. The increased yield might also be owing to better nutritional status of the soil which might have stimulated the rate of various plant physiological processes which led to increased yield attributing characteristics and their cumulative effect resulted in enhanced yield attributes. Similar work was also reported by Rahman *et al*.[10], Baboo and Rana[4], Tripathi *et al.*[15], Kumar *et al.*[7], Rai *et al.*[11], Khoja[6] and Singh[13] in coriander. The economics of crop production is a very important part of cultivation of any crop. The cost of cultivation was directly associated with various inputs *viz*. cost of chemical fertilizer (urea), FYM and vermicompost. Gross income was found directly associated with the leaf yield under various treatments

CONCLUSION

The production of higher leaf yield and lower input cost leads to greater returns per rupee invested and hence the increased benefit cost ratio. But one of the main objective of organic manures is sustainable agriculture in terms of improving soil health, quality and overall production which are fulfilled by treatment T_9. It can thus be proposed that optimization of resources is an important phase in cultivation of coriander and involves marginal skill. A good manager can reduce the factor cost and increase returns to the extent which will mean not only self-sustenance but family welfare as well. Therefore, cultivation of coriander is remunerative and economically viable.

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