Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

June 2023, Volume 36, Issue 1, Page 237-240

Impact of vermicompost, enriched compost and microbial consortium on the chlorophyll content, leaf relative water content and nutrient uptake of green Coriander (*Coriandrum sativum* L.)

Mausum Kumar Nath* • Jumi Saikia • Aanmona Bora

Department of Horticulture, Assam Agricultural University, Jorhat-13, Assam, India

ARTICLE INFO

Article history:
Received: 31 October, 2022
Revision: 14 December, 2022
Accepted: 10 January, 2023

Key words: *Chlorophyll, Leaf relative water content, Enriched compost, Vermicompost*

DOI: 10.56678/iahf-2023.36.01.31

ABSTRACT

An investigation was conducted during 2021-22 to find out the impact of vermicompost, enriched compost and microbial consortium on the chlorophyll content, leaf relative water content and nutrient uptake Green Coriander (*Coriandrum sativum* L.) in the organic block of experimental farm, Department of Horticulture, Assam Agricultural University, Jorhat. The experiment was laid out with 7 treatments in Randomized Block Design and replicated 3 times. The findings revealed that the maximum chlorophyll content (1.84 mg 100^{-g}) was obtained in T_7 (Enriched compost @ 5 t ha^{-1}).The highest leaf relative water content of 85.57 % was recorded in T_5 (Vermicompost @ 5t ha^{-1}+microbial consortium) followed by T_7 (84.27%).The highest nitrogen (29.75 Kg ha^{-1}), phosphorus (9.04 Kg ha^{-1}) and potassium (15.98 Kg ha^{-1}) uptake were recorded in T_7. The minimum nutrient uptake was obtained in T_1 (Absolute control). Hence, considering the positive effect on the above mentioned physiological parameters, T_7 (Enriched compost@ 5 t ha^{-1}) can be considered the best treatment for adopting under field conditions.

1. Introduction

Green or leafy coriander is one of the most important condiments in the world. Coriander is herbaceous plant that belongs to the family of Apiaceae. The young, tender green leaves of coriander are used as a garnishing medium in a variety of cuisines and traditional dishes. Coriander leaves are also termed as Chinese parsley and 'Dhanayaka' in Sanskrit, in addition to the spanish word 'Cilantro' (Pathak *et al.*, 2011). Fresh and green leafy vegetables are an inevitable part human nutrition (Caunii *et al.*, 2010). For enhanced production, coriander demands an optimum fertiliser input (Fikadu-Lebeta *et al.*, 2019). Many nations nowadays are using pesticides and fertilisers to increase farm production in order to meet their ever-increasing food need due to growing population constraints (Timsina, 2018). Chemical pesticides disrupt the functioning of soil microbes, potentially lowering the nutritional value of the soil and having detrimental environmental effects (Arora et al., 2016).

Keeping in mind the disastrous effects of toxic chemicals and pesticides on our health and our ability to prevent them, the best remedy is to switch to organic vegetables. Organic farming has the potential to assist the environment, conserve non-renewable resources, and enhances food quality (Charyulu and Dwivedi, 2010). A crucial part of organic farming is the utilization of organic amendments like manure, compost, and biofertilizers. There has not been much research conducted on the physiological aspects of coriander under organic management system. These amendments can boost the vital nutrient content of the soil over time, regenerate soil biological matter, increase bulk soil density, enhance soil water retention properties, and improve soil structure, all of which can benefit crop development and soil fertility (Sharma and Reynnells, 2018).

2. Materials And Methods

A field experiment was conducted during 2021-22 in the organic block of the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat. The experimental site was located at 26.45ºN latitude and 94.12ºE longitudes and an elevation of 86.8 m above mean sea level under Upper Brahmaputra Valley Agro Climate

*Corresponding author: mausumnath937@gmail.com

Zone of Assam. The maximum and minimum temperature recorded during the period of experiment was 23.7º C-29.2º C and 9.2º C-14.4º C respectively. The experiment was set up with 7 treatments using a Randomized Block Design, and it was replicated three times. The treatments included: T_1 (Absolute control), T_2 (Vermicompost @ 2.5 t ha^{-1}), T_3 (Vermicompost @ 2.5 t ha^{-1}+ microbial consortium), T_4 (Vermicompost @ 5 t ha^{-1}), T_5 (Vermicompost @ 5 t ha^{-1}+ microbial consortium), T_6 (Enriched compost @ 2.5 t ha^{-1}) and T_7 (Enriched compost @ 5 t ha^{-1}). Each experimental plot was $3m^2$ in size, with sandy loam being the soil textural class. Before sowing in each replication, organic manures including vermicompost, enriched compost, and microbial consortium were applied at random. The seeds were split in half by gentle rubbing and then immersed in water for 16 hours. After removing the floated seeds, the viable seeds were sown in a straight row in a furrow that was opened to a depth of 2.5 to 3 cm while maintaining a 20 cm inter-row distance.

Fresh leaf samples were used to estimate total chlorophyll content. The absorbance of the extract was measured at 645 and 663 nm wavelength filters in UV spectrophotometer for the determination of total chlorophyll content according to the method developed by Rangana (1986) as below:

$$\text{Total chlorophyll in mg/g} = \frac{20.2(A_{645}) + 8.02(A_{663}) \times V}{a \times 1000 \times W}$$

Where, a= length of light path in the cell (usually 1 cm)

V= Final volume of extract (ml)

W= Weight of sample taken (g)

A_{645} = O.D at 645 nm

A_{663} = O.D at 663 nm

Relative water content (RWC) of leaf sample was calculated by the following equation (Barrs and Weatherly, 1962) and was expressed as percentage.

$$\text{Leaf Relative water content} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{Dry weight}} \times 100$$

Nitrogen content in coriander was estimated by Nesslar's reagent, spectrophotometrically (Snell and Snell, 1959), phosphorus by Vanadomolybdate phosphoric acid yellow colour method (Jackson, 1967) and potassium by Flame photometer method (Jackson, 1967). The total uptake of nitrogen, phosphorus and potassium by the crop at harvest of each treatment was calculated by multiplying the stover yields by their respective contents as per the formula given below:

$$\text{Nutrient uptake (N, P and K kg/ha)} = \frac{\text{Nutrient conc. in stover (\%)} \times \text{Stover yield (kg/ha)}}{100}$$

The Panse & Sukhatme (1995) procedure was used to statistically analyse the data related to the physiological parameters.

3. Results and Discussion

Chlorophyll is one of the vital pigment content which is used as measure of plant productivity. It plays a significant part in metabolic processes, which ultimately affect crop output (Chatterjee, 2010). It was revealed from the results that the highest chlorophyll content of 1.84 mg 100^{-g} (**Table 1**) was recorded in T_7 (Enriched compost @ 5 t ha^{-1}). The presence of microorganisms in the compost that colonise in the rhizosphere and promote plant development and biochemical contents was the cause of the higher chlorophyll content (Ravimycin, 2016). Enhanced biological nitrogen fixation, improved organic nitrogen uptake and improved root development all contribute to increased chlorophyll content (Martinez *et al.* 2001). Similar finding was reported by Verma *et al.* (2014) in cabbage and Jabeen *et al.* (2018) in spinach beet. T_5 (Vermicompost @ 5 t/ha+ microbial consortium) had the highest leaf relative water content of 85.57 % (**Table 1**). Indole acetic acid (IAA), a hormone that promotes the growth of the plant's root system, is one of the growth-promoting hormones secreted by bacteria, which enhances moisture status of the plant and contributes for the increased relative water content in the coriander leaves (Dilfuza, 2011).This finding is in accordance with Jahanshahi *et al.* (2013) in coriander.

In the present investigation, the total nitrogen, phosphorus and potassium uptake by the plant recorded the highest values with application of treatment T_7 (Enriched compost @ 5 t ha^{-1}). The highest nitrogen, phosphorus and potassium uptake by plant was 29.75 Kg ha^{-1}, 9.04 Kg ha^{-1} and 15.98 Kg ha^{-1} respectively (**Table 2**). This might be the result of higher dry matter at various growth stages and biological yield of coriander at harvest combined with higher nutrient contents as a result of the application of enriched compost, which led to higher NPK content and uptake by coriander. The outcome was very similar to those of Patel *et al.* (2013) and Sanwal *et al.* (2017) in coriander.

4. Conclusion

Based on the outcomes obtained from the present investigation, it can be concluded that enhanced physiological characteristics of coriander can be achieved through application of enriched compost @ 5t ha^{-1}. The application of vermicompost @ 5 t ha^{-1} along with microbial consortium @ 3.5 Kg ha^{-1} was found to effective only in case of leaf relative water content. Thus, T_7 (Enriched compost @ 5 t ha^{-1}) can be inferred as farmer's friendly for sustainable production, higher net return and good quality which can be taken into consideration for adoption under field conditions.

5. Acknowledgements

The authors are highly thankful to the Department of Horticulture, Assam Agricultural University for providing the necessary resources required for the completion of this research work.

6. References

Arora S, Sahni D (2016). Pesticides effect on soil microbial ecology and enzyme activity-An overview. J Appl Nat Sci. 8(2):1126-1132.

Barrs H D, Weatherly P E (1962). Physiological indices for high yield potential in wheat. Indian J Plant Physiol. 25: 352-357.

Table 1. Impact of organic amendments on chlorophyll content and leaf relative water content

Treatments	Chlorophyll (mg 100^{-g})	Leaf Relative water content (%)
Absolute control	1.50	81.16
Vermicompost @ 2.5 t ha^{-1}	1.61	81.98
Vermicompost@ 2.5 t ha^{-1} + microbial consortium @ 3.5 Kg ha^{-1}	1.74	82.33
Vermicompost@ 5 t ha^{-1}	1.73	83.08
Vermicompost@ 5t ha^{-1}+microbial consortium @ 3.5 Kg ha^{-1}	1.79	85.57
Enriched compost@ 2.5 t ha^{-1}	1.68	84.07
Enriched compost @ 5 t ha^{-1}	1.84	84.27
S.Ed(±)	0.03	0.02
CD (5%)	0.07	0.04

Table 2. Impact of organic amendments on nutrient uptake by plant after harvest

Treatments	Nitrogen uptake by plant (Kg ha^{-1})	Phosphorus uptake by plant (Kg ha^{-1})	Potassium uptake by plant (Kg ha^{-1})
Absolute control	19.75	6.40	10.54
Vermicompost @ 2.5 t ha^{-1}	20.98	7.61	11.43
Vermicompost@ 2.5 t ha^{-1} + microbial consortium @ 3.5 Kg ha^{-1}	23.19	8.10	12.09
Vermicompost@ 5 t ha^{-1}	25.65	8.70	14.74
Vermicompost@ 5t ha^{-1}+microbial consortium @ 3.5 Kg ha^{-1}	27.56	8.85	15.45
Enriched compost@ 2.5 t ha^{-1}	27.01	8.32	15.13
Enriched compost @ 5 t ha^{-1}	29.75	9.04	15.98
S.Ed(±)	0.30	0.15	0.20
CD (5%)	0.66	0.33	0.44

7. References

Caunii A, Cuciureanu R, Zakar A M, Tonea E, Giuchici C (2010). Chemical composition of common leafy vegetables. Studia Univ. Vasile Goldis Arad, Ser. Stiintele Vietii. 20(2): 45.

Charyulu D K, Dwivedi A K (2010). Economics of organic farming vis-à-vis conventional farming in India. Biling J Humanit Soc Sci. 1:1-9.

Chatterjee R (2010). Physiological attributes of cabbage (*Brassica oleracea*) as influenced by different sources of nutrients under eastern Himalayan region. Res J Agric Sci. 1(4):318-321.

Dilfuza E (2011). Indole-acetic acid production by root associated bacteria and its role in plant growth and development. In: Auxins: Structure, Biosynthesis and Functions. Nova Science Publishers, New York, pp 1-13.

Fikadu-Lebeta W, Diriba-Shiferaw G, Mulualem-Azene M (2019). The need of integrated nutrient management for coriander (*Coriandrum sativum* L.) production. Int J Food Sci Nutr. 4(1): 1-13.

Jabeen A, Narayan S, Hussain K, Ahmed Mir S, Khan F A (2018). Effect of organic manures and biofertilizers on quality of spinach beet (*Beta vulgaris* var. *bengalensis*). Int J Curr Microbiol Appl Sci. 7(9): 1312-1317.

Jackson M L (1967). Prentice Hall of India. Pvt. Ltd., Vol 498, New Delhi, pp 38-226.

Jahanshahi S, Zadehbagheri M, Aboutalebi A (2013). Effect of vermicompost, *Azotobacter* and barvar II on some quantitative and qualitative traits of coriander (*Coriandrum sativum* L.) medicinal plant. J Crop Prod Res. 4(4): 391-400.

Martinez R, Dibut B, Casanova I, Ortega M (2001). Stimulating action of *Azotobacter chroococcum* on tomato crop on a red ferrallitic soil. Agrotecnia- de-Cuba. 27: 23-26.

Panse V G, Sukhatme P V (1995). Randomized design and square and factorial experiment in statistical methods of Agricultural workers (2nd edn.), ICAR, New Delhi.

Patel C B, Amin A U, Patel A L (2013). Effect of varying levels of nitrogen and sulphur on growth and yield of coriander (*Coriandrum sativum* L.). An Int Qua J Life Sci. 8(4):1285-1289.

Rangana S (1986). Hand book of analysis and quality control for fruit and vegetable products. (2nd edn). McGraw Hill Publishing Co, New Delhi, pp122.

Ravimycin T (2016). Effects of Vermicompost (VC) and Farmyard Manure (FYM) on the germination percentage growth biochemical and nutrient content of Coriander (*Coriandrum sativum* L.). *Int J Adv Res.* 3(6):91-98.

Sanwal R C, Sharma Y (2017). Impact of vermicompost, nitrogen and phosphorus on yield, quality and uptake of coriander (*Coriandrum sativum* L.) under arid condition. Int J Chem Stud. 5(6): 1698-702.

Sharma M, Reynnells R (2018). Importance of soil amendments: survival of bacterial pathogens in manure and compost used as organic fertilizers. Preharvest food safety, pp159-175.

Snell F D, Snell C T (1959). Colorimetric method of analysis. (3rd edn) Vol 2. Van Nostrand Co. Inc. Priencenton, New Jersey, pp 814-819.

Timsina J (2018). Can organic sources of nutrients increase crop yields to meet global food demand? Agronomy. 8(10): 214.

Verma R, Maurya B R, Meena V S (2014). Integrated effect of bio-organics with chemical fertilizer on growth, yield and quality of cabbage (*Brassica oleracea* var *capitata*). Indian J Agric Sci. 84(8): 914-919.