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Performance of coriander varieties (*Coriandrum sativum* L.) under organic management system

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Abstract

An experiment was conducted at ICAR-National Research Centre on Seed Spices, Tabiji, Ajmer, Rajasthan during the *Rabi* season of 2015-16 to find out the performance of different varieties of coriander (*Coriandrum sativum* L.) under organic production system. Eight varieties *viz.*, ACr-1, Azad Dhania-1, RCr- 435, RCr- 436, RCr- 446, RCr- 684, Hissar Sugandha and Hissar Anand were tested under the organic system. The results revealed that three varieties of coriander performed better in organic management system. The maximum plant height at harvest (121.53cm), number of primary branches per plant (8.27), number of secondary branches per plant (26.47), number of umbels per plant (44.00) with highest seed yield (1246.67 kg ha^{-1}) exhibited by variety Azad Dhania-1followed by ACr-1 (1225.20 kg ha^{-1}) and Hissar Anand (1218.33kg ha^{-1}). ACr-1 variety recorded highest plant nutrient status as compared to other varieties. Among eight varieties of coriander Azad Dhania-1 and ACr-1 found better for organic farming in terms of growth and seed yield.

Key words : Coriander, organic production, plant growth, seed yield, varieties.

Introduction

Coriander (*Coriandrum sativum* L.) an important major seed spice of India grown for both herbs as well as seed purpose. It belongs to the family Apiaceae. Rajasthan is leader in area and production of coriander accounting 80% of production. Major growing areas are Kota, Baran, Bundi and Jalawar of Rajasthan, Nimach and Mandsore region of Madhya Pradesh. Coriander growing areas constitute of black cotton soils and they are rich in organic carbon. But even then crop nutrient requirement is managed by application of chemical fertilizers. There is lot of possibilities to manage the crop organically so that soil health and crop quality can be maintained. Application of organic manures are directly or indirectly helpful in increasing the availability and uptake of nutrients from the soil and ultimately to boost up the yield and quality of coriander without rendering the detrimental effects on physiochemical properties of the soil. Farm yard manures (FYM) is available in plenty in locality and can be effectively utilized for spice production, however it also contains trace or micronutrients (Yawalkar *et al.*, 2002) in sufficient amount, the deficiency of which cannot be supplemented by others. Since vermi-composting supply all the nutrients in readily available form, it enhances uptake of nutrients by plants (Rai and Pandey, 2007). Castor cake is concentrated organic manures which supply nutrients readily by faster decomposition and also helps in reducing nematode infestation in the soil. In the mean time identification of suitable variety of coriander which suits to organic management so is very much pertimant that crop yield cannot be compensated. Best variety for organic farming with higher seed yield and quality is very much needed. The information available of varietal performance to organic production is very less in coriander and hence the present study was conducted with the objective of evaluation of various coriander varieties to organic production system under semi arid conditions.

Material and methods

Investigation was carried at ICAR-National Research Center on Seed Spices, Tabiji, Ajmer (Rajasthan) during 2015-16, to find out the performance of different varieties of coriander (*Coriandrum sativum* L.) under organic management system. Soil of experimental site is sandy loam in nature and the experimental block is maintained as per the organic production requirements from 2011. Soil fertility status of experimental site is having organic carbon (0.3%), available nitrogen (130.4 kg ha^{-1}), available phosphorus (12.06 kg ha^{-1}) and available potassium (359.07 kg ha^{-1}). The recommended dose of nutrients for coriander is 60:30:20 kg ha^{-1} and manures were applied

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on nitrogen equivalent basis through organic sources (50% by FYM, 25% by vermicompost and 25% by caster cake). Nitrogen content of farm yard, vermi compost and castor cake is 0.7 percent, 1.0 percent and 3.9 percent, respectively. Experiment was laid out in randomized block design with three replications with plot size of 12 m^2. Seeds were sown during second week of November by maintaining spacing of 30 cm × 10 cm. with seed rate of 12 kg ha^{-1} after treating seeds with *Trichoderma* at rate of 10 g kg^{-1}. Irrigation and intercultural operations were done as and when required. The observations on growth and yield parameters of coriander were recorded periodically and at the time of harvesting on 5 plants selected randomly. Soil and plant samples were collected at time of harvest and analyzed for available nutrients in soil and nutrient content in plant samples. Data obtained were subjected to statistical analysis for F test as suggested by (Panse and Sukhatme, 1985).

Results and discussion

Results obtained on performance of coriander varieties to organic management showed significant differences with respect to growth and seed yield. The results pertaining to growth and yield attributing characters, soil and plant nutrient status are presented below.

Performance of coriander varieties in terms of growth and yield parameters

Coriander varieties performed significantly to organic manures uniformly. Among the total varieties, Azad dhaniya-1 showed significant influence on plant height at various stages of growth and recorded 121.53 cm plant height at harvest followed by ACr-1, recorded 119.37cm height. (Table 1).The least plant height (113.9 cm) was recorded by the variety RCr-446 which is at par with RCr-436 (114.3 cm). The number of primary and secondary branches also showed the similar trends and affected positively due organic management. The higher number of primary and secondary branches recorded in Azad dhaniya-1 (8.27 and 26.47) followed by ACr-1 (7.53 and 25.10) and Hissar Anand (6.47 and 23.63) might be owing to fulfilment of nutrient requirement of the crop at initial growth period leads to improved branching. The present findings were in conformity with the findings of Chadha *et al*. (2010) in pea, Moslemi *et al., (*2012) in coriander, Chadha *et al*. (2013) in pea, and Lal and Singh (2016) in coriander.

Yield attributes such as umbels per plant and umbellets per umbel also influenced by varieties of coriander and it was highest in Azad Dhania-1 (44 and 6.7, respectively) and ACr-1 (41.7 and 5.8, respectively), similarly lowest was recorded in RCr-446 (35.1 and 4.3, respectively) and RCr-436 (35.2 and 4.5, respectively). Highest seed yield was recorded in Azad Dhania-1 (1246.6 kg ha^{-1}) followed by ACr-1 (1225.2 kg ha^{-1}), Hissar Anand (1218.3 kg ha^{-1}), RCr-435 (1194.7 kg ha^{-1}), RCr-684 (1146.9 kg ha^{-1}) and Hissar Sugandh (1094.7 kg ha^{-1}) which are at par. Lowest seed yield was recorded in RCr-436 (1003.0 kg ha^{-1}) followed by RCr-446 (988.8 kg ha^{-1}). It may also be due to the varietal influence but it clearly indicate that coriander varieties suitable for organic farming. Higher the growth and yield attributing characters of Azad Dhania-1 and ACr-1 made these two varieties perform better. Apart from this long duration nature and high biomass yielding varieties such as ACr-1, Azad dhania-1, Hissar Anand performed better due to availability of nutrients to the crop throughout the crop growth period. But in short duration and less biomass varieties such as RCr-436 and RCr-446 needs nutrients at initial stages since these varieties

Table 1. Performance of coriander varieties under organic management in terms of growth, seed yield and yield attributing characters.

Varieties	Plant height (cm)	No. of primary branches $plant^{-1}$	No. of secondary branches $plant^{-1}$	No. of Umbel $plant^{-1}$	No. of umbellate $umbel^{-1}$	Seed yield (kg ha^{-1})
ACr-1	119.3	7.53	25.10	41.7	5.8	1225.2
Azad Dhania-1	121.5	8.27	26.47	44.0	6.1	1246.6
RCr- 435	117.9	6.30	22.90	37.5	5.1	1194.7
RCr- 436	114.3	5.37	20.30	35.2	4.5	1003.0
RCr- 446	113.9	5.03	20.17	35.1	4.3	988.8
RCr- 684	116.6	6.03	22.23	37.1	5.0	1146.9
Hissar Sugandha	115.5	5.80	21.77	36.1	4.8	1094.7
Hissar Anand	118.0	6.47	23.63	39.4	5.2	1218.3
S Em±	1.95	0.36	0.83	0.86	0.27	53.8
CD(P=0.05)	5.93	1.10	2.51	2.60	0.82	163.2
CV %	2.89	9.87	6.29	3.87	9.11	8.1

completes crop cycle early compared to long duration varieties. Organic manures usually supply the nutrients in later stages as they need time to decompose and release the nutrients to soil solution. This may be the reason to better performance of Azad Dhania-1 and ACr-1 to organic management. The present finding are in close conformity with the findings of Lal *et al.*, (2012) in coriander, Vasmate *et al.*, (2008), Choudhary *et al.*, (2008) in coriander, Moslemi *et al.*,(2012) in coriander and Lal and Singh (2016) in coriander.

Soil fertility and plant nutrient status of coriander varieties

Soil fertility and nutrient status of coriander crop after harvest was influenced significantly under organic management (Table 2). High yielding varieties such as Azad Dhania-1 ACr-1 and Hissar Anand removed higher amount of nutrients as compared to low yielding group *i.e.*, RCr-446, RCr-436 and Hissar Sugandh. In the plots of RCr-446 (148.0 kg ha^{-1}), RCr-436 (143.8 kg ha^{-1}) and Hissar Sugandha (141.3 kg ha^{-1}) highest residual nitrogen was found. This is mainly due to early maturity of crop leads to more residual soil fertility in the respective plots which is attributed by less removal of nutrients. Similar trend was observed in phosphorus and potassium fertility of the soil. Nutrient use efficiency will vary with the efficiency of variety to utilize the applied nutrients. High yielding varieties are always efficient enough to absorb more nutrients since these are metabolically more active. The results are in confirmation with Chhibba *et. al.,* (2000) in fenugreek and Basu *et.al.,* (2008) in fenugreek.

Plant nutrient content was found highest in Azad Dhania-1 followed by ACr-1 and Hissar Anand. Lowest nitrogen content in plant tissue is recorded in RCr-435 (2.26%) followed by Hissar Anand (2.41%). Similarly lowest potassium content was recorded in RCr-446 (3.93%), followed by RCr-684 (4.05%). ACr-1 is having highest amount of nutrients in the plant tissue (2.8%, 0.6% P and 4.22% K). It is noted that ACr-1 is the one of the top performing varieties of coriander in organic farming practices. It is a dual purpose variety and produces more biomass. Higher nutrient content in plant tissue favours the higher growth and yield characters. The findings are in confined with that of Mehta *et al.*, (2011) in coriander reported that higher nutrient accumulation in coriander at initial growth stages of crop with recommended nutrients is due to availability of nutrient along with faster dry matter accumulation. But in later stages of crop growth organic source released nutrient for longer period which facilitated more nutrient absorption resulting in higher nutrient accumulation.

Conclusion

From the study it is concluded that suitable variety is very important for organic farming which is able to perform in organic condition. ACr-1 and Azad Dhania-1 are most suitable varietyies under organic management system as these are high yielded and produced more biomass which can be recycled to produce composte. Application of FYM 50%, vermi compost 25% and castor cake 25% on nitrogen equivalent basis along with *Trichoderma* seed treatment is sufficient to meet the demand of coriander varieties for achieving higher seed yield and biomass.

Table 2. Soil fertility and plant nutrient status of coriander varieties under organic management system

Varieties /Treatments	Soil fertility status after harvest (Kg ha^{-1})			Plant nutrient status at harvest		
	N	P_2O_5	K_2O	N %	P %	K %
ACr-1	136.7	13.09	373.48	2.80	0.60	4.22
Azad Dhania-1	135.0	12.69	366.65	2.56	0.54	4.18
RCr- 435	137.9	13.35	366.99	2.48	0.62	4.13
RCr- 436	143.8	14.90	372.77	2.61	0.60	4.12
RCr- 446	148.0	15.14	376.95	2.68	0.62	3.93
RCr- 684	139.2	13.40	370.68	2.26	0.56	4.05
Hissar Sugandha	141.3	14.05	371.50	2.48	0.59	4.08
Hissar Anand	134.2	12.86	369.30	2.41	0.54	4.10
S Em±	1.85	0.19	2.16	0.08	0.02	0.05
CD(P=0.05)	5.62	0.58	6.56	0.25	0.06	0.16
CV %	2.30	2.41	1.01	5.73	5.60	2.20

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