Indian J. Hort. 67(Special Issue), November 2010: 271-275

Response of spacing, phosphorus level and cutting of leaves on growth and yield of coriander

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ABSTRACT

The experiment was carried out to study the response of spacing, phosphorus levels and cutting of leaves on growth and yield of coriander cv. Hisar Anand. The experiment was laid out in split plot design with three replication, having three levels of phosphorus (25,50 and 75 kg P_2O_5/ha), two spacing (20x20 and 40x10cm) and three cutting of leaves (C_0-Control, C_1- One cutting at 30 days, C_2- two cutting at 30 and 50 days after sowing). The treatment combination 75 kg P_2O_5/ha with a spacing 40x10cm and without cutting resulted in maximum seed yield. It was closely followed by treatment 50 kg P_2O_5/ha + 40x10cm spacing without cutting. Significantly the higher green leaves yield was recorded in the treatment combination of highest levels of phosphorus (75 kg) + spacing (20x20cm) and two cutting of green leaves treatment. Minimum seed yield was recorded in 25 kg P_2O_5/ha + 20x20cm spacing with two cutting of green leaves treatment combination.

Key words: Coriander, phosphorus, spacing, cutting and yield.

INTRODUCTION

India is a major producer, consumer and exporter of spices in the world. Among the spice crops grown in India, Coriander (*Coriandrum sativum* L.) is one of the most important seed spice crop during rabi season. It is grown for green leaves as well as for spices purpose, Mehta *et al.* (4) and is good source of foreign exchange earning. Mostly it is used for flavouring food. Its leaves, stem and seeds have pleasant aromatic odour and also used in preparing chutneys, vegetables and condiments in the preparation of spices powder, pickling spices etc. Coriander have medicinal value and used for mucous, curing bleeding piles, diarrhea and locally in eye infection (Aggarwal *et al.*, 1). However, the yields of coriander are quite low because very little attention has been paid to develop the proper agro-technique for its production. Recently, the Indian government has taken steps to increase the production of spices including coriander to fill the gap between production and export. It is known fact that proper plant spacing and fertilization influence the total biomass production which reflects in seed yield, cutting of green leaves in coriander seed crop. (Thakral *et al., 7*). The present investigation was undertaken to study the response of spacing, phosphorus levels and cutting of leaves on growth and yield of coriander.

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MATERIALS AND METHODS

The field experiment was conducted at Krishi Vigyan Kendra farm, Sonipat of CCS, Haryana Agricultrual University, Hisar during 2002 to 2004 as well as farmer's field. The experiment consisted of three level of phosphorus (25, 50 & 75 kg P_2O_5/ha) as main plot, two spacing (20 × 20 and row to row 40 × 10cm) and three cutting of leaves (C_o-control or no cutting, C_1-one cutting at 30 days, C_2-two cutting at 30 and 50 days after sowing) as sub plot treatments in split plot design replicated three times in plot size of 5 × 3m. The amount of phosphorus, potash and one third dose of nitrogen was given at the time of sowing and remaining two-third nitrogen was given as top dressing into two equal doses at 30 and 55 days after sowing. The amount of phosphorus was applied through single super phosphate and only recommended dose of nitrogen and potash was applied. The green foliage was cut at 10 to 15cm above the ground level at the time of each cutting. Seeds of cultivar Hisar Anand (DH-5) were sown in the first week of November for all years. All the cultural operations were performed as and when required. The observations recorded were plant height, no. of branches per plant, cutting of green leaves yield, number of Umbels per plant, test weight and seed yield. Average data was analyzed statistically.

RESULTS AND DISCUSSION

The different spacing of planting resulted in significant variation in plant height (Table 1). The plants spaced at 20x20cm resulted in superior plant height as compared to wider spacing (40x10cm). The increased in plant height at 20x20cm spacing as compared to 40x10cm spacing is due to wider spacing with in rows. The treatment combination 75 kg P_2O_5 +20x20cm spacing without cutting produced the maximum height (80.6cm) of plants which was significantly superior to all other treatment combinations and it was closely followed by 75 kg P_2O_5 +40x10cm spacing with out cutting. Plant height increased significantly with increase in phosphorus level. Similar observations were also reported by Ghose *et al*. (3). Three way interactions were also found significant. Two cutting of green leaves in combination with low phosphorus level 25 kg + 40x10cm spacing recorded minimum plant height as compared to all other treatment combinations.

Number of branches per plant were recorded height in treatment combination, 50 kg P_2O_5 + 40 x 10cm spacing with one cutting and it was found significantly superior to 25 kg P_2O_5 with different cuttings and spacing treatments. Among cutting of green leaves treatment, one cutting after 30 days of sowing recorded highest number of branches per plant as compared to other treatments. This clearly shows that one cutting of leaves increase the number of branches per plant as compared to two cutting treatment. Two way interactions of 50 kg P_2O_5 x 40x10cm spacing, 50 kg P_2O_5 + one cutting and 40x10cm spacing + one cutting recorded highest and significantly superior for number of branches per plant as compared to rest of two way interactions. Numbers of branches per plant were found statistically at par for spacing levels. However spacing 40x10cm produced higher branches as compared to 20x20cm spacing. The lowest no. of branches per plant were recorded in treatment combinations of 25 kg P_2O_5 + 20x20cm spacing with two cutting. It was closely followed by 40x10cm spacing with same phosphorus and cutting level. These suggested that two cutting of green leaves adversely affected the number of branches per plant in coriander. Similar findings have been reported by Dahiya *et al*. (2).

Significantly higher green leaves yield was recorded in the treatment combination of highest levels of phosphorus (75 kg) + spacing (20x20cm) and two cutting of green leaves treatment (Table 1). The two way interactions were also found significant with 75 kg P_2O_5 + 20 x 20cm spacing, 20 x 20cm spacing + two cutting and 75 kg P_2O_5 + two cutting treatment. Three way interactions were also influenced the cutting of green leaves yield significantly 75kg P_2O_5 + 20 x 20cm spacing and two cutting treatment combination recorded highest green leaves yield (7.45 q/ha) and it was closely followed by 50 kg P_2O_5 + 40 x 10cm spacing with two cutting treatments combinations. It is clear from result that higher dose of phosphorus + 20 x 20cm plant spacing and two cuttings resulted in significant increase in production of green leaves yield. This is due to more plant cutting and higher dose of phosphorus which enhanced the biomass production of plant.

The treatment combination, 50 kg P_2O_5 + 40x10cm spacing with one cut or without cut and 75 kg P_2O_5 + 20 x 20 cm spacing with one cutting treatment resulted in more number of umbels per plant (Table 2). The number of umbels was recorded minimum in 25 kg P_2O_5 + 20x20cm spacing with two cutting. It was closely followed by treatment combination of 25 kg P_2O_5 + 40x15cm spacing with two cutting of green leaves treatment. It is clear from the above observations that two cutting adversely effective number of umbels per plant. The data also revealed that the highest numbers of umbels per plant were recorded with 50 kg P_2O_5 + 40x10cm spacing without cutting and it was found superior to other treatment combinations. It shows that phosphorus level, plant spacing and cutting treatments influenced the number of umbels per plant. Two way interaction of 50 kg P_2O_5 + 40x10cm spacing, 50 kg P_2O_5 + control and one cutting + 40x10cm spacing treatments were found significantly superior to many other treatments combinations. Higher dose of phosphorus (50 kg P_2O_5) with one cutting of green leaves at 40x10cm spacing resulted in more number of branches which ultimately produced more number of umbels per plant. The above results are in closed agreement with Parkesh *et al.* (5) and Singh *et al.* (6).

Phosphorus level and number of cutting had a significant effect on test weight of seed, however spacing have no significant effect. Higher dose of phosphorus 50 kg/ha without cutting + 40x10cm spacing produced maximum test weight of seed (10.7g) which was significantly higher as compared to one cutting and two cutting treatments. Test weight of seed was found statistically at par with in spacing treatment. The minimum test weight (9.0g) was recorded when low dose of phosphorus (25 kg) and two cutting treatments was applied in both the spacing levels. The interaction between phosphorus levels and cutting treatments was found significant. Similar findings were reported by Ghose *et al.* (3). Higher test weight of seed contributed towards total seed yield.

The phosphorus level, spacing and cutting of green leaves showed significant influence on seed yield of the

Table.1 Effect of spacing, phosphorus level & cutting of leaves on growth and yield of Coriander.

Treatment	Spacing			Cutting			Spacing					Over-all means
	20 × 20cm		40×10cm									
	Green leaves cutting											
	Co	C_1	C_2	C_0	C_1	C_2	Co	C_1	C_2	20×20	40×10	
Height of Plant (cm)												
Phosphorus (kg/ha)												
25	78.1	68.6	56.2	76.5	66.8	54.1	77.5	67.2	55.5	67.5	65.6	66.69
50	86.5	76.3	64.1	84.2	74.5	62.5	85.2	75.1	64.0	75.7	74.1	74.75
75	93.2	80.5	68.6	90.6	78.3	66.2	96.0	79.8	67.5	80.6	78.4	79.97
Means	83.9	75.1	63.0	83.8	73.2	60.9	86.2	74.0	62.3	74.6	72.7	73.80
Number of branches/plant												
Phosphorus (kg/ha)												
25	4.2	5.4	3.3	4.7	5.7	3.6	4.5	5.7	3.4	4.3	4.7	4.50
50	5.1	6.6	4.5	6.4	7.1	4.7	5.9	6.8	4.5	5.4	6.1	5.74
75	5.6	6.8	4.7	6.0	6.8	5.1	6.1	6.8	4.7	5.7	5.9	5.84
Means	5.0	6.3	4.2	5.7	6.5	4.5	5.5	6.4	4.2	5.1	5.6	5.36
Cutting green leaves yield (q/ha)												
Phosphorus (kg/ha)												
25	0.00	3.85	5.96	0.00	2.92	4.86	0.00	3.38	5.00	4.96	4.05	3.18
50	0.00	4.00	6.90	0.00	3.05	5.72	0.00	3.60	5.92	5.50	4.35	3.55
75	0.00	4.12	7.45	0.00	3.25	6.15	0.00	3.92	6.52	5.83	5.03	3.84
Means	0.00	3.99	6.77	0.00	3.07	5.58	0.00	3.63	5.81	5.43	4.48	3.52
CD at 5%	Phosphorus (P)	Cutting (C)	Spacing (S)		P×C		P×S	CxS		P×C×S		
Height of Plant		2.1		2.1		1.6		3.7		3.2	3.1	4.9
Branches/plant		0.6		0.6		0.5		1.2		1.0	1.0	1.7
Cutting Green leaves yield	0.4		0.4		0.3		0.5		0.5	0.5	0.7	

Table 2. Effect of spacing, phosphorus and cutting of green leaves on growth and yield of Coriander.

Treatment	Spacing			Cutting			Spacing					Over-all means
	20 × 20cm		40×10cm									
	Green leaves cutting											
	Co	C_1	C_2	C_0	C_1	C_2	Co	C_1	C_2	20×20	40×10	
No. of Umbels/Plant												
Phosphorus (kg/ha)												
25	11.9	13.8	7.4	14.1	14.8	8.6	12.9	14.2	7.9	11.1	12.4	11.74
50	14.5	15.6	9.5	19.7	19.5	11.9	16.8	17.2	10.5	13.0	16.7	15.00
75	17.4	18.4	11.8	18.5	18.3	13.0	17.6	18.0	12.2	15.6	16.0	16.07
Means	14.6	15.9	9.6	17.4	17.5	11.2	15.8	16.5	10.2	13.2	15.0	14.27
Test weight (1000 seed weight)												
Phosphorus (kg/ha)												
25	10.1	9.6	9.0	10.4	9.8	9.2	10.2	9.7	9.1	9.6	9.8	9.68
50	10.5	10.4	9.6	10.9	10.6	9.7	10.7	10.5	9.6	10.2	10.3	10.26
75	10.7	10.6	9.8	10.7	10.3	9.9	10.7	10.5	9.8	10.4	10.3	10.36
Means	10.4	10.2	9.5	10.7	10.3	9.6	10.5	10.2	9.5	10.1	10.1	10.10
Seed yield (q/ha)												
Phosphorus (kg/ha)												
25	6.7	6.5	4.7	7.1	6.9	4.8	6.9	6.7	4.8	5.9	6.3	6.12
50	9.3	9.3	7.1	10.6	10.3	9.1	10.1	9.8	7.9	8.4	10.1	9.31
75	10.2	10.3	8.8	11.1	10.5	9.0	10.5	10.3	8.9	9.6	9.8	9.82
Means	8.7	8.7	6.9	9.4	9.2	7.6	9.2	8.9	7.2	8.0	8.7	8.42
CD at 5%	Phosphorus (P)	Cutting (C)	Spacing (S)		P×C	P×S	C×S	P×C×S				
Umbels/Plant	0.50			0.50		0.42		1.00	0.80	0.80	1.38	
Test weight of seed	0.24			0.24		0.19		0.30	0.25	0.25	0.46	
Seed yield	0.26			0.26		0.24		0.42	0.30	0.30	0.60	

coriander (Table 2). The treatment combination of 75 kg P_2O_5 + 40 x 10 cm spacing and with out cutting of leaves resulted in maximum seed yield (11.1 q/ha). It was closely followed by treatment combination of 50 kg P_2O_5/ha + 40x10cm spacing without cutting. The two way interactions of 75 kg P_2O_5 + 40 x 10cm spacing, control + 75 kg P_2O_5 and 40x10 cm spacing + no cutting (control) recorded highest seed yield which was significantly higher over other two way interactions. Three way interactions were also found significant. Highest seed yield was recorded in the treatment combination of 75 kg P_2O_5 + 40 x 10 cm spacing and without cutting of leaves, which was significantly superior to rest of the three way interactions combinations. Significantly higher seed yield was obtained in all combination under 40x10cm. It may be attributed to better plant height, more no. of branches, more umbel per plant and higher test weight of seed under wider (row to row) spacing. These results are in agreement with the findings of Ghose *et al.* (3) and Dhaiya *et al.* (2). Two cutting enhances the yield of green leaves whereas it decreased the seed yield. It is suggested that frequent cutting of green leaves effected the vegetative growth and depicted the plant of available nutrient, thus delayed the flowering and setting of seed and resulted in poor seed yield. In one cutting treatment there was an appreciable increase in number of branches and umbels per plant which could be the reasons for higher seed yield as compared to two cutting treatments. Higher phosphorus (75 kg) + one cutting of leaves + 20x20cm spacing gave higher yield of green leaves which may compensate for lose of seed yield in this treatment. The significantly higher seed yield with 75 kg P_2O_5 + 40x10 cm spacing and without cutting is due the combined effect of optimum dose of phosphorus, no cutting and 40x10 cm spacing. These information need to be cared for maximizing the gain from coriander cultivation.

REFERENCES

1. Aggarwal, S., Sharma, R.K. and Bhatt, B.N. 1991. Quality evaluation in coriander. *Indian Cocoa, Arecanut Spices J.* **14**: 137.
2. Dahiya, M.S., Nehra, B.K., Singh, A. and Singh, N. 2004. Effect of sowing times, spacing and cutting on yield and quality of seed of fenugreek variety pusa early bunching. *Proceeding of national Symposium on Diversification of Agriculture Through Horticulture Crops held at Karnal* (Haryana) on Feb. 21-23, pp. 338-43.
3. Ghose, D., Maity, T.K., Sern, G.M. and Bose, T.K. 1985. Effect of nitrogen and phosphorus on growth and yield of coriander. *Indian Cocoa, Arecanut Spices J.* **9**: 44-46.
4. Mehta, K.G., Patel, P.G., Ugherela, P.P. and Edison, S. 1996. Varietal response of leaf cutting management on seed and green leaf yield of coriander (*Coriandrum sativum L.*). *Indian Cocoa, Arecanut Spices J.* **20**: 80-82.
5. Prakash, Rao, E.V.S., Mannu, S., Narayana, M.R., Ganesh Rao, R.S. and Rajeshwar Rao, B.R. 1983. Fertilizers studies in coriander (*Coriandrum sativum L.*). *J. Agric. Sci. Cambridge,* **100**: 251-53.
6. Singh, Jage, Malik, Y.S., Thukral, K.K, and Mehla, C.P. 2000. Effect of sowing time, nitrogen levels and leaf cutting on green and seed yield of coriander. *Haryana J. Hort. Sci.* **29**: 225-28.
7. Thakral, K.K., Singh, G.R., Pandey, U.C. and Srivastava, V.K. 1992. Effect of nitrogen levels and cutting on the production of green leaves and seed yield of coriander cv. Narnaul Selection. *Haryana Agric. Univ. J. Res.* **22**: 35-39.

Received: September, 2008; Revised: February, 2010
Accepted: June, 2010