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## A study on efficacy of organic and inorganic fertilizers on growth and yield of carrot (*Daucus carota* L.) var. Pusa Meghali under Dehradun valley condition

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### Abstract

The present investigation was conducted during 2016-2017 in the department of Horticulture, Doon (PG) College of Agriculture Science and Technology, Selaqui, Dehradun (UK). The experiment was laid out in RBD with 8 treatments and 3 replications viz. T<sub>1</sub>:100% FYM, T<sub>2</sub>: 100% poultry manure (PM), T<sub>3</sub>: 100% NPK, T<sub>4</sub>:100% FYM + 100% NPK, T<sub>5</sub>: 100% FYM + 100% PM, T<sub>6</sub>:100% FYM + 50% NPK, T<sub>7</sub>:100% FYM + 50% PM & T<sub>8</sub> Control. The highest growth and yield parameters was recorded in T<sub>5</sub> treatments and significantly the lowest was recorded in T<sub>8</sub> (Control). The result of the present investigation demonstrated that among different organic and inorganic fertilizers tried, FYM (100%) combined with poultry manure (100%) can be considered as the best treatment obtaining higher growth and root yield in carrot. Under organic cultivation of carrot, for obtaining maximum net returns, Poultry Manure (100%) may be used as an organic source of nutrient.

**Keywords:** FYM, fertilizers and poultry manure

### Introduction

Carrot (*Daucus carota* L.) from Family Apiaceae having chromosome no- 2n=18 is a well-known cool season root crop grown all over India. They are used for human consumption as well as for the forage and particularly for feeding horses. Carrot is taken as raw, cooked in curries, making pickles and sweetmeats. It contains 86% moisture, 0.9 g protein, 1.1 g minerals, carbohydrate and calcium per 100g of edible portion. Most of the benefits of carrot can be attributed to beta-carotene and fibre content. Furthermore, carrots are rich in vitamin C, vitamins K, vitamin B 8, pantothenic acid, folate, potassium iron, copper and manganese.

Organic fertilizers originate from both livestock waste and crop residues, with the nutrients in them being mineralised by soil microbes and slowly making them available to plants over a long period of time (Lampkin, 2000) [9]. Humus serves as an effective buffer regulating the balance between acid and base in the soil solution, i.e. soil pH (Naramabuye *et al.* 2007) [12]. Fertilizers are the indispensable for the production system of modern agriculture and play a vital role to increase the yield, provide others factors are not limiting. Humus added by organic fertilizers adsorbs large quantities of water and makes it available to plants during drought. This feature as well as the capacity to hold nutrients is important for sandy soils which remain very few nutrients and water (Scholl & Nieuwenhuis, 2004) [14]. Carrot depends on chemical fertilizers for optimal growth and high yields. NPK are the major macro nutrients that are necessary for the physicomorphology and biological development of plants.

In India, a very little work has been reported regarding the effect of different organic and inorganic in carrot particularly. This study would reveal the impact of the productivity potential of carrot to recommended the best possible and affordable for carrot cultivation by the common vegetable grower. With this background the present investigation was carried out with the following objectives to study the effect of organic and inorganic fertilizers on growth and yield of carrot.

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## Materials and Methods

A field experiment was conducted at Research Field, Department of Horticulture, DCAST, Dehradun (UK) during the year of 2016-17 with the view to study the effect of different levels of organic and inorganic fertilizers on growth and yield of carrot. cv. Pusa Meghali. The experiment was laid out in a Randomized Block Design with three replications and consisted of 08 treatments, namely T<sub>1</sub>:100% FYM, T<sub>2</sub>: 100% poultry manure (PM), T<sub>3</sub>: 100% NPK, T<sub>4</sub>:100% FYM + 100% NPK, T<sub>5</sub>: 100% FYM + 100% PM, T<sub>6</sub>:100% FYM + 50% NPK, T<sub>7</sub>:100% FYM + 50% PM & T<sub>8</sub> Control (water spray). The seeds were dibbled at a distance of 30 X 10 cm between rows and plants. All the recommended agronomic practices and crop husbandry were followed to raise a good crop. Five plants were selected randomly from each net plot to record the observation namely, Plant Height (cm), Root to shoot ratio, Root Length(cm), Root Diameter(cm) and Total root yield (t ha<sup>-1</sup>).The data recorded on different parameter during investigation were statically analysed as per the statistical methods described by (Panse and Sukhatme, 1985) [13].

## Result and Discussion

The findings of the investigation have been described and

explained with support of relevant research work published by earlier workers on the subject as follows:

The findings pertaining to growth parameters viz., plant height, and root to shoot ratio were observed at 30, 45 days after sowing and at the final harvesting stage. There was significant effect of organic manures, inorganic fertilizers and their combinations on all the growth parameters. Among the treatments, T<sub>5</sub> (100% FYM + 100% PM) recorded the maximum value of plant height (cm), during the different stages followed by T<sub>4</sub> (100% FYM + 100% NPK), T<sub>6</sub> (100% FYM + 50% NPK). While the minimum value of plant height was observed with T<sub>8</sub> (Control) at all the stages of crop growth. The increase in height of plant by the use of poultry manure with integration of NPK may be due to beneficial influence of nitrification inhibition properties of manure in the soil. Besides, it may also be due to rapid elongation and multiplication of cell in the presence of adequate quantity of nitrogen (Barman *et al.*, 2014) [4]. Similar results were reported by Bhattarai and Maharjan (2013) [5] in carrot and Mahokar *et al.* (2007) [10] and Kumar *et al.* (2014) [8] in radish. Maurya and Goswamy (1985) [11] also found significant increase in plant height of carrot with the application of higher N than its lower dose. Nitrogen being a major element has a profound effect on plant growth and development.

**Table 1:** Effect of Organic and Inorganic Fertilizers on Growth and Yield parameters of carrot cv. Pusa Meghali during 2016-17

S. No.	Treatments	Plant height (cm)	Root-shoot Ratio	Length of root (cm)	Diameter of root (cm)	Root yield (q/ha)
1	T <sub>1</sub> 100% FYM	32.90	1.41	10.12	3.17	21.01
2	T <sub>2</sub> 100% Poultry Manure	33.87	1.47	11.08	3.28	22.50
3	T <sub>3</sub> 100% NPK	35.65	1.50	14.23	3.44	23.29
4	T <sub>4</sub> 100% FYM + 100% NPK	38.92	1.89	16.70	3.68	25.37
5	T <sub>5</sub> 100% FYM + 100% Poultry Manure	39.71	2.09	17.17	3.77	25.65
6	T <sub>6</sub> 100% FYM + 50% NPK	38.41	1.56	16.12	3.59	24.72
7	T <sub>7</sub> 100% FYM + 50% Poultry Manure	36.20	1.54	15.08	3.47	23.88
8	T <sub>8</sub> Control	32.20	1.38	9.08	3.08	20.73
9	Sem±	0.16	0.07	1.10	0.07	0.08
10	C.D at 5%	2.12	0.19	2.36	0.17	1.42

Recommended dose of NPK: (120:80:100) kg/ha

The root to shoot ratio was significantly measured which was affected by the application of Poultry Manure, Farmyard Manure, Nitrogen, Phosphorus and Potassium. The result is presented in the given Table. The maximum root to shoot ratio 2.09 was recorded in T<sub>5</sub> with application of Poultry Manure and Farmyard Manure of 100%. The minimum ratio was recorded of 1.38 in the treatment T<sub>8</sub>. Similar findings have been reported by Uddain *et al.* (2010) [16] in radish. Among treatments, maximum root length and diameter was recorded in the treatment T<sub>5</sub>, which was followed by T<sub>4</sub> and T<sub>6</sub>. While, minimum root length and diameter was observed under without nutrient treatment T<sub>8</sub> (control). Because with the application of organic manures to the soil, physical condition of the soil will be improved by the better aggregation of soil particles These aggregates effects the soil fertility and often determine the retention and movement of water, diffusion of gases, growth and development of roots in the soil which contributed to the growth of the plant (Gupta, 1979 and Arulmozhan, 2002) [6]. In addition to this, application of organics helps the soil micro-organisms to produce polysaccharides and thus leads to better soil structure useful for root growth (Balasubramanian, 1972) [3]. The maximum root diameter recorded may be attributed to enhanced cell division and quick cell multiplication.

The total yield was significantly affected by the application of Poultry Manure, Farmyard Manure and NPK. Highest root yield (25.65 t ha<sup>-1</sup>) was recorded in T<sub>5</sub> with the application of Farmyard Manure (100%) + Poultry Manure (100%) followed by T<sub>4</sub> (25.37 t ha<sup>-1</sup>) with Farmyard Manure (100%) + NPK (100%) which were par but significantly superior to all other treatments. The lowest yield was recorded at T<sub>8</sub> (20.73 t ha<sup>-1</sup>). The root yield of carrot was also significantly affected with the application of organic manure especially Poultry Manure in combination with FYM. This increase in root yield might be due to the cumulative effect of all yield components viz. root length, root diameter fresh and dry weight of root with the treatment. The slow release of nutrients from organic manure and their better utilization by carrot throughout the growing period might have resulted in higher root yields of carrot.

Similar results of increased yields with neem cake were reported in radish (Sharma *et al.*, 1986) [15]. The uptake of N, P and K was more in the same treatment, implying that the increased root yield was due to outcome of increased nutrient uptake. The FYM might have enhanced the efficiency of applied N and P (Kumar, N. and Veeraragavathatham, 1999) [7]. It may be due to the fact that nitrogen is the major constituent of chlorophyll, proteins and amino acids, the synthesis of which is accelerated by the increased supply of

the nitrogen in soil (Arnon, 1943 and Verma *et al.*, 1974) [1-17].

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