Eco. Env. & Cons. 28 (4) : 2022; pp. (1784-1787)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2022.v28i04.017

Comparative studies on the effect of certain biofertilizers on growth, yield and quality of carrot (*Daucus carota* L.) under Punjab conditions

Annapareddy Sharmila[1], Avinash Kumar[1], Rajkumari Asha Devi[1]*, Rupmalin Kropi[1] and Lakshmi Narayanan[1]

School of Agriculture, Lovely Professional University, Jalandhar 144 411, Punjab, India

(Received 7 March, 2022; Accepted 1 May, 2022)

ABSTRACT

The investigation entitled "Comparative studies on the effect of certain biofertilizers on growth, yield and quality of carrot (*Daucus carota L.*) under Punjab conditions" was carried out at vegetable research farm, Lovely Professional University, Phagwara, Punjab during Rabi 2021-2022. The experimental design adopted was two factorial RBD with three replications. The first factor was biofertilizers and second factor, carrot cv. Country Red and Lalima. The experiment included 8 treatment combinations viz. *Azospirillum*+50% RDF, PSB+50%RDF, VAM+50% RDF, *Azospirillum*+PSB+50% RDF, *Azospirillum*+VAM+50% RDF, PSB +VAM+50% RDF, Azospirillum+VAM+PSB+50%RDF, Control 100% RDF. Among the interaction effects the combination of 50% RDF+ PSB + *Azospirillum* + VAM recorded highest values in terms of growth characters viz., plant height (87.82 cm), number of leaves (19.74), fresh and dry weight of root (124.91 g and 4.72 g, respectively) and yield characters viz., root length (27.33 cm), yield per plot (5.82 kg/ plot) and yield per hectare (194 q/ha), and quality characters viz. carotene content (47.39 mg), total soluble solids showed better performance with application of *Azospirillum* and 50%RDF and on other hand ascorbic acid found superior in the combination (*Azospirillum* + VAM + 50% RDF), respectively.

Key words: *Carrot, Biofertilizers, Growth, Yield, Quality, Economics, Parameters.*

Introduction

Vegetables are recognized as an important adjunct for the maintenance of good health and to provide nutritional security. They play a key role in providing valuable vitamins, minerals, carbohydrates, proteins and roughages. The daily requirement of an individual for a balanced diet can be met very well consumption of 125 g leafy vegetables, 100 g root and tuber vegetables, along with 75 g other vegetables per day (Hazra and Som, 1999). Among the root vegetables, carrot (*Daucus carota* L.) is one of the important members.

Carrot (*Daucus carota* L.), a member of Apiaceae family with chromosome number (2n=2x=18) is a biennial crop. Its nomenclature was done by Linnaeusin1753as

Daucus carota in his publishedbook" Species planetarium". There are basically two types of carrot: European and Asiatic type. Later group yields higher, rich in anthocyanins but poor in quality. European varieties on the other hand are rich in carotene content, have blunt ends and uniform core and cortex

It is rich in vitamin-C, carotenoids, flavonoids, phenols content, which are thereby responsible for

good health and nutrition. They have a characteristic flavor due to the presence of terpenoids and polyacetylenes. Carotenoids and anthocyanin aremajor antioxidants present in it. Carotenoids (Yellow, orange), the mostly cultivated orange variety contain both alpha, betacarotene and rich in vitamin-A. The carotene content is more at cortical region compared to core. It has many properties like anti-fungal, anti-bacterial, anti-diabetic, cholesterol, anti-inflammation etc. (Vithwel *et al.,* 2013). It can be consumed both as raw as well as cooked, and they can also be processed into a variety of products like as salad, halwa, kheer, powder, juice, oil, puree, and so on.

Generally, it is grown in both cool and warm seasons, with temperatures ranging from 16 °C to 20 °C. Best temperature for color development is 15 °C-20 °C. When the temperature exceeds 30 °C, the roots may become light in colour and have a low quantity of carotene. The ideal soil for optimum growth is sandy loam soil with a pH of 6- 7. The recommended seed rate is 4 kg per acre. With the application of biofertilizers to the soil results in enhancement of soil health and improvement in the quality characters of the carrot crop.

A bio-fertilizer is a microbial inoculant which have active or dormant microorganisms such as bacteria, fungus, antinomycetes, and algae which helps in fixing atmospheric nitrogen, mobilize soil nutrients, and secrete growth-promoting chemicals. It influence on soil fertility has been studied by scientists and grouped into N-fixing biofertilizers, P-solubilizing/mobilizing biofertilizers, composting accelerators, and plant-growth-promoting rhizobacteria It helps in conjunction with NPK enhances nutrient availability and aeration, improves soil health, and aids in the mobilization of microorganisms. It swiftly absorbs water and nutrients for the plant. It depicts the evolution of cell division, elongation, and vegetative growth, as well as economic expansion

It showed that apply of biofertilizers may have boosted the supply of NPK and improved the soil's fertility condition, which may have aided the plant in enhancing water uptake, adequate aeration, and productivity, resulting in a rise in carrot production and its defining characteristics A successful combination would result in a synergistic effect on nutrient uptake, improved economic development, and expanded soil area explored by the roots, all of which would increase yield qualities

Consequently, this work shows the Comparative studies on the effect of certain biofertilizers on growth, yield and quality of carrot (*Daucus carota* L.) under Punjab condition.

Materials and Methods

The field experimental study was conducted in the Lovely Professional University's Vegetable Research Field in Phagwara, Punjab. The experimental place is situated between 310 14′48" N latitude and 750 41′57" E longitude. The land used for the experiment had a pH of 7.8 and was quite uniform. The experiment consisted of eight treatment combinations with three replications and materials used are Azospirillum + 50 % RDF, PSB + 50 % RDF, VAM+50 % RDF, Azospirillum + PSB + 50 % RDF, Azospirillum + VAM + 50 % RDF, PSB + VAM + 50 % RDF, Azospirillum+VAM + 50 % RDF, PSB + VAM + 50 % RDF, PSB+VAM+50 % RDF, PSB+VAM+50 (100 % RDF) and carrot cv. Lalima , country red in a two-factorial randomized block design. The experimental field was ploughed twice and harrowed to a depth of 30 cm. The field was laid out with a gross plot size of 5 metres by 3.5 metres and a net plot size of 4 metres by 2 metres. The biofertilizers [PSB, Azospirillum, and VAM] were mixed with 50 percent RDF and applied to the soil in various treatments. The field was irrigated and the beneficial microbes were allowed to develop. Carrot seed cv. Country red and Lalima were sowed at a depth of 1 cm in a ridge and furrow system. Standard management and cultural practices were implemented. five plants are tagged in each plot, observations were made on several growth and yield parameters like plant height (cm) at (30DAS, 60DAS, 90DAS), number of leaves at (60DAS, 90DAS), root length (cm), root diameter (cm), fresh weight of roots (g), yield/plot (kg), TSS (°Brix), ascorbic acid (mg/100g), and carotene content (mg/100g) are among the observations. An analysis of variance was performed on the data collected (ANOVA). At 0.05 percent probability, the test of significance (t-test) and crucial difference were determined.

Results and Discussion

The study revealed that different combinations of biofertilizers and carrot cv. Country Red and Lalima showed variation in growth, yield and quality char-

Table 1. Effect of different combinations of biofertilizers on growth, yield and quality characters

Treatments	Plant height	Number of leaves	Root Diameter	Root length	Fresh root weight	Dry root weight	Root yield/ plot	Root yield/ Hac	TSS	Ascorbic acid	Carotene content
Azospirillum + 50% RDF	73.95	16.32	2.78	23.15	118	4.72	3.54	19.66	7.10	3.83	38.51
PSB + 50% RDF	74.07	16.09	2.60	23.08	100.94	5.37	3.02	16.82	5.55	2.16	39.96
VAM + 50% RDF	74.24	16.37	2.71	23.34	103.72	5.39	3.11	17.29	5.83	3.40	40.46
Azospirillum + PSB+ 50% RDF	73.73	15.37	3.53	22.34	101.36	5.76	3.04	16.89	5.97	3.33	38.27
Azospirillum + VAM + 50% RDF	73.43	15.58	3.62	25.54	98.00	6.95	2.94	16.33	6.16	4.27	42.51
PSB + VAM + 50% RDF	71.24	15.50	3.45	23.54	96.28	6.93	2.89	16.04	5.68	2.48	41.36
Azospirillum + VAM+PSB + % RDF	87.82	19.74	4.48	27.33	124.91	8.84	3.74	20.81	6.05	3.77	47.39
CONTROL (100% RDF)	69.32	15.57	3.83	21.70	10.3.44	5.78	3.10	17.24	5.57	2.56	37.04
CD at 5% (Factor A)(Factor B)	2.693	0.682	0.088	1.349	3.433	0.260	0.102	0.573	0.771	0.244	1.618
(AXB)	1.347	0.341	0.044	0.675	1.716	0.465	0.051	0.286	0.385	0.122	0.809
	3.809	0.964	0.124	1.908	4.855	0.367	0.144	0.810	1.090	0.345	2.288
SE(m)_+ (Factor A)	0.464	0.235	0.030	0.465	1.183	0.090	0.035	0.197	0.266	0.119	0.558
(Factor B) (AXB)	0.928	0.117	0.015	0.232	0.591	0.045	0.018	0.099	0.133	0.059	0.279
	1.312	0.332	0.043	0.658	1.673	0.127	0.050	0.279	0.376	0.168	0.788
SE(d) (Factor A)	1.312	0.332	0.043	0.658	1.673	0.127	0.050	0.279	0.376	0.084	0.788
(Factor B) (AXB)	0.656	0.166	0.021	0.329	0.836	0.063	0.025	0.140	0.188	0.042	0.394
	1.856	0.470	0.060	0.930	2.366	0.179	0.070	0.395	0.531	0.119	1.115

acters of carrot.

Growth and yield characters

Good performance of the crop was observed during growth period and showed a significance difference with the application of (Azospirillum + PSB +VAM+ 50%RDF) combination. The interaction of carrot cv. Country Red and combination of three biofertilizers with half recommended dose (V2T7) reported as best treatment as, it showed highest plant height (87.32 cm) and number of leaves (19.74) as shown in the Table 1 and yield parameters like root diameter, fresh root weight, yield/ plot and yield/ hac reported with high significant values,4.48, 124.91, with the interaction of country red and Azospirillum + PSB +VAM + 50%RDF (V2T7). On other hand root length (27.33) performed well with interaction of Lalima and three biofertilizers combination (V1T7) and dry weight of roots reported significant value (4.72) with interaction of country red and three combinations of biofertilizer with half recommended dose (V2T1), respectively as shown in the Table 1.

Quality parameters

The quality parameters like carotene content, total soluble solids and ascorbic acid shown a best reports with the application of different combinations as, carotene content reported the highest value (47.39 mg/100 mg) with the interaction of country red and Azospirillum + PSB +VAM+ 50%RDF, TSS showed its highest value (7.10) in V2T1 (interaction of country red and Azospirillum), ascorbic acid showed a significant value (4.27) in V2T5 (Azospirillum + VAM + 50% RDF) respectively as shown in the Table 1.

Conclusion

The perusal from this study can be concluded as follows; in terms of growth parameters, it can be found that treatment T7 i.e., (Azospirillum +VAM+ PSB+ 50%RDF combination) have produced best results in almost all parameters *viz.*, days to emergence, plant height, fresh and dry root weight, yield per plot, root diameter. T7 treatment also produced the best interaction with two varieties, V1 and V2 for most of the growth parameters as well. With respect to qual-

ity parameters, the treatments T7, i.e., (Azospirillum +VAM +PSB + 50%RDF) combination gave equally good results in (Carotene, TSS, Ascorbic acid) respectively. The same for their interaction with the variety V2 can be declared as best results were obtained in almost all quality parameters.

References

Abdel Naby, H. M. E., Dawa, K. K., El-Gamily, E. E., El-Hameed, A. and Samar, M. 2013. Effect of organic, bio and mineral fertilization on yield and quality of carrot plants. *Journal of Plant Production.* 4(2): 335-349.

Anonymous. 2019. National horticultural data http://nhb.gov.in/

Hazra, P. and Som, M.G. 1999. *Technology for Vegetable Production and Improvement*. Naya Prakash publishers, Calcutta.

Kanaujia, S. P. 2013. Integrated nutrient management on productivity of carrot and fertility of soil. *SAARC Journal of Agriculture.* 11(2) : 173-181.

Mahsoud, Shahein, M.M. and Hosna, Sayed, El. 2008. Production of improvement of carrot Journal of Agricultural Sciences Mansouria University, p. 7777-8797.

Muhamadtaswin, Mangunsong. 2018. How to extract and examine carotene in carrot, advances in social science, education and humanity research, volume 521.

Nguyen, H. H. V. and Nguyen, L. T. 2015. Carrot processing. Handbook of Vegetable Preservation and Processing, P 449-466.

Que, Wang and Khadr, Xiong., 2019. Advances in research on the carrot, an important root vegetable in apiaceae family.

Raeesul, H. and Prasad, K. 2015. Nutritional and processing aspects of carrot (Daucuscarota)- Areview. *South Asian Journal of Food Technology and Environment.* 1(1): 1-14.

Roshni, P., Narasimha Murthy, D. K. and Salomi, D. R. 2019. Studies on biofertilizers and inorganics on growth and yield of carrot. *Journal of Pharmacognosy and Phytochemistry. 8*(2), P 1559-1562.

Shanu, V., Lakshmi Narayana, D., Prasanth, P., Saida Naik. 2009. Department of vegetable science, SKLTS Horticultural University, Rajendranagsar, Hyderabad. *International Journal of Current Microbiology.* 8(4): ISSN:2319-77.