"Response of NPK and Organic Manures on Growth, and Root, Yield of Carrot (*Daucus carota* L.) cv. Nantes"

ABSTRACT

A trial was conducted at the Horticulture Research Farm (HRF), Department of Horticulture, Naini Agricultural Institute, SHUATS ,Prayagraj , Uttar Pradesh during winter 2022 to study the "**Response of NPK and Organic Manures on Growth and Root, Yield of Carrot (*Daucus carota* L.) cv. Nantes**". Results revealed that treatment T_2 100% NPK emerged as superior over all other treatment combination in terms of Plant height 59.05 cm, Fresh weight of leaves per plant 137.18, Root yield per plot 4.30 kg, Yield 426.40 quintal/ha^{-1} T_3 75%NPK + FYM number of leaves 19.88,T_5 75% NPK + PM Fresh weight of plant 132.04 gm, Length of root 23.75 cm, Diameter of root 5.13 cm T_7 50% NPK + VC 116.98 gm Showed higher B:C ratio (5.67) compared with the other treatments under Prayagraj Argo-Climatic conditions.

***Keywords*:** NPK; Vermicompost; Farm Yard Manure; Poultry manure, Carrot.

1. INTRODUCTION

The root crop, Carrot (*Daucus carota* L.) is an important one. The carrot gets its namefrom the French word **"Carrotte"**. Which comes from the *latin*word **"*Carota*"** (**Singh andBahadur, 2015**). The carrot is originated in Asia and belonging to the family Umbelliferae,genus*Daucus*andspecies*carota*withchromosomeno2n=18(X=9).Thecarrotisanannual (rootproduction)andbiennial(seedproduction).Initiallytherootswerelongandthinandeitherpurple or yellow in colour. The stem are small plate like structure, leaves are rosette of leavesarise from the stem. The inflorescence of carrot is 'Compound Umbel' and the edible part ofcarrot is modified root (Conical form) which develops in soil. The root type is tap, root lengthvaryingfrom15-35cm.botanically"modifiedroot"(Conicalform)whichdevelopedinthesoil.Carrothasverticalrootsyst em.Thefruittypeofcarrotisschizocarpandseedarespinyandonegramseed have500-1000 seed(**SinghandBahadur, 2015**). Carrot is cross pollinated (allogamous) in nature and the causes ofcross pollination in carrot is due to potandry (maturation of male part (stamen) before thanfemale part (pistil). in carrot highTheinbreeding depression is found (**Singh B.D., 2017**) of theyellowform. Theoptimumtemperatureforseedgerminationis20-30^{0}C,forfoliageandrootgrowthis16-21^{o}C, and for pigmentation (anthocyanin and carotene) is 16-25^{0}C. Plant performs well insandyloamsoilwithap^{H}rangeof6.5to7.5.Nutrientcompositionofcarrotrootismoisture86g,protein0. 9g,carbohydrate10.6g,fat0.2g, fibre1.2g,energy48kilocalorie,mineral1.1g,iron 2.2 mg, carotene 1890 mg, thiamine 0.04 mg, riboflavin 0.02 mg, niacin 0.5 mg, vitamin-C 3 mg, vitamin-A-3150 IU, magnicium-14 mg, sulpher-27 mg, sodium-35.6mg, potassium-108mg, folic acid 15 mg, calcium 80 mg and phosphorus 30 mg per 100 g of edible portion(**Bose *et al.*, 2000**). Green carrot leaves are also highly nutritive rich in protein, minerals andvitamins. Carrot roots contain sucrose 10 times higher than that of glucose or fructose. It alsocontains abundantamounts of nutrients suchas protein,carbohydrates,fibre and sodium(**Ahmad *et al.*, 2014**). Poultry manure one of the components in integrated nutrient management highly used in production of vegetable crops. Carrot is a most important crop for healthy diet so it's needed to be available in high quality (**Radices *et al.*, 2002**). Carrot is a heavy feeder of nutrients and is very sensitive to nutrient and soil moisture (**Sunanadarani and Mallareddy, 2007**). One of the practical ways to boost the yield by the use of organic manures in conjunction with chemical fertilizers. Since root vegetables are an exhaustive crop therefore, use of organic manures alone may not be able to supply the desired amount of nutrients to the crop. However, it has been observed that use of

organic manures with inorganic fertilizers play vital role and hold great promise in pushing up the production of root vegetables.

2. MATERIALS AND METHODS

An Experiment on Carrot was conducted during the winter season of November 2022 to April 2023, in Horticultural Research Farm (HRF), Department of Horticulture, Naini Agricultural Institute, Sam HigginbottomUniversity of Agriculture, Technology & Sciences, Prayagraj (U.P.) India. The results ofthe investigation regarding the performance of organic manures in the 11 treatments i.e. T_1(Control),T_2 (100%NPK), T_3 (75%NPK+FYM), T_4 (75%NPK+VC) T_5(75%NPK+PM), T_6 (50 NPK + FYM), T_7 (50% NPK + VC), T_8 (50% NPK + FYM), T_9 (25% + FYM), T_{10} (25% NPK + VC), T_{11} (25% NPK + PM). To find out the best performance in terms of growth, root and yield were evaluated in Randomized Block Design with three replications. The observations were recorded on five randomly selected plants from each treatment for plant height (cm), number of leaves per plant, length of leaves (cm), fresh weight of leaves per plant (gm), fresh weight of plant (gm), Length of root (cm), Fresh weight of root (gm), Diameter of root (cm), Root yield per plot (kg), Yield q/ha in carrot. The data recorded during the course of investigation were analyzed by analysis of variance (ANOVA) using the statistical program and the significance differences between the mean were tested against the critical difference at 5% probability level.

Table-1: Response of NPK and Organic Manures on Growth and Root, Yield of Carrot.

Treatment	Plant height,	No. of leaves /plant	Fresh weight of leaves per plant (gm)	Fresh weight of plant (gm)	Length of root (cm)	Fresh weight of root (gm)	Diameter of root (cm)	Root yield per plot (kg)	Yield q/ha
T_1 Control	48.52	12.69	112.53	90.81	15.73	105.64	3.77	2.03	388.10
T_2 100%NPK	55.05	16.55	137.18	115.32	18.01	116.07	3.90	4.30	426.40
T_3 75%NPK+FYM	52.58	19.88	129.65	112.16	16.38	111.78	4.24	3.21	410.70
T_4 75%NPK+VC	41.74	15.54	130.80	123.60	19.47	113.98	3.39	2.98	418.80
T_5 75%NPK+PM	50.18	16.88	122.27	132.04	23.75	109.62	5.13	3.26	402.70
T_6 50%NPK+FYM	45.85	16.70	118.55	128.09	20.28	108.05	4.33	4.10	397.00
T_7 50%NPK+VC	47.18	17.62	128.32	111.60	21.00	116.98	3.90	4.12	411.80
T_8 50%NPK+PM	41.32	15.40	125.20	108.47	19.52	114.79	3.87	3.40	421.70
T_9 25%NPK+FYM	51.04	14.72	114.03	101.86	22.39	113.98	4.22	3.44	418.80
T_{10} 25%NPK+VC	48.22	13.54	125.90	108.56	20.37	109.62	3.39	3.57	402.70
T_{11} 25%NPK+PM	50.93	14.69	124.04	111.35	21.91	112.45	4.62	3.35	415.00
F Value	S	NS	S	NS	S	NS	NS	S	S
SE (d)	1.20	1.19	8.78	12.97	1.30	3.42	0.60	0.17	0.13
CV	3.01	9.94	9.51	8.80	2.71	3.73	18.15	16.84	0.80
CD 5%	2.50	2.49	18.32	27.06	2.99	7.13	1.26	0.35	1.16

3. RESULT AND DISCUSSION

3.1 Plant height (cm)

The maximum plant height per plant (59.05 cm) was observed in T_2 (100%NPK) followed by T_3 75%NPK+FYM (52.58) and minimum plant height T_1 control (48.52 cm). The maximum plant height was observed in treatment T_2. It is due to the presence of Nitrogen, Phosphorus and Potash which fulfilled the nutrient requirement in carrot plant. Nitrogen effected the vegetative growth of plant. Hence the maximum plant height was observed in treatment T_2. Similar report also has been given by (**Karmakar *et al.*, 2020**). Vermicompost is a tea like structure organic fertilizer which is more nutrient rich than the other organic fertilizers and might have improved the soil porosity, structure, water holding capacity and supplied other plant growth promoting substances and hence vermicompost significantly increased plant height. result was reported by other researchers. **(Fallah *et al.*, 2020).**

3.2 Number of leaves per plant

The maximum plant height per plant (19.88 cm) was observed in T_3 (75%NPK+FYM) followed by T_7 50%NPK+VC (17.62 cm) and minimum plant height T_1 control (12.69 cm). The results showed that the integrated mineral and organic manure increased the number of leaves by providing macro and micro nutrient to plants. The increase in the number of is attributed to the use of variant nature of the organic manures. The obtained results are in accordance to previously reported literature **(Singh *et al.*, 2007).** Similar report also has been given by**(Kirad*et al.*, 2010).**

3.3 Fresh weight of leaves per plant (gm)

The data projected against different treatments of NPK and organic manures on carrot. It clearly indicates the all the treatment increases the Fresh weight of leaves plant^{-1} significantly over the control. Statistical analysis revealed that treatment maximum Fresh weight of leaves per plant(137.13 gm) was observed by T_2 100%NPK followed by T6 50% NPK+FYM (118.55 gm) and minimum fresh weight of leaves per plant T_1 control (112.53gm).The results indicated that incorporation of full dose of among fertilized treatments. The shortest fresh weight of perleaves plant as well as NPK supplied the macro and micro nutrients to plants, The results revealed that like other production. Commercial fertilizers were more productive parameters,root length of carrot was considerably due to easily available nutrients as

compared to organic increased with the incorporation of full dose of NPK fertilizer. The increment in fresh weight of leaves per plant due to inorganic fertilizer used. Similar report also has been given by **(Solaimalai*et al.*, 2001).**

3.4 Fresh weight of plant (gm)

Response of NPK and organic manures on fresh weight of plant (g) at all the stages. Among the nutrient levels, maximum fresh weight of plant (128.09gm) observe redby T_5 75%NPK+PM at harvesting stage, respectively under the nutrient level. It was followed by T_8 50%NPK+PM (108.47gm) While minimum fresh weight of T_1 control (90.81gm).The results indicated that incorporation of full dose of among fertilized treatments.The shortest fresh weight of per leaves plant as well as NPK supplied the macro and micro nutrients to plants, The results revealed that like other production.Commercial fertilizers were more productive parameters, root length of carrot was considerably due to easily available nutrients as compared to organic increased with the incorporation of full dose of NPK fertilizer. The increment in fresh weight of leaves per plant due to inorganic fertilizer used. Similar report also has been given by **(Solaimalai*et al.*, 2001).**

3.5 Length of root (cm)

Significant influence of response of NPK and organic manures on length of root in carrot. Length of root in carrot was significantly affected with different treatments. Maximum length of root (23.75 cm) was observed under the treatment T_4 (75%NPK+PM). It was significantly superior over other treatments. While minimum length of root i.e. (15.73cm) was observed under the treatment T_1 (control) after harvesting. The results of this study showed that the combined use of organic manure vermicompost and NPK fertilizers substantially increased the root weight of carrot, which might be attributed to the well solubilization of plant food, contributing to the increased nutrient uptake. These results suggested that combination of organic manures and mineral fertilizers with appropriate ratios can significantly increase the root weight. (**Vijaya Prabhakar *et al.*, 2020**).

3.6 Fresh weight of root (gm)

Influence of NPK and organic manures on fresh weight of root in carrot. Fresh weight of root in carrot was significantly affected with different nutrient levels. Maximum fresh weight of root (116.98 g) was noted under the nutrient level T_7 (50%NPK+VC) followed by (109.48) in T_5 (75%NPK+PM). Minimum fresh weight of root (105.64 g) was observed under the T_1 (control).The result exposed that amongst various combinations, NPK + VM surpassed rest of the treatments in enhancing fresh weight of root. The NPK incorporation with manures significantly increased the fresh wight of root, which might be attributed to the plant nutrient solubilization leading to increased macro and micronutrients uptake. The advantage of the use of mixture of organic and mineral fertilizers is it increase the efficiency of the fertilizers, minimized the nutrient loss and enhanced the fresh weight of root of carrot (**Vijaya Prabhakar *et al.*, 2020**).

3.7 Diameter of root (cm)

Influence of organic manures, inorganic fertilizers and their combinations on diameter of root in carrot. Diameter of root in carrot was significantly affected with different treatments. Maximum diameter of root (5.13 cm) was observed under the treatment T_5 (75%NPK+PM) which was followed by (4.24cm) in T_3 (75%NPK+FYM), Minimum diameter of root (3.77 cm) was recorded under the treatment T_1 (control). The study showed that the combined use of organic manures together with NPK substantially increased the carrot root diameter. Addition of PM proved superior amongst treatments, while FYM was least effective that might be due to lower nutrient concentrations in FYM as well as its slow release and delayed decomposition. From the obtained results it was concluded that the integrated nutrients increased the root diameter (**Toor *et al.*, 2020**).

3.8 Root yield per plot(kg)

The mean performance of root yield plot^{-1} of different treatments of NPK and organic manure has been presented inTable 1. The yield root plot^{-1} was significantly increased due todifferent treatment of NPK and organic manures. The highest root yield plot^{-1} wasrecorded under the T_2 (100% NPK)(4.30 kg) followed by T6 50%NPK+FYM (4.10kg). However, the lowest root yield plot^{-1} was observed in the treatment T_1 control (2.03kg). The result exposedthat

amongst various combinations, NPK surpassed rest of the treatments in enhancing root yield. The NPK increased the root yield, which might be attributed to the plant nutrient solubilization leading to increased macro and micronutrients uptake. The advantage of the use of inorganic fertilizers it increases the efficiency of the fertilizers, minimized the nutrient loss and enhanced the yield of carrot. (**Vijaya Prabhakar *et al.*, 2020**).

3.9 Root yield (q/ha^{-1})

Response of NPK and organic manures on root yield in carrot. Treatments showed significant influence on root yield (qha^{-1}) in carrot. Highest root yield (426.40 qha^{-1}) was recorded under the treatment T_2 100%NPK which was significantly superior over all other treatments under study. While, Lowest root yield of (388.10qha^{-1}) was observed under the treatment T_1 (control). The result exposed that amongst various combinations, NPK surpassed rest of the treatments in enhancing root yield. The NPK increased the root yield, which might be attributed to the plant nutrient solubilization leading to increased macro and micronutrients uptake. The advantage of the use of inorganic fertilizers it increases the efficiency of the fertilizers, minimized the nutrient loss and enhanced the yield of carrot (**Vijaya prabhakar*et al.*, 2020**).

4. CONCLUSION

Based on the above result and discussion, the treatment T_2 100% NPK was found superior and best in the term of growth, yield parameters. The treatment T_2 found maximum in net return (351200) and higher Benefit cost ratio (5.67).

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