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# Study the efficiency of different organic manures on growth and yield attributes of turnip (*Brassica rapa* L.)

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**Abstract**
**Background:** Continuous use of chemical fertilisers has caused havoc on soil health, soil fertility and ultimately crop production. Moreover indiscriminate use of chemical fertilisers has caused ill health effects on plants, animals and also to humans due their residual effects. Decline in soil fertility has resulted in unsustainable crop production and the residual effect of chemicals has caused serious concern by creating problems in ecological balance. Now the way to reduce effects of in-organic chemicals lies in use of organic manures for sustained crop yield. With the use of organic manures there has been improvement in soil health, soil fertility and ultimately leading to increased crop productivity.
**Methods:** Keeping in view above ill effects of inorganic nutrients, the present investigation was carried out to study of effects of different organic manures on growth, yield and quality of turnip. Soil application of organic manures *viz*; FYM. Vermicompost, Poultry manure, sheep manure and their integration was studied under cold temperate conditions of Gurez where average remains in summer hardly 20-25 °C.
**Results:** From the study it was observed that application of different organic manures have increased significantly growth, yield and quality attributes of Turnip. Among different treatments of organic manures $T_6$ (PM 50% +FYM 50%) recorded maximum values of growth, yield and quality attributes of Turnip. Application of organic manures has improved soil health, sustained crop yield and enhanced quality attributes. Application of organic manures is ecofriendly and sustainable approach of crop production.

**Keywords:** Organic manures, growth, turnip, yield, quality

## Introduction
Turnip (*Brassica rapa* L.) is a winter vegetable and herbaceous biennial in nature, comes under the family of brassicaceae. It is mainly grown for the hypocotyls and the swollen upper part of the root and lower part of the stem. It has a crisp white flesh and a zesty mustard-like flavor and a rapidly maturing crop. Its root is called underground modified root, which is napiform in shape. The stem is short at vegetative stage but elongated at the reproductive stage. It is well established in fertile and medium to heavy well drained soils are best suited to grow. Turnip can be grown in slightly acidic to saline soils. However, the optimum soil pH range is 6.0-7.0 (Choudhary, 2015) [12]. Under cold temperate regions of Gurez valley Turnip is most suitable crop in terms of climate, soil and local preference of people of valley
Traditional use of chemical fertilisers has increased crop production in early 1960,s due to use of high yielding varieties during the era of green revoluation. But despite has threatened our natural resources such as soil, water and have caused human hazards as rise of cancerous in modern era of agriculture without sustaining the crops productivity. One of the alternatives is organic farming. Organic agriculture is environment friendly, ecological production system that promotes and enhances biodiversity, biological cycles and biological activity. It is based on minimal use of off-farm inputs and management practices that restore, maintain and enhance ecological harmony. The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of tiring soil, plant, animal and people. Organic products provide lucrative business in the world market. Organically grown food is expected to fetch higher price and this can offset any loss due to lower yield.
The organics are the indigenous source of nutrients which can help in increasing production and productivity along with improvement in soil physical conditions (K.V. Kumar *et al* 2022) [5]. Use of such organic materials, which are being wasted in large amounts without proper use can help in reducing cost of cultivation, increasing productivity and improving soil as well as human and livestock health. Various organic manures so far recognized in this group are green

manures, rural/urban compost, farm yard manure, vermicompost, liquid organic manure etc. Organic materials such as compost, vermicompost, poultry manure, oilcakes, green manures and crop residues can substitute inorganic fertilizers to maintain productivity and environmental quality (Chaudhary, 2009) [2]. It is reported that the quality of agricultural produce, particularly horticultural produce *viz.*, vegetables, flowers and fruits improves when the nutrients are supplied through organic manures than in the form of fertilizers. This is because of the supply of all essential plant nutrients by the manures besides growth principles like enzymes, hormones and growth regulators *etc*. As a result, the metabolic function gets regulated more effectively, resulting in better synthesis of proximate constituents and consequent improvement in the quality of produce.

## Materials and Methods

The Experimental trial was conducted at Mountain Agriculture Research and Extension station Gurez, SKUAST-K during the two consecutive years Kharief (2021-22) and Kharief (2022-23). The Soil sample was collected, processed and analysed. The crop was turnip variety purple top white globe suitable for cold temperate regions of India. The experimental was laid out in Randomised Block Design with eight treatments and three replications. The treatments include $T_1$ (FYM=100%), $T_2$ (VC 100%), $T_3$ (PM 100%), $T_4$ (SM 100%), $T_5$ (FYM50% +VC 50%), $T_6$ (FYM 50%+PM 50%), $T_7$ (FYM50% +SM 50%) and $T_8$ (control or no inputs).The organic manures like FYM, Vermicompost (VC), Poultry manure (PM), Sheep manure (SM) were used during study. The crop was sown by line sowing method during 15$^{th}$ June in plots of size (3×2 m$^2$) in spacing of 30×20 cm. Each plot was given manures as per treatments. Organic manures were thoroughly mixed with soil at the time of land preparation. Irrigation, weeding and other intercultural operations were given as per requirement. Thining was 25 days after sowing to maintain plant population as per spacing. Growth attributes were measured using standard procedures at full maturity stage. Root yield and other yield attributing traits were taken after harvesting of crop. Quality attributes were measured using standard procedures as Vitamin C by (A.O.A.C. 1975) method and protein content by Kjeldahls method as outlined by Tandon (1993) [11].

The data on various characters studied during the investigation was statistically analyzed (Gomez and Gomez, 1984) [4].

## Results and Discussion

### Growth Attributes

From table-1 it was interpreted that the growth attributes recorded maximum values with treatment $T_6$ (FYM 50%+PM 50%), as plant height (58.93 cm), No. of leaves per plant (21.79), leaf length (30.61 cm), leaf width (16.63 cm), root length (8.09 cm) and root diameter (6.13 cm) were significantly superior with respect to other treatments but at par with treatments $T_5$ in case of plant height, $T_3$, $T_5$ and $T_7$ in case of leaf width.$T_5$ in case of root length and root diameter followed by treatment $T_5$ (FYM50% +VC 50%) in most of the attributes but in case of leaf length followed by treatment $T_3$ (PM 100%). The lowest values of plant height (43.93 cm), No. of leaves per plant (13.38), leaf length (21.11 cm), leaf width (9.85 cm), root length (5.30 cm) and root diameter (4.72 cm). Growth attributes like plant height, No. of leaves per plant, leaf length, leaf width, root length and root diameter were significantly enhanced with the application of all organic manures as compared with control treatment. This could be possible due to availability of micro as well as macronutrients present in organic manures. The similar trend was observed by Pamula and Anita 2021 in turnip also showed increase in growth attributes with the application of different organic manures as vermicompost, poultry manures and could be possibly due to presence of growth hormones, enzymes, micro-nutrients and macronutrients. The significant increase with the application of poultry manure as sole application and also with integration with FYM could be possibly due to less C:N ratio leading to more decomposition resulting in avaibility of nutrients for plant uptake in greater amount and thereby increasing growth attributes of turnip. Our results are in conformity with Vinoth Kumar *et al* 2022 [5] in tomato and Magray *et al* 2012 [7] in tomato.

### Yield Attributes

The yield attributes were calculated and tabulated in Table 2 which indicates that the maximum values of yield attributes like root weight (115.94 gms), root yield per plot (14.07kg) and root yield per hectare (331.60 q ha$^{-1}$) were recorded with the treatment

$T_6$ (FYM 50%+PM 50%) where the values significantly higher as compared with rest of other treatments but at par with treatment $T_5$ (FYM50% +VC 50%) and $T_7$ (FYM 50%+SM 50%) followed by treatment $T_5$ (FYM50% +VC 50%).Treatment $T_8$ (control or no inputs) recorded significantly lowest values of root weight (80.91 gms), root yield per plot (10.01 kg) and root yield per hectare (172.03 q ha$^{-1}$). Similar trends were observed by several research works such as Anitha *et al.* (2020) [13] also found Application of 50% vermicompost showed maximum yield and quality attributes of Radish. The maximum fruit yield and maximum number of fruits were obtained with the application of farm yard manure as a source of organic manure (Rajbir, 2016) [9] and Sujatha *et al*., 2020 [3] reported in radish significantly maximum value of root yield per hac with the application of organic manures. This could be possible due to availability of all nutrients, growth hormones, enzymes present in organic manures like poultry manure vermicompost and sheep manure. Among different organic manures poultry manure @100% and combined application of FYM 50%+PM 50% proved superior in enhancing root yield attributes of turnip.

### Root Quality attributes

The root quality parameters of turnip like protein content and vitamin C content also varied among different treatments and maximum values of quality attributes *viz*:- vitamin C content (20.17 mg/100 g) and protein content (1.07 g/100 g) were recorded with the treatment $T_6$ (FYM 50%+PM 50%) where the values were significantly superior with respect to other treatments but at par to treatments $T_5$,$T_6$ in case of vitamin c content and to treatment $T_5$ in case of treatment protein content. Treatment $T_8$ (control or no inputs) recorded significantly lowest values of vitamin C content (16.14 mg/100 g) and protein content (0.96 g/100 g). Application of organic manure showed the higher root t quality characters which might be due to the organic nutrient source which releases numerous active enzymes, vitamins, macro and micro nutrients. Our research is in conformity with the several research workers Sujatha *et al*., 2020 [3] in radish, K. B. Khatri

*et al* 2019 [6] in radish and Magray *et al*., 2014 [8] in tomato.

**Table 1:** Effect of organic manures on growth attributes of turnip plant at harvest

| Treatments | Plant height (cm) | No. of leaves | Leaf Length (cm) | Leaf width (cm) | Root length (cm) | Root diameter (cm) |
|---|---|---|---|---|---|---|
| $T_1$ | 48.28 | 15.93 | 24.00 | 7.98 | 6.31 | 4.94 |
| $T_2$ | 52.55 | 17.31 | 24.67 | 12.71 | 6.73 | 5.26 |
| $T_3$ | 54.16 | 18.93 | 26.16 | 13.74 | 7.09 | 5.48 |
| $T_4$ | 50.32 | 16.60 | 23.26 | 11.87 | 6.48 | 5.13 |
| $T_5$ | 55.54 | 19.08 | 25.83 | 15.41 | 7.73 | 5.76 |
| $T_6$ | 58.93 | 21.79 | 30.61 | 16.63 | 8.09 | 6.13 |
| $T_7$ | 53.17 | 18.49 | 24.86 | 14.85 | 7.49 | 5.38 |
| $T_8$ | 43.93 | 13.38 | 21.11 | 9.85 | 5.30 | 4.72 |
| S.Ed | 1.731 | 0.873 | 0.942 | 1.683 | 0.264 | 0.218 |
| C.D (0.05%) | 3.75 | 1.89 | 2.03 | 3.64 | 0.57 | 0.47 |

**Table 2:** Effect of organic manures on root yield of Turnip

| Treatments | Root Weight (gms) | Root yield per plot (kgs) | Root Yield per hac q/ha |
|---|---|---|---|
| $T_1$ | 89.45 | 11.60 | 189.11 |
| $T_2$ | 96.76 | 12.72 | 228.05 |
| $T_3$ | 100.56 | 12.97 | 256.17 |
| $T_4$ | 94.87 | 12.20 | 214.31 |
| $T_5$ | 107.92 | 13.57 | 280.56 |
| $T_6$ | 115.94 | 14.07 | 331.60 |
| $T_7$ | 105.89 | 13.39 | 266.26 |
| $T_8$ | 80.91 | 10.01 | 172.03 |
| S.Ed | 1.777 | 0.391 | 10.27 |
| C.D (0.05%) | 3.85 | 0.85 | 4.744 |

**Table 3:** Effect of organic manures on quality attributes of turnip root

| Treatments | Vitamin C content (mg/100 g) | Protein content (g/100 g) |
|---|---|---|
| $T_1$ | 17.59 | 1.00 |
| $T_2$ | 18.96 | 1.03 |
| $T_3$ | 18.95 | 1.02 |
| $T_4$ | 18.73 | 1.04 |
| $T_5$ | 19.12 | 1.05 |
| $T_6$ | 20.17 | 1.07 |
| $T_7$ | 19.82 | 1.06 |
| $T_8$ | 16.14 | 0.96 |
| S.Ed | 0.533 | 0.034 |
| C.D (0.05%) | 1.15 | 0.016 |

## Conclusion

Application of organic manures *viz* FYM, vermicompost, Poultry manures, Sheep manures and in integration also resulted better crop growth, yield and quality parameters in turnip crop was observed. Among different applications of organic manures. Poultry manure PM @ 100% and PM @ 50% + FYM @ 50% was found effective in enhancing growth, yield and quality attributes significantly.

Therefore, application of Poultry manure as sole application and in integration with FYM is best suited practice for turnip crop cultivation under cold temperate conditions of Gurez valley and also increased a net return and improved turnip root quality.

## Conflict of Interest

No Conflict of Interest

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