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EFFECT OF SEAWEED EXTRACT ON GROWTH, YIELD ATTRIBUTES AND NUTRIENT UPTAKE OF CARROT (*DAUCUS CAROTA* L.)

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ABSTRACT

A field experiment was conducted during *rabi* 2022-23 on sandy loam soil of Horticultural Garden, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana Agricultural University, Hyderabad, to study the effect of seaweed extract on growth and yield of carrot. The experiment consisted of eight treatments laid out in randomized block design and replicated thrice. The treatments include bio stimulants *i.e* seaweed extract soil application as granules, sea weed extract liquid as foliar spray and Vermiwash spray *etc.*, Among the treatments, RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water registered higher root length, root diameter, average fresh weight and root yield and it was statistically similar with RDF + foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water. Similarly, higher nutrient uptake was noticed with RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water and it was statistically similar with RDF + foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water.

Key words : Sea weed extract, Foliar spray, Soil application, Yield, Nutrient uptake.

Introduction

Any improvement in agricultural system quality and quantity wise should reduce the negative environmental impact and enhance the sustainability of the system. Long-term indiscriminate use of chemical fertilizers invites the crucial problem of soil health disorder vis-à-vis reduced input use etc. Due to these reasons the farmers are being compelled gradually day by day to turn towards various options like organic manures, bio stimulants growth regulators. The role of agricultural bio stimulants in food production worldwide is expanding. Among the diverse array of bio stimulants, seaweed extracts (SWE) has gained importance because of its organic nature and its composition. These extracts are also rich in phytohormones such as auxins, gibberellins, cytokinins, and betaines, as identified by Crouch and Van Staden

(1993). Sea weed extract has shown beneficial effect on seed germination and plant growth (Thirumal *et al.*, 2003). They also help in enhancing the post-harvest shelf life of perishable products (Noorie and Keathley, 2005).

Carrot, scientifically known as *Daucus carota* L., is a widely cultivated vegetable crop renowned for its nutritional richness. Carrot is a significant source of beta-carotene, a precursor to vitamin A which plays a principal role in shielding the human body against cancer (Zaini *et al.*, 2011), prevents blindness (Dias, 2012). The carrot is considered as a highly export-oriented crop and plays a significant role in earning foreign exchange for the country. In India, carrot cultivation covers an area of 128.20 lakh hectares with a total production of 2214.07 million tonnes. The average productivity of a carrot in India is reported to be 17.27 t ha⁻¹. The information on

seaweed extract effect on crops is very meagre. By taking the points into consideration the experiment was planned to know the effect of seaweed extract on carrot growth and yield.

Materials and Methods

The experiment was conducted during *rabi* 2022-23 at horticultural garden, college of agriculture, Rajendranagar, Hyderabad, Professor Jayashankar Telangana Agricultural University. The experiment was laid out in randomized block design with eight treatments and replicated thrice. Treatments T_1 - RDF, T_2 - RDF+ soil application of seaweed extract twice extract twice at the time of sowing and at 30 DAS, T_3 - RDF+ foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water, T_4 - RDF+ soil application of seaweed extract twice at the time of sowing and at 30 DAS + foliar spray thrice 2.5 ml l⁻¹ of water, T_5 - RDF+ vermicompost 5 t ha⁻¹, T_6 - RDF + foliar spray of water three times, T_7 - RDF+ foliar spray of 10% of vermiwash, T_8 - Soil application of seaweed extract twice at the time of sowing and at 30 DAS + foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water. The soil was sandy loam with pH 7.8 with available nitrogen (235 kg ha⁻¹), available phosphorus (32.6 kg ha⁻¹) and available potassium (330 kg ha⁻¹). Super caroda variety was sown 3-11-2022 with a spacing of 30 × 5 cm. A common fertilizers 50 N, 40 P₂O₅ 50 K₂O kg ha⁻¹ were applied in the form of urea, single super phosphate and muriate of potash respectively. Entire dose

of P₂O₅, K₂O and 1/3rd of N was applied as basal and remaining nitrogen was applied in two splits at 30 and 60 DAS. First foliar spray of seaweed extract was done at 2-3 leaf stage and there after it was applied at every 20 days' time interval. Soil application of seaweed extract granules at the rate of 50 kg ha⁻¹ was done 2 times *i.e.*, at basal and at 30 intervals. Foliar spray of 10% vermiwash was done three times was similar to seaweed extract spray *i.e.*, at the 2-3 leaf stage and it was applied at a 20 days' time interval. The seaweed extract liquid and granules used in this study was commercially manufactured by the IFFCO Cooperative company, and it goes by the brand name "Sagarika." (liquid form) and "Sagarika Gold" (granular form). Bio metric observations were taken on five randomly selected representative plants from the net plot and mean values were calculated.

Results and Discussion

Higher root length, root diameter, average fresh weight, and root yield were observed with RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water and it was statistically similar with RDF + foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water and RDF with soil application of seaweed extract at the time of sowing and 30 DAS. The lower values for root length, root diameter, average fresh weight, and root yield were observed in the treatment soil application of sea weed extract twice at time of sowing

Table 1 : Influence of sea weed extract as bio-stimulant on growth and yield attributes of Carrot.

Treatments	Plant height (cm)	Root length (cm)	Root diameter (cm)	Average fresh root weight (cm)
T_1 - RDF	24.80	18.11	2.72	63.30
T_2 - RDF + soil application of seaweed extract at time of sowing and 30 DAS	26.38	19.80	3.40	65.27
T_3 - RDF+ foliar spray of seaweed extract thrice at the rate of 2.5 ml l ⁻¹ of water	26.63	19.90	3.48	65.53
T_4 - RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate of 2.5 ml l ⁻¹ of water	27.37	20.20	3.60	65.60
T_5 - RDF + vermicompost 5 t ha ⁻¹	24.95	18.33	2.90	63.83
T_6 - RDF + foliar spray of water 3 times	24.21	18.19	2.69	62.16
T_7 - RDF + foliar spray of 10 % of vermiwash	25.23	18.66	3.00	64.03
T_8 - Soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray thrice at the rate of 2.5 ml l ⁻¹ of water	16.01	12.60	1.53	38.25
SEm±	0.5	0.32	0.12	0.31
CD (P = 0.05)	1.4	1.0	0.40	0.90

Table 2 : Yield nutrient uptake of carrot as influenced by seaweed extract as a bio stimulant.

Treatments	Yield (kg ha ⁻¹)	Nutrient uptake (kg ha ⁻¹)		
		N	P	K
T ₁ - RDF	29183	30.01	12.70	28.93
T ₂ - RDF + soil application of seaweed extract at time of sowing and 30 DAS	35946	35.63	14.57	31.56
T ₃ - RDF+ foliar spray of seaweed extract thrice at the rate of 2.5 ml l ⁻¹ of water	36303	35.90	14.70	31.90
T ₄ - RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate of 2.5 ml l ⁻¹ of water	37013	36.51	15.10	32.50
T ₅ - RDF + vermicompost 5 t ha ⁻¹	32552	31.19	12.86	28.89
T ₆ - RDF + foliar spray of water 3 times	29937	29.53	12.36	28.45
T ₇ - RDF + foliar spray of 10 % of vermiwash	33118	32.12	13.57	29.69
T ₈ - Soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray thrice at the rate of 2.5 ml l ⁻¹ of water	12951	14.99	6.38	13.16
SEm±	488.9	0.28	0.20	0.5
CD (P = 0.05)	1482.6	0.8	0.6	1.5

and 30 DAS + foliar spray of seaweed extract thrice at the rate of 2.5 ml l⁻¹ of water. Increase in growth and yield attributes might be due to the fact that seaweed extract is a bio stimulant which provide growth promoting substances like IAA, IBA, gibberellins, cytokinins, vitamins and amino acids ultimately increasing the overall performance of plant there by reflecting through an escalated productivity. The present discussion was in agreement with the findings of Zodape *et al.* (2008), Abdel-Mawgoud *et al.* (2010) and Pramanick *et al.* (2014a).

The application of treatments significantly influenced the nutrient uptake by the crop. RDF + soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water recorded significantly higher nutrient uptake and it was on par with RDF + foliar spray of seaweed extract thrice at the rate of 2.5 ml l⁻¹ of water and RDF + soil application of seaweed extract at time of sowing and 30 DAS. Seaweed sap increases the availability of nutrients and helps in better absorption, which increases the higher nutrient uptake. The results were in accordance with Prasad *et al.* (2010).

Higher gross returns and net returns recorded with RDF + soil application of seaweed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water followed by RDF + foliar spray of seaweed extract thrice 2.5 ml l⁻¹ of water and RDF + soil application of seaweed extract at time of sowing and 30 DAS over other treatments. Whereas, the highest B: C ratio was observed with application of

RDF + foliar spray of seaweed extract thrice at the rate of 2.5 ml l⁻¹ of water. The lowest gross returns, net returns and benefit - cost ratio was recorded with soil application of sea weed extract twice at time of sowing and 30 DAS + foliar spray thrice 2.5 ml l⁻¹ of water. These findings coincide with those of earlier studies by Abdel-Mawgoud *et al.* (2010) and Venkatesan and Selvakumari (2017).

Conclusion

Results of the experiment revealed that application of RDF + soil application of seaweed extract twice at time of sowing and 30 DAS + foliar spray of seaweed extract thrice at the rate 2.5 ml l⁻¹ of water and RDF + foliar spray of seaweed extract thrice at the rate of 2.5 ml l⁻¹ of water performed superior over the the other. However, RDF + foliar spray of seaweed extract thrice at the rate of 2.5 ml l⁻¹ of water registered higher benefit cost ratio.

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