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Effect of inorganic fertilizer and organic manure on growth, yield and quality of carrot (*Daucus carota* L.)

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Abstract

The experiment entitled "Effect of inorganic fertilizer and organic manure on growth, yield and quality of carrot (*Daucus carota* L.)" was conducted during the rabi season of the year 2022-2023 at the instructional farm of the department of Horticulture, AKS University, satna (M.P.). The experiment was laid out in a Randomized Block Design comprising 12 treatments, each replicated three times. T_0- Control, T_1-100% RDF of NPK (100 : 70 : 90 kg/ha), T_2- Vermicompost (10t/ha), T_3- Poultry manure (10 t/ha), T_4- FYM (20 t/ha), T_5-50 % RDF + Vermicompost 10t/ ha, T_6-50 % RDF + Poultry manure 10 t/ha, T_7-50 % RDF + FYM 20t/ha, T_8-100 % RDF + Vermicompost 10 t /ha, T_9-100 % RDF + Poultry manure 10t /ha, T_{10}-100 % RDF + FYM 20t /ha, T_{11}-Vermicompost 10t /ha + Poultry manure 10t /ha + FYM 20 t/ha. The results revealed that the treatment T_{11}, which includes Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha), was identified as the most effective among the various treatments in terms of growth, yield and quality in the satna agro-climatic conditions.

Keywords: carrot, Vermicompost, Poultry manure, FYM, TSS.

Introduction

Vegetables boast a nutrient-rich profile comparable to that of grains and leafy greens, with their exceptional nutritional value stemming from a high content of vitamins and minerals. Notably, root vegetables, such as carrots, stand out for their antioxidant richness, contributing to both overall health and skin well-being. Carrots, globally consumed, hold a significant

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status among root crops due to their affordability and richness in carotene, a vitamin A precursor (28129 I.U (Vithwal and Kanaujia, 2013). Belonging to the Umbelliferae or apiaceae family with a chromosome count of 2n=18, carrots additionally offer abundant iron, thiamine, riboflavin, ascorbic acid and niacin. Despite being a biennial crop, carrots are cultivated annually for their roots, characterized by rosette plants with lengthy petioles and pinnately compound leaves. The origin of carrots traces back to South western Asia, particularly Afghanistan, recognized as the primary center due to morphological diversity (Kirad *et al.*, 2010).). Introduced variants like purple and yellow appeared in Europe around the 11th century, in India and China between the 13th and 14th centuries and in Japan by the 17th century.

Carrot roots, comprising an enlarged, modified fleshy taproot of 5-30 cm length, consist of outer phloem (cortex) and inner xylem (core). The ideal root possesses a minimal core (xylem), maximum cortex (phloem) and minimal colour intensity difference between these tissues (Bhattarai and Maharjan, 2013). Carrot roots' colour intensity primarily lies in the phloem, containing about 30% more pigment than the xylem. The alpha and beta-carotene ratio in carrot roots is approximately 1:2. Beyond culinary uses, carrots find applications in various sectors. Carrot juice, a rich source of carotene, is utilized for industrial dehydration and colour extraction (Rani *et al.,* 2006). Additionally, carrots contribute to sugar production, alcohol manufacturing and animal feed. Carrot tops and roots enhance milk yield and carrot leaves are utilized for protein extraction. Carrot juice and its by products, containing bioactive compounds like carotenoids and fiber. Furthermore, carrot ingestion, detoxifying properties and relief from sunburn effects underscore the vegetable's diverse applications in promoting health and well-being.

Despite India ranking second in vegetable production, the per capita availability of vegetables falls short of dietary recommendations, emphasizing the need for enhanced productivity through organic and inorganic soil supplements. The role of nutrients like nitrogen, phosphorus and potassium in soil management becomes pivotal for sustaining agricultural growth and addressing nutritional demands. Organic sources, including vermicompost, poultry manure and farmyard manure, contribute significantly to soil health and crop productivity (Singh *et al.*, 2007). While traditional agriculture leans on these organic forms, a balanced approach incorporating inorganic fertilizers is crucial for meeting the nutritional demands of a growing population.

Materials and Methods

The experiment entitled "Effect of inorganic fertilizer and organic manure on growth, yield and quality of carrot (*Daucus carota* L.)" was conducted during the rabi season of the year 2022-2023 at the Instructional Farm of the Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in a Factorial Randomized Block Design comprising 12 treatments, each replicated three times. T_0- Control, T_1-100% RDF of NPK (100 : 70 : 90 kg/ha), T_2- Vermicompost (10t/ha), T_3- Poultry manure (10 t/ha), T_4- FYM (20 t/ha), T_5-50 % RDF + Vermicompost 10t/ ha, T_6-50 % RDF + Poultry manure 10 t/ha, T_7-50 % RDF + FYM 20t/ha, T_8-100 % RDF + Vermicompost 10 t /ha, T_9-100 % RDF + Poultry manure 10t /ha, T_{10}-100 % RDF + FYM 20t /ha, T_{11}-Vermicompost 10t /ha + Poultry manure 10t /ha + FYM 20 t/ha. On November 12, 2022, the seeds were sown, initiating germination, which concluded on December 7. Observations were documented 30 days post-sowing, with subsequent readings taken at 30-day intervals. The harvest occurred on February 17, 2023. Observations recorded during 30, 45 and 60 days include: Plant height (cm), Number of leaves per plant, Leaf length (cm) and the Leaf area per plant (cm^2) recorded at 45 and 60 days. At harvesting time, the following measurements were taken for elongated roots: Diameter of elongated root (cm), Fresh weight per elongated root (g), Dry weight per elongated root (g), Yield per plot (kg/plot), Yield (tonnes/ha) and T.S.S. (Total Soluble Solids). To ensure adequate growth and development, a seed rate of 5-6 Kg/ha is employed. Carrot seeds are directly planted in well-prepared fields or beds with ample soil moisture. The seeds are planted at a depth of 1cm and after planting, they are appropriately covered with soil using a rake.

Result

The field experiment was investigated the impact of integrated nutrient management on the growth and yield of carrot. Conducted at the Agriculture Farm of AKS University in satna, the study took place during the rabi season of 2022-2023. The results of the experiment revealed significant improvements in both growth, yield and quality attributes of carrot. This suggests that the integrated nutrient management approach employed during the study given in table no. 1 had a noteworthy positive effect on the overall performance of carrot cultivation.

The treatment T_{11}, consisting of Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha), exhibited the highest plant height (12.90, 33.16 and 40.63 cm), closely followed by T_8, which included 100% RDF + Vermicompost (10 t/ha), with plant heights of 12.28, 32.19 and 40.08 cm. The minimum plant height (9.34, 23.13 and 25.91 cm) was recorded in T_0 (Control) at 30, 45 and 60 days, respectively. The treatment T_{11}, comprising Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha), demonstrated the highest number of leaves per plant (4.46, 7.84 and 11.32) closely followed by T_8, which involved 100% RDF + Vermicompost (10 t/ha) 4.23, 7.51 and 10.88. Conversely, the lowest number of leaves per plant (2.34, 4.17 and 7.23) was observed in the control group T_0 at 30, 45 and 60 days, respectively. The treatment involving T_{11}-Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha) exhibited the maximum leaf lengths (12.07, 20.57 and 33.88 cm) at 30, 45 and 60 days, respectively. Following closely, treatment T_8-100% RDF + Vermicompost (10 t/ha) showed leaf lengths of 12.06, 19.78 and 31.43 cm during the same respective periods. The minimum leaf lengths (7.44, 10.16 and 17.91 cm) were observed in T_0-Control at 30, 45 and 60 days, respectively. The treatment combination T_{11}, consisting of Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha), exhibited the highest leaf area (290.01 and 523.19 cm2). It was closely followed by T_8, which involved 100% RDF + Vermicompost (10 t/ha), recording leaf areas of 256.15 and 508.46 cm2. The lowest leaf area (51.61 and 147.46 cm2) was observed in the control group (T_0) at 45 and 60 days, respectively. Similar findings have been reported by (Kumar *et al.*, 2007), (Daba *et al.*, 2018), (Pal *et al.*, 2021) and (Vikram *et al.*, 2022),

Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum diameter of elongated root (3.49 cm) followed by (3.32 cm) with T_9 (RD of P@ 40 kg/ha, K @ 50 Kg/ha + Nitrogen @ 80Kg/ha.) and the minimum diameter of elongated root (1.84 cm) was recorded with T_0 -Control. Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum fresh weight of elongated root (63.69 g) followed by fresh weight of elongated root (61.83 g) with T_8-100% RDF + Vermicompost (10 t/ha) and the minimum fresh weight of elongated root (48.27 g) was recorded with T_0 - Control (Without inorganic fertilizer and organic manure). This finding is supported by (Vijayakumari *et al.*, 2009), (Appiah *et al.*, 2017), (Sharma *et al.*, 2018), (Shyam *et al.*, 2022) and (Amartey *et al.*, 2023).

Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum dry weight of elongated root (12.81 g) followed by dry weight of elongated root (12.35 g) with T_8-100% RDF + Vermicompost (10 t/ha) and the minimum dry weight of elongated root (5.95 g) was recorded with T_0 –Control. Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum root yield/plot (6.89 Kg) followed by root yield/plot (6.57 Kg) with T_8-100% RDF + Vermicompost (10 t/ha) and the minimum root yield/plot (4.06 Kg) was recorded with T_0 –Control. Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum root yield (22.07 t/ha) followed by root yield (21.22 t/ha) with T_8-100% RDF + Vermicompost (10 t/ha) and the minimum root root yield (11.07 t/ha) was recorded with T_0 –Control. These results are in agreement with those of Shanmugasundaram and Savithri (2002), Anjaiah and Padmaja (2006), (Jeptoo *et al.*, 2013), (Shanu *et al.*, 2019) and (Yadav *et al.*, 2022).

Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha) recorded maximum total soluble solids (8.98 ^{o}Brix) followed by total soluble solids (8.72 ^{o}Brix) with T_8-100% RDF + Vermicompost (10 t/ha) and the minimum total soluble solids (6.40 ^{o}Brix) was recorded with T_0 –Control. The findings of the study unveiled that the treatment labelled as Treatment T_{11}-Vermicompost (10 t/ha) + Poultry manure (10 t/ha) + FYM (20 t/ha), emerged as the most effective when compared to all other treatments. The results revealed that the treatment T_{11}, which includes Vermicompost (10 t/ha), Poultry manure (10 t/ha) and FYM (20 t/ha), was identified as the most effective among the various treatments in terms of growth, yield and quality in the Satna agro-climatic conditions.

References:

Amartey, J.N.A., Sarkordie-Addo, J., Essilfie, E. and Dapaah, H.K. (2023). Growth and yield of carrots affected by integrated nutrient management of organic and inorganic fertilizers. *African Journal of Agricultural Research.* 18(7): 576-585.

Anjaiah, T. and Padmaja, G. (2006). Effect of potassium and farm yard manure on yield and quality of carrot. *Journal of Research Acharya N G Ganga Agricultural University,* 34 (2): 91-93.

Appiah, F. K., Sarkodie A., J.and Opoku A. (2017). Growth and Yield Response of Carrot (*Daucus carota* L.) to Different Green Manures and Plant Spacing, *Journal of Biology, Agriculture and Healthcare*, 7(20): 16-23.

Bhattarai, B. P. and Maharjan, A. (2013). Effect of organic nutrient management on the growth and yield of carrot *(Daucus carota* L.*)* and soil fertility status, *Nepalese J. Agric. Sci.*, 11:16-25.

Daba, G., Mulugeta, M. and Ayana, T. (2018). Effect of cattle manure on growth and yield of carrot (*Daucus carota* L.) under Jimma condition, *Indian J. Agric. Res*., 52 (2):195-198.

Jeptoo, A.; Aguyoh, J.N. and Saidi, M. (2013). Improving carrot yield and quality through the use of Bio-Slurry manure. *Sustainable Agric. Res*. 2(1): 164-172.

Kirad, K.S., Swati Barche and Singh, D.B. (2010). Integrated nutrient management on growth, yield and quality of carrot. *Karnataka Journal of Agricultural Sciences.* 23(3): 42-543.

Kumar, A., Rana, M.K. and Baswana, K.S. (2007). Effect of crop residues and farm yard manure on yield and quality of carrot (Daucus carota L.) roots. *Haryana Journal of Horticultural Sciences.* 36(3/4): 367-369.

Pal, A., Srivastav, A., Yadav, H. C., Patel, V. K., Singh, B.K., Baksh, H., Pandey, R. and Singh, R. (2021). Response of Organic Manures and Micronutrients on Growth, Yield and Quality Attributes of Carrot (*Daucus carota* L.) cv. Pusa Rudhira. *Int.J.Curr.Microbiol.App.Sci.*, 10(07): 43-47.

Rani, N.S.; Syed, I. and Reddy, Y.N. (2006). Effect of cropping situation and integrated nutrient management practices on growth , yield, quality and economics of growing carrot in ber-based cropping system. *Indian J. Dryland agric. Res. Development*.21(2): 136-140.

Shanmugasundaram, R. and Savithri, P. (2002). Impact of nitrogen with organics on quality attributes and yield of carrot root (Daucus carota). *Advances in Plant Sciences*. 15(2): 637-639.

Shanu, V., Lakshminarayana, D., Prasanth, P. and Naik, S.D. (2019). Studies on the Effect of Integrated Nutrient Management (INM) on Growth and Yield

Parameters of Carrot (Daucas carota L.) cv. Kuroda Improved under Southern Telangana Conditions. *Int. J. Curr. Microbiol. App. Sci.*, 8(04): 2786-2791.

Sharma, R.,Thakur A.,Kumar R. and Shukla, Y.R. (2018). Effect of plant density and fertilizer doses on seed yield and its attributes in carrot. *Journal of Hill Agriculture*, 9(2): 153-157.

Shyam, S., Verma, S., Bisen, R.K., Raj, S., Pandey, T.D., Chaure, N.K. and Keshry, P.K. (2022). Effect of integrated nutrient management on yield of Carrot (Daucus carota L.). *The Pharma Innovation Journal*, 11(7): 3161-3163.

Singh, B. N.; Singh, A. P.; Singh, T. and Singh, N. K. (2007). Integrated nutrient management in carrot (Daucus carota L.). *Prog. Agric.* 7(1/2): 84-86.

Vijayakumari, B., Hiranmaiyadav, R. and Sowmya, M. (2009). A study on the effect of few eco-friendly manures on the growth attributes of carrot (Daucus carota L.). *Journal of Environmental Science & Engineering.* 51(1): 13-16.

Vikram, D., Kathayat, K. and Karangiya, K. (2022). Effects of integrated nutrient management on growth, yield and quality and economics of carrot. *The Pharma Innovation Journal.* SP-11(7): 4490-4493.

Vithwal and Kanaujia, S.P. (2013). Integrated nutrient management onproductivity of carrot and fertility of soil. *SAARC J. Agri.* 11(2): 173-181.

Yadav, A., Jakhar, R.K., Kumari, N., Yadav, G.N., Sharma, R.K., Yadav, S.L., Meena, H.K. and Khandelwal, A.K. (2022). Response of organic manures and fertilizers on yield and quality of carrot under sandy soil condition. *The Pharma Innovation Journal*. 11(4): 1822-1827.

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Table.1: Effect of inorganic fertilizer and organic manure on growth, yield and quality of carrot.

Treatment	Plant height (cm)	Number of leaves per plant	Leaves length (cm)	Leave area (cm^2)	Diameter of elongated root (cm)	Fresh weight of elongated root (g)	Dry weight of elongated root (g)	Root yield/plot (Kg)	Root yield (t/ha)	TSS (°Brix)
T_0	25.91	7.23	17.91	147.46	1.84	48.27	5.95	4.06	11.07	6.40
T_1	38.03	9.87	30.24	385.61	2.51	59.00	10.78	5.92	19.61	8.18
T_2	35.58	8.70	28.33	203.09	3.93	55.04	9.66	5.17	16.72	7.22
T_3	34.42	8.32	27.69	186.66	3.50	54.68	9.22	4.84	15.39	7.18
T_4	33.67	7.85	25.10	163.74	2.07	54.34	8.39	4.70	15.22	7.10
T_5	37.44	9.63	30.16	330.49	2.39	58.63	10.46	5.71	18.46	7.78
T_6	36.98	9.26	29.99	278.25	2.89	57.26	10.31	5.64	17.91	7.51
T_7	36.61	8.95	29.82	241.57	2.36	55.42	9.92	5.37	17.40	7.36
T_8	40.08	10.88	31.43	508.46	3.32	61.83	12.35	6.57	21.22	8.72
T_9	39.16	10.60	31.18	480.55	3.09	60.85	11.59	6.30	21.02	8.57
T_{10}	38.79	10.26	30.58	437.27	2.33	60.50	11.11	5.99	19.85	8.40
T_{11}	40.63	11.32	33.88	523.19	3.49	63.69	12.81	6.89	22.07	8.98
S.Em(±)	**0.37**	**0.17**	**0.36**	**15.23**	**0.17**	**0.70**	**0.17**	**0.17**	**0.20**	**0.16**
CD at 5%	**1.11**	**0.50**	**1.06**	**44.96**	**0.51**	**2.08**	**0.51**	**0.51**	**0.60**	**0.48**