

Response of organic and inorganic sources of nutrients on growth and yield of Turnip (*Brassica rapa* L)

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Abstract

*A field experiment entitled “Response of organic and inorganic sources of nutrient on growth and yield of turnip (*Brassica rapa* L.)” was carried out during rabi season of 2021-2022 at “Campus for Research and Advanced Studies, Dhablan of the G.S.S.D.G.S. Khalsa College, Patiala”. A field experiment was laid out in randomized block design with 10 different treatments and 3 replications. The results revealed that the growth and yield parameters were recorded maximum in treatment (T₉) 75% RDF + 12.5% Farm yard manure + 12.5% Vermicompost were at par with the treatment of (T₈) 75% RDF + 25% Vermicompost and the minimum values recorded in the treatment (T₁).*

Keyword: Turnip, Farm yard manure, Vermicompost

Introduction

Turnip (*Brassica rapa* L.) is a member of the cruciferous family. Turnip, also known as field mustard or turnip mustard, is a plant widely cultivated as a leaf vegetable, a root vegetable and an oilseed. It is cultivated as an annual crop, but grows best in cool weather because hot temperatures cause the roots to become woody and bad-tasting (Pamula and Kerketta, 2021). In India, turnip cultivation is mostly constricted to north western parts of the country like Punjab, Haryana, Rajasthan and Western U.P. as an early winter season crop. Green Top, Purple Top and ‘Kenshin-Kaba’ are paramount cultivars of turnip for fodder production. Turnip has enormous prospective as a short duration, high yielding fodder crop. Its fodder is rich in readily available carbohydrate and crude protein as well as it is highly palatable, succulent and easily digestible. (Yadav *et al.* 2021). India is the world’s second largest producer of vegetables next to China. In India, turnip covers 2500 ha area with 50,000 t ha⁻¹ productivity. (Anonymous 2020)

Turnips are high in Vitamin C, Calcium, Iron and other minerals, the tops (turnip greens) can be used as green vegetable which have prominent Vitamin

A and B, but the crop is generally and commercially grown for its roots. The fleshy root and young leaves are wholesome portion and nutritionally not so poor as commonly believed.

The soil with its content in macro and micro elements, enhanced by the use of organic fertilizers, plays a major role in the plant’s growth and development, In biosynthesis of the organic substances. Inorganic fertilizers which are formulated in suitable concentrations and combinations which supply three main nutrients: nitrogen, phosphorus and potassium (NPK) for various crops and promote the growth conditions. Nitrogen (N) promotes leaf growth and forms proteins and chlorophyll. Phosphorus (P) contributes to root, flower and fruit development. Potassium (K) contributes to stem and root growth and the synthesis of proteins (Yadav *et al.* 2021).

The integrated nutrient management overcomes these problems, which involves conjunctive use of chemical fertilizers and organic manures to sustain crop production as well as to maintain the soil health. Systematic approach to nutrient management by tapping all possible sources of organic and inorganic in a judicious manner to maintain soil fertility and crop productivity is the essence of integrated nutrient management (Nanjappa *et al.* 2001).

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Materials and Methods

The experiment was performed during winter season of 2021-2022 at Campus for Research and Advanced Studies, G.S.S.D.G.S. Khalsa College, Patiala (Punjab). The field experiment was carried out with 8 treatments and 3 replications laid out in Randomized Block Design consisting treatment combination T₁ : Control, T₂ : 100% FYM, T₃ : 100% Vermicompost, T₄ : 100% RDF, T₅ : 50% RDF + 50% FYM, T₆ : 50% RDF + 50% Vermicompost, T₇ : 75% RDF + 25% FYM, T₈ : 75% RDF + 25% Vermicompost, T₉ : 75% RDF + 12.5% FYM + 12.5% Vermicompost and T₁₀ : 50% RDF + 25% FYM + 25% Vermicompost and these treatments were applied to L-1 variety of turnip. The net plot size was 3.6 m×3.75m. Turnip was sown on 24 October, 2021 with a spacing of 45 cm×7.5 cm and harvested on 5th January, 2022. Growth parameters were recorded at various stages which was starting from 20 DAS, 40 DAS, 60 DAS and at the time of harvesting. The growth parameters like plant height, number of leaves plant⁻¹, leaf length and leaf width. Similarly, all yield parameters like root length, root diameter, root yield (Kg plot⁻¹) and root yield (q ha⁻¹) were recorded. Economics parameters of different treatments were also analyzed.

Results and Discussion

Growth parameters

The growth parameters such as plant height, number of leaves plant⁻¹, leaf length and leaf width was significantly influenced by the t₉ treatment. The treatments combination of organic manures showed the improved growth parameters over the rest of treatments. The maximum results in plant height (41.63

cm), number of leaves plant⁻¹ (14.57), leaf length (45.25 cm), leaf width (16.48 cm) were recorded in treatment (T₉) 75% RDF + 12.5% FYM + 12.5% Vermicompost at the time of harvesting which gave the highest values in all growth parameters. The maximum growth parameters were observed in T₉ because organic manures gave nutrients to crop during its whole life cycle and manures released the nutrients slowly which leads to enhanced the growth parameters of turnip crop. The application of RDF, Vermicompost and farm yard manure contains higher percentage of macronutrients and micronutrients which supply the available nitrogen to plants. They also improved the water holding capacity, soil aeration, increased the porosity and increased the vegetative growth of plants. The parallel study findings were comparable with the earlier researcher on organic manure by Singh *et al.* (2009) and Aisha *et al.* (2014) in turnip crop which stated that by the use of organic fertilizers to increase the growth of turnip plant and fertility of soil.

Yield parameters

The maximum root length (8.45 cm), root diameter (11.78 cm), root yield (48.42 kg plot⁻¹) and root yield (358.66 q ha⁻¹) at harvest were observed in treatment (T₉) 75% RDF + 12.5% FYM + 12.5% Vermicompost. The minimum values of all yield parameters were recorded in treatment (T₁) control. It was observed that the root yield was influenced with every nutrient source applied i.e. RDF, vermicompost and farm yard manure improved the soil physical conditions which helped in more nutrients uptake by plant and increased the vegetative growth of turnip. By increasing the vegetative growth of plant, it

Table 1: Effect of organic and inorganic sources of nutrient on growth of turnip

Treatment	Plant Height (cm)	No. of Leaves plant ⁻¹	Leaf length (cm)	Leaf width (cm)
T ₁ : Control	21.22	9.22	27.39	10.21
T ₂ : 100% FYM	32.06	10.44	33.64	12.02
T ₃ : 100% Vermicompost	33.91	10.91	35.12	12.12
T ₄ : 100% RDF (NPK)	33.91	13.34	44.15	15.84
T ₅ : 50% RDF + 50% FYM	38.34	11.83	37.16	12.54
T ₆ : 50% RDF + 50% Vermicompost	34.91	11.95	41.18	13.74
T ₇ : 75% RDF + 25 %FYM	37.23	13.34	42.15	14.13
T ₈ : 75% RDF + 25% Vermicompost	40.43	14.23	44.67	16.18
T ₉ : 75% RDF + 12.5% FYM + 12.5% Vermicompost	41.63	14.57	45.25	16.48
T ₁₀ : 50% RDF + 25% FYM + 25% Vermicompost	38.07	12.18	39.62	14.35
SE m±	0.88	0.32	0.20	0.41
CD at 5 %	1.22	0.33	0.61	0.33

Table 2: Effect of organic and inorganic sources of nutrient on yield parameters of turnip

Treatment	Root length (cm)	Root diameter (cm)	Root yield (Kg plot ¹)	Root (yield q ha ⁻¹)
T ₁ : Control	4.44	7.14	17.24	127.70
T ₂ : 100% FYM	5.3	8.22	38.46	284.88
T ₃ : 100% Vermicompost	5.8	8.24	39.56	293.03
T ₄ : 100% RDF (NPK)	7.57	10.94	44.34	328.44
T ₅ : 50% RDF + 50% FYM	6.01	8.44	40.72	301.62
T ₆ : 50% RDF + 50% Vermicompost	6.55	9.36	41.51	307.48
T ₇ : 75% RDF + 25% FYM	7.22	10.2	43.54	322.51
T ₈ : 75% RDF + 25% Vermicompost	7.71	11.12	46.62	345.33
T ₉ : 75% RDF + 12.5% FYM + 12.5% Vermicompost	8.45	11.78	48.42	358.66
T ₁₀ : 50% RDF + 25% FYM + 25% Vermicompost	6.99	9.91	43.18	319.85
++SE m±	0.26	0.32	0.87	9.10
CD at 5 %	0.77	0.69	1.83	14.52

ultimately supports to increase the yield parameters. The application of RDF, vermicompost and poultry manure helped to granular the soil which assist the roots to easily penetrate into soil and increased the root length, root diameter and root yield. Similar results are stated by Kumar and Devi (2014) in radish to find out that the organic manures more beneficial than the inorganic fertilizers and shows significant effect on root length. By the accordance of Khede *et al.* (2019) and Suman *et al.* (2019) in Turnip which revealed the same results with the current work by using the combination of different organic manures.

Conclusion

From the above research finding it was concluded that application of treatment (T₉) 75% RDF + 12.5% FYM + 12.5% Vermicompost resulted in maximum root yield. Beside from the root yield, it also produced turnip with better growth parameters in turnip. The application of RDF, Vermicompost and farm yard manure also improves the physical condition and water holding capacity of soil and nutrients as well as it reduces economic pressure on farmers.

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