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Effect of integrated nutrient management on growth, herbage yield and leaf quality of coriander (*Coriandrum sativum* L.) cv. Swati

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Abstract

The experiment entitled "Effect of Integrated Nutrient Management on growth, herbage yield and leaf quality of Coriander (*Coriandrum sativum* L.) cv. Swati" was conducted during Rabi season of the year 2020-2021 on experimental farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in a randomized block design with three replicated 12 treatments *viz.*, T_0: Without compost (Control), T_1: 100 kg N/h + 60 kg P/h + 40 kg K/h (RDF), T_2: VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h, T_3: 100% (RDF) + VC@ 2.5t/h, T_4: 100% (RDF) + Spent Rice Husk Compost @ 2.5t/h, T_5: 100% (RDF) + Biochar @ 1t/h, T_6: 100% (RDF) + Bamboo Leaf Compost@ 0.1 t/h, T_7: 80% (RDF), T_8: 80% (RDF) + VC@ 2.5t/h, T_9: 80% (RDF) + Spent Rice Husk Compost @ 2.5t/h, T_{10}: 80% (RDF) + Biochar @ 1t/h, T_{11}: 80% (RDF) + Bamboo Leaf Compost @ 0.1 t/h. The results reveal that increase in Composts level had significant response on vegetative growth yield and quality of Coriander. The treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h was found superior in growth yield with quality corrector. for Coriander under satna condition.

Keywords: coriander, spent rice husk compost, biochar, vermicompost

1. Introduction

Coriander occupies prime position among them. It is an aromatic and fragrant seed spice which has uses in kitchen and a number of industries like cosmetics and beverages. It has great potential for export. Madhya Pradesh is a suitable climate for cultivation for coriander which shows a great scope for increasing its productivity through nutrition management practices.

Organic manures constitute a dependable source of macro and micro nutrients and are helpful in improving physical, chemical and biological health of soil, reduces nutrient losses, increases nutrient availability and uptake leading to sustainable production devoid of harmful residues, beside improving quality of vegetables (Acharya and Mandal, 2000). It has been observed that sole application of organic manures or inorganic fertilizers are not able to sustain the soil fertility and crop productivity. However, their integration has proved superior than individual components with respect to yield, quality and nutrient uptake.

In traditional agriculture, farmers use farm manure like cow dung, Poultry manure, Vermicompost as nutrient sources to the crops to supplement the natural supply available through soil and atmosphere. This system of low nutrient supply can only sustain low productivity of crops. Increasing needs for enhanced crop productivity due to ever increasing population necessitate the high amount of nutrition. Organic form of nutrient constitutes a potential renewable source of nutrient supply to crops under all situations. Organic sources are relatively bulky materials and are added mainly to improve the physical condition of soil, to replenish and keep up its humus status to maintain the optimum condition for the activities of soil micro-organism.

Excreta of earthworms are called Vermicompost, which has several plant growth promoters, enzymes rich in plant nutrients, beneficial bacteria and mycorrhiza. Vermicompost is a rich mixture of major and minor plant nutrients, increase total microbial population of nitrogen fixing bacteria, actinomycetes and symbiotic association of mycorrhiza on plant root system. In recent years, Vermicompost is widely used in horticultural crop production and has all the characteristics to use it as most valuable organic manure.

Materials and Methods

The experiment entitled "Effect of Integrated Nutrient Management on growth, herbage yield and leaf quality of Coriander (*Coriandrum sativum* L.) cv. Swati" was conducted during Rabi season of the year 2020-2021 on experimental farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in a randomized block design with three replicated 12 treatments *viz*., T_0: Without compost (Control), T_1: 100 kg N/h + 60 kg P/h + 40 kg K/h (RDF), T_2: VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h, T_3: 100% (RDF) + VC@ 2.5t/h, T_4: 100% (RDF) + Spent Rice Husk Compost @ 2.5t/h, T_5: 100% (RDF) + Biochar @ 1t/h, T_6: 100% (RDF) + Bamboo Leaf Compost@ 0.1 t/h, T_7: 80% (RDF), T_8: 80% (RDF) + VC@ 2.5t/h, T_9: 80% (RDF) + Spent Rice Husk Compost @ 2.5t/h, T_{10}: 80% (RDF) + Biochar @ 1t/h, T_{11}: 80% (RDF) + Bamboo Leaf Compost @ 0.1 t/h.. The seeds were sown on 12th December-2020, germination started and completed on 28 December the recording of observations was done 30 days after sowing and subsequent readings were recorded after every 30 days interval . The crop was harvested 28th february -2021. The experimental field was prepared and ploughed with a disc harrow by tractor drawn two times with cultivator and well levelled by planker before sowing. After that rocks and debris were removed from the field soil. After field preparation, the area was marked and laid out as per plan. Organic manures (Vermicompost, Spent Rice Husk Compost, Bamboo Leaf Compost, Biochar) obtained from department of horticulture, A.K.S. University, Satna (M.P.). Organic manures (Vermicompost, Biogas slurry compost and Mushroom Spent compost) help plants to quick uptake of nutrients from soil, increase nutrient availability in soil and reduce soil pollution, minimize soil erosion and degradation, improve nutritional security and reduce many problems related to crop production. On the basis of organic manure of well rotten farm yard manures was applied in the field after the field was prepared and mixed up thoroughly as the recommendation of treatment combinations before sowing the corms in the entire plot. In order to get good tilth of the soil for sowing one cross cultivation was done by tractor draw cultivator followed by two harrowings and one planking before sowing of seed. For proper growth and development Seed rate of 2.2 Kg/ha is followed. Coriander seeds are directly sown in a well prepared field or beds having sufficient soil moisture. Seeds are sown to a depth of 1cm and after sowing the seeds were properly covered with soil by the use of rake. In the beginning of the experiment, seeds were dibbled. After two weeks of sowing, thinning was carried out to maintain plant to plant distance. All the recommended package of practices was followed to raise healthy crop. The observations were taken at 30, 60 and 90 days after sowing. The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance. The significance and non-significance of the treatment effect were judged with the help of 'F' variance ratio test. Calculated 'F' value (variance ratio) was compared with the table value of 'F' at 5% level of significance. If calculated value exceeded the table value, the effect was considered to be significant. The significant difference between the means was tested against the critical difference at 5% level of significance.

Results and Discussion

The higher values of growth and yield attribute *viz.*, plant height cm, germination percentage, number of leaves per plant, primary branches/plant and Green foliage yield. The optimum levels of nutrients were found to significantly improve plant height at all the growth stages. The significantly higher plant height of coriander was recorded under T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h with the respective values of 6.31, 13.59 and 17.83 cm at growth stage of 25, 50 and at harvest, respectively. The optimum levels of nutrients were found to significantly improve germination percentage (%). The significantly higher number of germination percentage (%) of coriander was recorded under T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h with the respective values of 87.96% proved significantly superior to rest of the treatments. The optimum levels of nutrients were found to significantly improve days required for initiation, 50% seeds germination. The significantly lowest days required for initiation, 50% seeds germination of coriander was recorded under T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h with the respective values of 9.51 days proved significantly superior to rest of the treatments. Results related to fresh weight per curd (g) of Coriander found to be close agreement with that of Delaquis *et al.* (2002) [4], George *et al.* (2008) [5], Mishra *et al.* (2016) [10] and Dash *et al.* (2019) [3]. The optimum levels of nutrients were found to significantly improve number of leaves per plant. The significantly higher number of leaves per plant of coriander was recorded under T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h with the respective values of 28.72 proved significantly superior to rest of the treatments. Treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum leaf length (16.63cm) at harvesting time followed by 16.45cm T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum leaf length (8.65cm) was recorded with T_0 - Without Fertilizer (Control). Treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Leaf width (2.73cm) followed by 2.68 cm with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum (2.14 cm) was recorded with T_0 - Without Fertilizer (Control). Treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum No. of primary branches/plant (7.42) followed by 7.05 with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum No. of primary branches/plant (5.03) was recorded with T_0 - Without Fertilizer (Control). These findings are come in conformity with the findings of Kumar *et al.* (2002) [8], Dadiga *et al.* (2015) [2] and Javiya *et al.* (2017) [7]. The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum root length (4.02cm) followed by 3.98 cm with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum root length (2.76cm) was recorded with T_0 - Without Fertilizer (Control). The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Leaf: Root ratio (1.93) followed by 1.91 with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum Leaf: Root ratio (1.51) was recorded with T_0 - Without Fertilizer (Control). The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Green foliage yield per plant (18.07g) followed by 16.65g with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum Green foliage yield per plant (g) (6.41g) was recorded with T_0 - Without Fertilizer (Control). The results of present study are almost match with the findings of Meena *et al.* (2006) [9], Yousuf *et al.* (2013), Suman *et al.* (2018) [14] and Singh *et al.* (2020) [13]. The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Dry weight of leaves per plant (1.88g) followed by 1.62g with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum Dry weight of leaves per plant (g) (0.21g) was recorded with T_0 - Without Fertilizer (Control). The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Green foliage yield per plot (2.307 kg) followed by (2.165 kg) with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum Green foliage yield per plot (kg) (0.641kg /ha) was recorded with T_0 - Without Fertilizer (Control). These results closely match with the findings of Reis *et al.* (2004) [12], Alessandra *et al.* (2006) [1], Pooja *et al.* (2017) [11], Hossain and Pariari (2018) [6] and Dash *et al.* (2019) [3]. The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum Green foliage yield (8.03t/ha) followed by (7.20 t/ha) with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum Green foliage yield (2.74t/ha) was recorded with T_0 - Without Fertilizer (Control). The result shows that the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h recorded maximum juice (%) in green leaf (66.74) followed by 64.81with T_3 - 100% (RDF) + VC@ 2.5t/h and the minimum juice (%) in green leaf (41.26) was recorded with T_0 - Without Fertilizer (Control). The investigation on coriander treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h was found superior in growth yield with quality corrector. In this investigation the treatment T_2 - VC@ 2.5t/h + Spent Rice Husk Compost @ 2.5t/h + Biochar 1t/h + Bamboo Leaf Compost 0.1 t/h was found suitable for cultivation in winter season for better green foliage yield (8.03t/ha).

Table 1: Effect of Integrated Nutrient Management on growth, herbage yield and leaf quality of Coriander

Treatments	Germination percentage (%)	Days required for initiation, 50% seeds germination	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf width (cm)	No. of primary branches/ plant	Root length (cm)	Leaf: Root ratio	Green foliage yield per plant (g)	Dry weight of leaves per plant (g)	Green foliage yield per plot (kg)	Green foliage yield (t/ha)	Juice (%) in green leaf
T_0	54.07	13.04	9.16	13.54	8.65	2.14	5.03	2.76	1.51	6.41	0.21	0.641	2.74	41.26
T_1	77.94	10.82	15.69	24.41	13.68	2.56	6.16	3.54	1.80	13.90	1.31	1.590	5.80	57.34
T_2	87.96	9.51	17.83	28.72	16.63	2.73	7.42	4.02	1.93	18.07	1.88	2.307	8.03	66.74
T_3	84.16	9.76	17.54	28.46	16.45	2.68	7.05	3.98	1.91	16.65	1.62	2.165	7.20	64.81
T_4	81.48	9.88	16.91	26.14	15.77	2.66	7.00	3.85	1.87	15.84	1.56	1.984	6.78	63.39
T_5	78.22	10.65	16.28	25.39	14.20	2.60	6.53	3.62	1.82	14.82	1.37	1.782	6.09	58.65
T_6	80.64	10.23	16.75	25.70	14.84	2.63	6.84	3.71	1.85	15.11	1.41	1.811	6.33	61.88
T_7	67.03	12.97	12.52	20.33	10.83	2.29	5.27	3.07	1.64	10.24	0.59	1.024	4.20	47.11
T_8	75.41	11.33	15.02	22.88	13.19	2.51	5.92	3.46	1.79	12.75	1.29	1.316	5.31	55.08
T_9	73.80	11.48	14.77	21.59	12.51	2.46	5.75	3.30	1.76	12.16	1.15	1.275	5.75	53.72
T_{10}	69.67	11.80	13.10	20.68	11.49	2.35	5.44	3.11	1.67	10.55	0.84	1.055	4.67	49.53
T_{11}	70.55	11.72	14.43	21.27	11.78	2.42	5.61	3.13	1.72	11.38	1.07	1.138	4.90	51.16
S.Ed(±)	0.24	0.64	0.14	0.22	0.48	1.16	1.27	1.75	0.59	0.12	0.40	0.21	0.13	0.48
CD at 5%	0.50	1.33	0.28	0.45	1.00	2.41	2.64	3.63	1.22	0.26	0.83	0.43	0.26	1.00

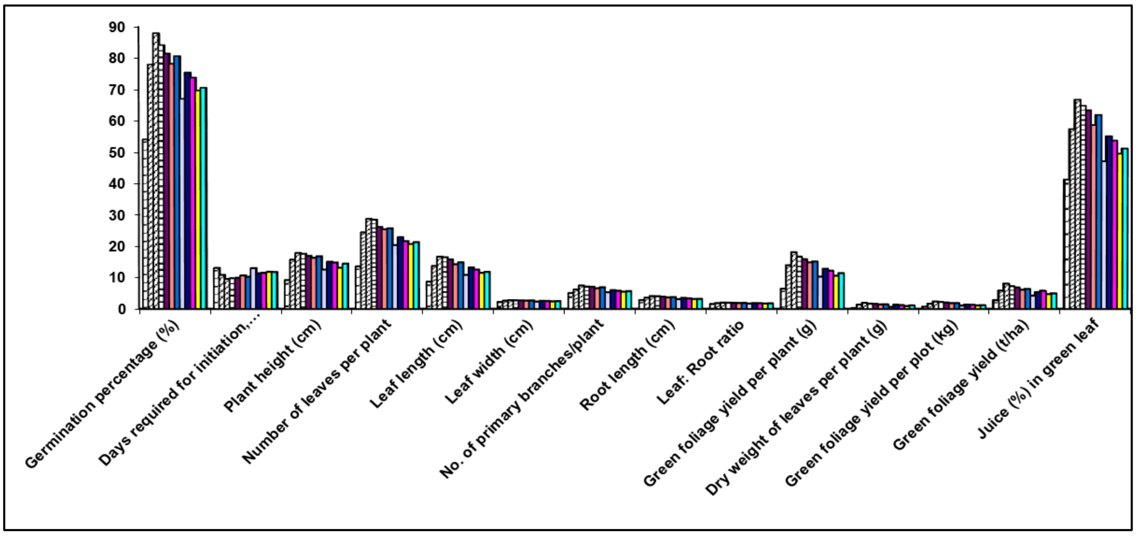

Fig 1: Effect of Integrated Nutrient Management on growth, herbage yield and leaf quality of Coriander

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