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# STUDIES ON THE EFFECT OF ORGANIC SOURCES ON GROWTH AND YIELD OF CARROT (*DAUCUS CARROTA* L.)

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**ABSTRACT**

The present investigation entitled "Studies on the effect of organic sources on growth and yield of carrot (*Daucus carrota* L.)" was laid out on the experiment of site of Agriculture Farm of Mahatma Gandhi Chitrakoot Gramodya Vishwavidyalaya, Chitrackoot, M.P. (Satna) during *rabi* season 2017-2018. The experiment was conducted in 6 RBD with different level of Organic manures. The application was replicated thrice times and was allocated at random in each replication. The treatments consisted six levels of organic manure ($O_1$: FYM @ 10 t $ha^{-1}$,$O_2$: Vermicompost @ 5 t $ha^{-1}$,$O_3$: FYM@ 5 t $ha^{-1}$+ Panchagavya (Spray)-3 times + irrigation with Jiwamrit, $O_4$: Vermicompost @2.5 t $ha^{-1}$+Panchagavya, $O_5$: FYM @5 t $ha^{-1}$ Vermivash + seed treatment with bijamrit and $O_6$: Vermicompost @ 2.5 t $ha^{-1}$ + vermivash). The application of O4: Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya significantly increased growth and yield attributes viz., plant height (cm), number of leaves per plant, fresh weight of leaves per plant, length of root per plant, diameter (cm) of root per plant, fresh weight of root per plant, dry matter of leaves(%), per cent of dry matter of roots, gross yield of root per plot (kg), gross yield of root (t $ha^{-1}$) of carrot.

***Keywords*** **:** Organic manures, growth, yield and carrot

## Introduction

Carrot (*Daucus carota* L.) is an important root vegetable, belongs to the family umbelliferae with diploid chromosome number 2n = 18. It is cultivated all over the world, during spring-summer in temperate countries and winter in tropical and subtropical countries. Carrot is an excellent source of carotene a precursor of vitamin A and fibre in the diet Handelman (2001). Carrot is major vegetable crop of India. Haryana, Andhra Pradesh, Karnataka, Punjab and Uttar Pradesh are major carrot growing states of India. In India, carrot is cultivated on 106 thousand hectares with an annual production of 1875 thousand metric ton Anonymous (2020) and productivity is 17689 kg ha-1 during 2019-20. In Rajasthan, carrot is cultivated on 1776 hectares with an annual production of 13318 metric ton (Anonymous, 2020) and productivity is 7499 kg ha-1 during 2019-20. Carrot roots are used as vegetables, salad, soup, stews, and curries. A special type of beverage known as 'kanji' is prepared from black carrot and used as appetizer (Fageria *et al.*, 2018). Nutrient composition of carrot are - Moisture 86 g, Fat 0.2 g, Protein 0.9 g, Fibre 1.2 g, Carbohydrates 10.6 g, Calories 57 Kcal, Calcium 80 mg, Magnesium 14 mg, Oxalic acid 55 mg, Phosphorus 30 mg, Iron 2.2 mg, Potassium 108 mg, Sodium 35.6 mg, Copper 0.13 mg, Sulphur 27 mg, Vitamin A 3150 IU, Thiamine 0.04 mg, Riboflavin 0.02 mg, Nicotinic acid 0.6 mg, Vitamin C 3 mg Bose *et al.* (2000) and Astha *et al.* (2021). Vermicompost, which is produced by earthworms, is a rich source of both micro and macro nutrients, vitamins, growth hormones and enzymes

Bhavalkar, (1991). Farm Yard Manure (FYM) is not a rich source of nutrients, increases organic carbon content to the soil and improves soil physical properties Sunanda and Mallareddy (2007). Farmyard manure being a bulky organic material releases the soil compaction and improves the aeration in addition to the supply of essential plant nutrients and organic matter, thereby increasing the soil microbial establishment along with accumulation of excess humus content. Vermicompost is a potential source of readily available nutrients, growth enhancing substances and a number of beneficial microorganisms like N-fixing, Psolubilizing and cellulose decomposing organisms. It has been studied that the vermicompost effects on the plant growth, yield and quality of crops considerably Astha *et al.* (2021).

## Materials and Methods

The present investigation entitled "Studies on the effect of organic sources on growth and yield of carrot (*Daucus carrota* L.)" was laid out on the experiment of site of Agriculture Farm of MahatmaGandhi Chitrakoot Gramodya Vishwavidyalaya, Chitrackoot, M.P. (Satna) during *rabi* season 2017-2018. The present trial was conducted at agriculture farm of Mahatma Gandhi Chitrakoot Gramodya Vishwavidyalaya, Chitrackoot, (Satna) which is located (80°21′ to 81°23′ East longitude and 23°58′ to 25°12′North latitude). The altitude of Chitrakoot (Satna) is 317 meters above mean sea level. The experimental plot is located at Rajula, three kilometre away from main University Campus. The experiment was conducted in Randomized Block Design (RBD) with three replications and 6 treatment combinations of organic sources viz., ($O_1$: FYM @ 10 t $ha^{-1}$,$O_2$: Vermicompost @ 5 t $ha^{-1}$,$O_3$: FYM@ 5 t $ha^{-1}$+ Panchagavya (Spray)-3 times + irrigation with Jiwamrit, $O_4$: Vermicompost @2.5 t $ha^{-1}$+ Panchagavya, $O_5$: FYM @5 t $ha^{-1}$ Vermivash + seed treatment with bijamrit and $O_6$: Vermicompost @ 2.5 t $ha^{-1}$ + vermivash). The seed of carrot sowing on the ridges were done at a spacing of 10 x 15 cm in first week of November 2017. The variance of the measure of the variability and is defined as the average of the square deviation from the mean. The analysis of variance was carried out as per methods suggested by Panse and Sukhatme (1989).

### Observations recorded

The technique of representative sampling was adopted for recording the observation on various morphological characters in carrot. At every observation 5 plants from each net plots were selected at random were tagged properly to record the change in the morphological characters at different successive stages of growth. The first recording of observations was done 30 days after sowing and subsequent readings were taken after 30 days interval.

### Plant height (cm)

The height of the plant was measured from the ground level to the tip of the leaves with the help of meter scale and their mean were calculate and expressed in cm.

### Number of leaves per plant

The fully opened and functional number of leaves per plant was counted and average was worked out at 30 days interval up to 90 days after germination.

### Root length (cm)

The length of root was taken from uprooted plants from the crown to the end of root and then average length was calculated and expressed in centimeter.

### Root Diameter (mm)

The diameter of root was measured with the help of called vernier calipers.

### Root weight (g)

After measuring the plant weight, the roots were detached and weighed separately to observe the root weight.

### Per cent dry matter of leaves

The leaves sample weighing 100 g were taken and cut into small pieces at harvest. After sun drying for 3 days, the samples were oven dried at 72-80 °C for 72 hours. Then with an electrical balance leaves were weighed. The dry matter content of leaves was calculated on percentage basis by using the following formula.

$$per\ cent\ dry\ matter\ of\ leaf \frac{dry\ weight\ of\ leaf}{fresh\ weight\ of\ leaf} \times 100$$

### Per cent dry matter of root

Immediately after harvest, the roots were cleaned thoroughly by washing with water. Then from several roots, a sample of 100 g was taken and made into small pieces. The small pieces were sun dried for 3 days, and then oven dried for 72 hours at 72-80 °C. Immediately after oven drying the dried root pieces were weighed, and the dry matter content of the root was calculated by the following formula:

$$per\ cent\ dry\ matter\ of\ root \frac{dry\ weight\ of\ root}{fresh\ weight\ of\ root} \times 100$$

**Yield per plot (kg)**

To find out the yield per plot, the five randomly selected plants from each plot were weighed together then the data was averaged for yield per plot in kg. and analysed statistically.

**Root yield per hectare**

This was obtained by converting the average weight of five roots into total yield per plot and thereafter converting into yield per hectare.

## Results and Discussion

The data pertaining to effect of different level of organic manures viz., FYM, Vermicompost, Panchagavya, Jiwamrit, Bijmarit and vermivash on growth and yield of carrot (*Daucus carrota* L.) are presented in table 1. The result for the growth and yield of carrot showed significant different for the various treatment applied soil application organic manures. However the maximum plant height at 30, 60 and 90 DAS (17.47, 36.72 and 52.63) was recorded for the treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya. Where as the minimum plant height (13.43, 31.04 and 42.40) was found in treatment O1 FYM @ 10 t $ha^{-1}$. However the maximum number of leaves per plant at 30, 60 and 90 DAS (4.25, 7.42 and 11.75) was recorded for the treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya . Where as the minimum number of leaves per plant at 30 DAS (3.16, 4.76 and 7.49) was found in treatment O1 FYM @ 10 t $ha^{-1}$. This result agrees with the finding of Rani and Malla Reddy (2007), Yadav *et al.* (2022), Kumawat *et al.* (2018) and Kushwah *et al.* (2019). The results obtained from the present investigation are presented in table 1. The combined effect of organic sources was found significantly influenced in terms of growth and yield parameters of carrot. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum fresh weight of leaves per plant (11.75). whereas minimum fresh weight of leaves per plant (7.49) was found in treatment O1 FYM @ 10 t $ha^{-1}$ was recorded with O1 FYM @ 10 t $ha^{-1}$. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum length of root per plant (25.17). whereas minimum length of root per plant (20.81) was found in treatment O1 FYM @ 10 t $ha^{-1}$ was recorded with O1 FYM @ 10 t $ha^{-1}$. This finding is an agreement with the result of Schuch *et al.* (1999) they reported that the root length of carrot varied with different amount of manure application. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum diameter (cm) of root per plant (4.66). Where as the minimum diameter (cm) of root per plant (3.26) was found in treatment O1 FYM @ 10 t $ha^{-1}$. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum fresh weight of root per plant (101.72). Where as the minimum fresh weight of root per plant (63.45) was found in treatment O1 FYM @ 10 t $ha^{-1}$. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum dry matter of leaves (%) (14.25). Where as the minimum dry matter of leaves (%) (9.25) was found in treatment O1 FYM @ 10 t $ha^{-1}$. These results due to the beneficial effect application of organic manure (vermicompost) might be attributed to the increased efficacy of micronutrients and supply of all the essential nutrients in a balanced amount owing to their control release coinciding with the stage of root growth (Kumar *et al.,* 2014). Similar findings have been reported by Sunandarani and Malareddy (2007) and Astha *et al.* (2021). Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum per cent of dry matter of roots (14.248). Where as the minimum per cent of dry matter of roots (6.901) was found in treatment O1 FYM @ 10 t $ha^{-1}$. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum gross yield of root per plot (kg) (40.69) was recorded for the treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya . Where as the minimum gross yield of root per plot (kg) (25.38) was found in treatment O1 FYM @ 10 t $ha^{-1}$. Application of treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya recorded significantly maximum gross yield of root (t $ha^{-1}$) (67.81) was recorded for the treatment O4 Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya . Where as the minimum Gross yield of root (t $ha^{-1}$) (42.30) was found in treatment O1 FYM @ 10 t $ha^{-1}$. The results were in accordance with the findings of Rani *et al.* (2016), Kumawat *et al.* (2018) and Kushwah *et al.* (2019).

## Conclusion

It is concluded from the present investigation that application of organic sources positively influenced growth and root yield of carrot. The experimental result revealed that the organic sources O4: Vermicompost @ 2.5 t $ha^{-1}$+ Panchagavya gave the highest growth and root yield of carrot.

**Table 1:** Studies on the effect of organic sources on growth and yield of carrot (*Daucus carrota* L.)

| Treatment Notation | Plant height (cm) | | | Number of leaves per plant | | | Fresh weight of leaves per plant | Length of root per plant | Diameter (cm) of root per plant | Fresh weight of root per plant | Dry matter of leaves (%) | Dry matter of roots (%) | Gross yield of root per plot (kg) | Gross yield of root (t ha$^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | | | | | | | | |
| O1 | 13.43 | 31.04 | 42.40 | 3.16 | 4.76 | 7.49 | 101.97 | 20.81 | 3.26 | 63.45 | 9.25 | 6.901 | 25.38 | 42.30 |
| O2 | 14.55 | 33.56 | 41.66 | 3.29 | 6.08 | 10.62 | 111.58 | 20.92 | 3.61 | 74.80 | 13.87 | 7.633 | 29.92 | 49.86 |
| O3 | 15.02 | 31.95 | 42.32 | 3.10 | 4.64 | 9.18 | 108.84 | 21.68 | 4.22 | 87.03 | 11.60 | 8.661 | 34.81 | 58.02 |
| O4 | 17.47 | 36.72 | 52.63 | 4.25 | 7.42 | 11.75 | 122.17 | 25.17 | 4.66 | 101.72 | 14.25 | 14.248 | 40.69 | 67.81 |
| O5 | 15.07 | 31.87 | 43.07 | 3.13 | 4.90 | 9.42 | 104.05 | 21.18 | 3.91 | 78.73 | 13.41 | 11.611 | 31.49 | 52.48 |
| O6 | 16.15 | 34.26 | 51.49 | 3.84 | 6.74 | 11.25 | 116.67 | 23.69 | 4.49 | 95.16 | 13.92 | 12.448 | 38.06 | 63.44 |
| F-Test | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| S.Em | 0.358 | 0.244 | 0.493 | 0.055 | 0.062 | 0.116 | 0.870 | 0.316 | 0.020 | 0.398 | 0.207 | 0.091 | 0.159 | 0.265 |
| C.D. at 0.5% | 1.022 | 0.695 | 0.1399 | 0.158 | 0.177 | 0.332 | 2.484 | 0.902 | 0.058 | 1.137 | 0.590 | 0.259 | 0.45 | 0.75 |

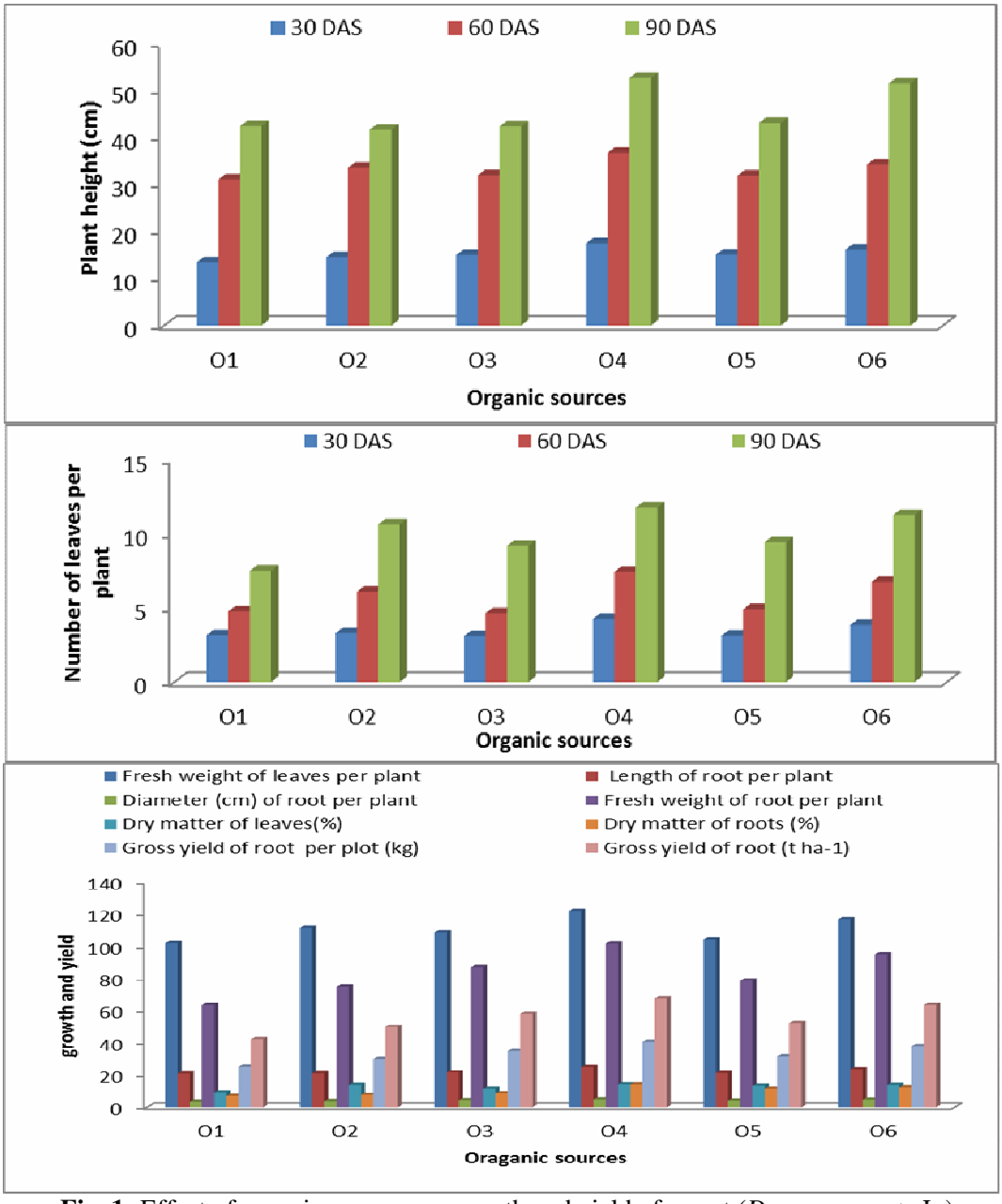


**Fig. 1:** Effect of organic sources on growth and yield of carrot (*Daucus carrota* L.)

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