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RESEARCH ARTICLE

Effect of organic manures and micronutrients on seed production of carrot (*Daucus carota L.*)

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Abstract: The experiment was conducted during 2021-22 in *rabi* season. The field study to assess the effects of organic manures and micronutrients on seed production of carrot (*Daucus carota* L.) cv. Pusa Rudhira was carried out at Horticulture farm, SKNCOA, Jobner, Rajasthan, India. The study revealed that the application of Poultry manure @ 2.5 t/ha significantly increased the plant height (41.95 cm), Number of shoots per plant (12.71), chlorophyll content (1.11 mg/100g), days to 50% umbel initiation (134.50 days) , number of umbels per plant (17.30), number of seed per umbel (1177.35), diameter of umbel (16.71 cm), seed weight per plant (8.43 g), days to seed maturity (185.27 minimum days) and seed yield per hectare (6.24 q/ha). Similarly, the spray of $ZnSO_4$ @ 0.5% to the carrot crop significantly increased the plant height (40.60 cm), number of shoots per plant (12.49), chlorophyll content (1.07 mg/100g), days to 50% umbel initiation (133.51 days), number of umbels per plant (16.30), number of seed per umbel (1175.30), diameter of umbel (16.10 cm), seed weight per plant (8.39 g), days to seed maturity (184.12 days) and seed yield per hectare (6.21 q/ha)

Keywords: carrot, organic manures, micronutrients, seed production

1 Introduction

Carrot (*Daucus carota* L.) is a most important vegetables of Apiaceae family having chromosome number 2n = 18 (x= 9). It is originated from South West Asia. Carrot (*Daucus carota* L.) is a most important vegetables of Apiaceae family having chromosome number 2n = 18 (x= 9). It is originated from South West Asia. Carrot is an annual crop grown for root production and biennial for seed production. The inflorescence of carrot is 'compound Umbel' and the edible part of carrot is modified root (conical form) which develop in soil. Fruit type of carrot is schizocarp and seed are spiny and in 1 gm seed having 500-1000 crop of carrot [1]. Carrot seeds are used as fragrances, stimulants and digestive agents. They help with kidney diseases or kidney related disease, edema, nerve tension, aphrodisiacs, and uterine pain.

In carrot, for seed production two methods may be employed *viz.* (i) seed to seed method and (ii) root to seed method. In order to maintain high genetic purity and to obtain high vigour and viability of seed root to seed method is followed. This technique allows selecting true to type and healthy roots for replanting of stecklings. But farmer's quite often use seed for planting produced from seed-to-seed method where the rate of genetic deterioration is faster due to no scope for selection of healthy true to type roots.

Farm manure is a decomposed mixture of bovine manure and urine that contains straw and bedding as bedding and leftovers from cattle feed. FYM helps improve and maintain soil fertility. Vermicompost is a nutrient- rich, microbiologically- active organic amendments that results from the interactions between earthworms and microorganisms during the breakdown of organic matter. Poultry manure as an organic matter is especially important because it regulates and improves soil fertility and contains all major nutrients and most micronutrients [2].

Boron is the essential micro nutrients required for dividing tissue development and glucose metabolism [3]. Zinc affects many plant functions such as hormonal movement, active salt intake, flowering and fruiting processes, pollen germination, carbohydrate and nitrogen metabolism, and plant water balance. Iron is essential for chlorophyll synthesis. It acts as an oxygen carrier and is a component of a particular enzyme and protein. It plays an important role in the synthesis of carotenoids in carrots.

2 Materials and methods

The experiment was conducted at Horticulture Farm, S.K.N. College of Agriculture, Jobner (Jaipur) during *Rabi* season 2021-2022. In Rajasthan, this region falls under agro-climatic zone-

IIIA (Semi-Arid Eastern Plains). The experiment was laid out in Factorial Randomized Block Design with four treatments of organic manures (control, FYM @ 10 t/ha, vermicompost @ 3.5 t/ha and poultry manure @ 2.5 t/ha) and foliar spray of micronutrients (control, $FeSO_4$ @ 0.5 percent, Borax @ 0.5 percent and $ZnSO_4$ @ 0.5 percent). The crop geometry was kept at 50 × 30 cm and all the required cultural operations were followed to raise the good crop. Five plants were tagged in each plot to record observations. Observations were recorded plant height (cm), number of shoots per plant, chlorophyll content (mg/100g), days to 50 % umbel initiation, number of umbels per plant, number of seed per umbel, diameter of umbel, seed weight per plant, days to seed maturity and seed yield per hectare (q/ha) The data obtained from the trial were subjected to statistical analysis which are presented in tabular form.

3 Results and discussion

3.1 Effect of organic manures

3.1.1 Growth attributes

In the current study, that application of poultry manure @ 2.5 t/ha significantly higher than control and treatment O_1 except vermicompost @ 3.5 t/ha is statistically at par with it resulted in significantly increased growth attributing characters, *viz.*, plant height (41.95cm), number of shoots per plant(12.71), chlorophyll content (1.11 mg/100g), days to 50% umbel initiation (134.50 minimum days significant).

This could be attributed to the improvement in soil structure and enhanced nutrient and moisture availability and uptake that may have favoured plant growth due to application of organic manure. The poultry manure showed significantly higher leaf area which could be due to increased cell division and elongation resulting in increased leaf expansion, more number of leaves due to beneficial influence of bio-fertilizers which release growth promoting substances and enhances the availability of nitrogen [4]. Duncan (2005) [5] noted that chicken manure was an organic fertiliser that contained all the macronutrients and most of the micronutrients needed for crop growth. Highest length of leaves due to organic manure provide the micronutrients such as zinc, copper, iron and manganese etc. in the adequate amount to the plant [6]. Similar findings have been reported by Kumar *et al.* (2014)) [7] in radish.

3.1.2 Seed yield attributes

Application of increasing doses of poultry manure 2.5 t/ha significantly increased number of umbels per plant (17.30), number of seed per umbel(1177.35), Diameter of umbel per plant (16.71 cm), seed weight per plant(8.43 g), days to seed maturity(185.27 minimum days significant) and seed yield per hectare (6.24 q/ha) of carrot. Enhanced vegetative growth in terms of number of branches per plant provide more sites for the translocation of photosynthates and ultimately resulted in increased number of yield attributes. The beneficial effect of poultry manure on yield attributes may probably due to enhanced supply of macro as well as micronutrients during entire growing season which led to higher assimilation of food and its subsequent partitioning in sink. The availability and optimum supply of nutrients of plants favourably influenced the flowering and seed formation, which ultimately increased the umbel per plant and seed per umbel. The result was in conformity with Yadav *et al.* (2007) [8] in mungbean. The significant differences in seed yield under the influences of poultry manure was largely a function of improved growth and the consequent increase in different yield attributes as mentioned above. Further, poultry manure increases the activities of N fixing bacteria and increase rate of humification. Humid acid in poultry manure enhanced the availability of both native and added micro nutrients in soil and thus plant growth, yield attributes and yield. As seed yield of a crop is function of yield attributes, such as higher number of umbels per plant seed per umbel due to poultry manure increased seed yield of carrot.

3.2 Effect of micronutrients

3.2.1 Growth attributes

The results of the present investigation revealed that the response of micronutrients on growth attributes *viz.*, plant height (40.60 cm), number of shoots per plant (12.49), chlorophyll content (1.07 mg/100g), days to 50% umbel initiation(133.51 days) were significantly increased in the treatment M_3 ($ZnSO_4$ @ 0.5%).

Zinc is essential micronutrients which play a vital role in various enzymatic and physiological activities such as protein metabolism, gene expression, structural and functional integrity of bio membranes and photosynthetic carbon metabolism [9]. It also regulates the auxin concentration in plants and is an essential component of enzymes *viz.* Alcohol dehydrogenase, carbonic anhydrase, super oxide dismutase which are needed for root development and increasing the absorption of

CO_2 per leaf area unit and thus increasing the chlorophyll content and photosynthesis. Similar findings have also been reported by Marschner (1995) [10] and Sharma (2002) [11].

3.2.2 Seed yield attributes

The significantly enhanced number of umbels per plant (16.30), number of seed per umbel (1175.30), diameter of umbel per plant (16.10 cm), seed weight per plant(8.39 g), days to seed maturity(184.12 days) and seed yield per hectare (6.21 q/ha), were observed with the foliar application of different micronutrients. The application of $ZnSO_4$ @ 0.5 percent gave significantly maximum increase in seed yield and yield attributes of carrot over control.

The significant effect of zinc application on these yield attributes may be ascribed to catalytic or stimulatory effect of zinc on most of the physiological and metabolic processes of the plant. Zinc also acts as a metal activator and is an essential component of enzymes such as proteinase and peptidase which are responsible for assimilation of nitrogen. It also helps in chlorophyll formation and plays an important role in nitrogen metabolism. There by resulting in to increased uptake of nitrogen by the plant. Zinc has also been reported to play an important role in regulating the auxin concentration in plant. Beside this zinc also enhances the absorption of essential elements by increasing the cation exchange capacity of root. Thus, the application of zinc in a soil, efficient in zinc content, improved the overall growth and development of plant. These results are in close conformity with Yadav (1990) [12] who reported significant increase in yield attributing character and yield of carrot due to application of zinc. The increase in these yield attributes and yield due to application of zinc were also reported by Maliwal *et al.* (1985) [13], Jat (1990) [14], Sharma (1992) [15], Kalidasu (2008), Sharangi *et al.* (2009) [16] and Dwivedi *et al.* (2001) [17] in different crops.

Table 1 Effect of organic manures and micronutrients on growth attributes of carrot

Treatments	Plant height (cm)	Number of shoots per plant	Chlorophyll content (mg/100g)	Days to 50% umbel initiation
Organic manures				
O_0- Control – no manure	30.79	9.76	0.86	158.98
O_1- Farm yard manure (10t/ha)	38.84	11.35	0.95	150.45
O_2- Vermicompost (3.5 t/ha)	41.01	12.48	1.06	136.40
O_3- Poultry manure (2.5 t/ha)	41.95	12.71	1.11	134.50
SEm±	0.67	0.22	0.02	2.49
CD (P = 0.05)	1.93	0.64	0.05	7.12
Foliar spray of micronutrients at 45 DAS				
M_0- Control – no spray	34.87	10.30	0.89	160.03
M_1- $FeSO_4$ @ 0.5 %	39.68	12.14	1.06	151.30
M_2- borax @ 0.5 %	37.44	11.36	0.96	135.49
M_3- $ZnSO_4$ @ 0.5 %	40.60	12.49	1.07	133.51
SEm±	0.67	0.22	0.02	2.49
CD (P = 0.05)	1.93	0.64	0.05	7.12

Table 2 Effect of organic manures and micronutrients on seed yield attributes of carrot

Treatments	Number of umbels per plant	Number of seed per umbel	Diameter of umbel (cm)	Seed weight per plant (g)	Days to seed maturity	Seed yield (q/ha)
Organic manures						
O_0- Control – no manure	10.50	862.26	10.33	5.50	210.19	4.07
O_1- Farm yard manure (10t/ha)	12.10	922.34	14.83	7.14	201.19	5.29
O_2- Vermicompost (3.5 t/ha)	16.70	1133.68	15.99	8.17	187.27	6.05
O_3- Poultry manure (2.5 t/ha)	17.30	1177.35	16.71	8.43	185.27	6.24
SEm±	0.25	18.30	0.26	0.13	3.37	0.10
CD (P = 0.05)	0.71	52.40	0.76	0.38	9.64	0.28
Foliar spray of micronutrients at 45 DAS						
M_0- Control – no spray	11.50	865.46	11.23	5.81	211.28	4.30
M_1- $FeSO_4$ @ 0.5 %	13.20	924.37	15.02	6.88	202.20	5.10
M_2- borax @ 0.5 %	15.60	1130.50	15.52	8.16	186.32	6.04
M_3- $ZnSO_4$ @ 0.5 %	16.30	1175.30	16.10	8.39	184.12	6.21
SEm±	0.25	18.30	0.26	0.13	3.37	0.10
CD (P = 0.05)	0.71	52.40	0.76	0.38	9.64	0.28

4 Conclusion

On the basis of one year experiment results, it may be concluded that the treatment O_3 (Poultry manure @ 2.5 t /ha) was found significantly better in terms of seed yield. The treatment

combination O_3M_3 (poultry manure @ 2.5 t/ha and $ZnSO_4$ @ 0.5%) was better in terms of seed yield (7.17 q/ha).

References

[1] Singh KP and Bahadur A. Cultivation of carrot, production and improvement of vegetables. Kalyani Publication New Delhi, 2015, **2**: 386-396.

[2] Warman PR. The effect of fertilizer, chicken manure and dairy manure on Timothy yield, tissue composition and soil fertility. Agricultural Wastes, 1986, **18**: 289-298. https://doi.org/10.1016/0141-4607(86)90074-0

[3] Siddiky MA, Halder NK, Ahammad KU, *et al*. Response of brinjal to zinc and boron fertilization. International Journal of sustainable Agriculture Technology, 2007, **3**: 40-45.

[4] Mog B. Effect of organics and biofertilizers on productivity potential in carrot (Daucus carota L.) (M.Sc. Agric. Thesis in Crop Physiology). Department of Crop Physiology College of Agriculture, Dharwad University of Agricultural Sciences, Dharwad, India, 2007.

[5] Duncan J. Composting chicken manure WSU cooperative extension King Country Master Gardener and cooperative extension livestock advisor, 2005, pp. 255.

[6] Bhattarai BP and Maharjan A. Effect of organic nutrient management on the growth and yield of carrot (Daucus carota L.) and soil fertility status. Nepalese Journal of Agriculture Science, 2013, **11**: 16-25.

[7] Kumar S, Maji S, Kumar S, *et al*. Efficacy of organic manures on growth and yield of radish (Raphanus sativus L.) cv. Japanese White, International Journal of Plant Science, 2014, **9**(1): 57-60.

[8] Yadav AK, Varghese K and Abraham T. Response of biofertilizers, poultry manure and different levels of phosphorus on nodulation and yield of green gram (Vigna radiata L.). Agricultural Science Digest, 2007, **27**(3): 213-215.

[9] Catmak I. Possible role of zinc in protecting plants cells from damage by reactive oxyzen species. New Pathologist, 2000, **146**: 185-205. https://doi.org/10.1046/j.1469-8137.2000.00630.x

[10] Marschner H. Functions of mineral nutrients: micronutrients. In: Mineral Nutrition of Higher Plants. 2nd Ed., Academic Press, London, 1995, 313-404. https://doi.org/10.1016/B978-012473542-2/50011-0

[11] Sharma MP, Singh A and Gupta JP. Sulphur status and response of onion to applied sulphur in soils of Jammu district. Journal of Agriculture Science, 2002, **72**: 26-28.

[12] Yadav LN. Response of pearlmillet varieties to varying levels of phosphorus and zinc a loamy sand soil. M.Sc. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 1990.

[13] Maliwal PC, Manohar SS and Dhaka SS. Response of pearlmillet (Pennisetum americanum L.) to different levels of phosphorus zinc and farm yard manure. Indian Journal of Agronomy, 1985, **30**: 314-317.

[14] Jat PC. Effect of phosphorus and zinc on fodder production of bajra, M.Sc. (Ag.) Thesis Rajasthan Agricultural University, Bikaner, 1990.

[15] Sharma RA. Influence of integrated fertility management on productivity and water use efficiency of rainfed soyabean, Crop Research, 1992, 52-58.

[16] Sharangi AB, Pariari A, Chatterjee R, *et al*. Response of boron and zinc on growth and seed yield of fenal. Dept. of spices and plantation crops, faculty of Horticuture, Bidhan Chandra Karshi Viswavidyalaya, Mohanpur, West Bengal. Journal of Intracademicia, 2009, **6**: 472-475.

[17] Dwivedi SK, Singh RS and Dwivedi KN. Effect of sulphur and zinc on yield and nutrient content in maize. Annals of Plant and Soil Research, 2001, **3**: 155-157.