Indian Journal of Ecology (2024) 51(3): 599-602
DOI: https://doi.org/10.55362/IJE/2024/4280

Manuscript Number: 4280
NAAS Rating: 5.38

Effect of Different Fertilizer Levels, Biostimulant and Novel Organic Liquid Nutrient on Growth and Yield of Beet Root (*Beta vulgaris* L.)

S.P. Chaudhari, P.C. Joshi[1] and K.V. Chaudhary

Department of Vegetable Science, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University Jagudan, Mehsana-382 710, India
[1]Department of Horticulture, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar-385 506, India
E-mail: chaudharishailesh007@gmail.com

Abstract: Experiment was conducted during *rabi* season of 2020-21 and 2021-22 to study the influence of different fertilizer levels, biostimulant and novel organic liquid nutrient on growth and yield attributes parameters of beet root (*Beta vulgaris* L.). Present investigation comprising three factors *viz*., three levels of fertilizer *viz*., 40 % RDF , 60 % RDF and 80 % RDF, biostimulant *viz*., *Jeevamruta*, *Panchagavya*) and Bio NPK Consortium and three levels of novel organic liquid nutrient *viz*., 1.0 % , 1.5 % and 2.0 % . The maximum different growth and yield parameters *viz*., plant height at 30 DAS and harvest (cm), number of leaves per plant at 30 DAS and harvest, leaf area per plant (cm^2), leaf area index, root weight per plant (g), marketable root yield (kg $plot^{-1}$), marketable root yield (t ha^{-1}), total root yield (kg $plot^{-1}$), total root yield (t ha^{-1}) and minimum days taken for harvest were observed with application of 80 % RDF . application of *Panchagavya* @ 3 % (b_2) and application novel organic liquid nutrient @ 2.0 % (n_3) in both the years.

Keywords: Beet root, Biostimulant, Novel organic liquid, *Jeevamruta, Panchagavya* and Bio NPK Consortium

Beet root (*Beta vulgaris* L.), is one of the major root vegetable belongs to the family Amaranthaceae along with spinach, palak, swiss chard, parsley and celery. Beet root originated in Western Europe and North Africa where they were grown to feed both by humans and livestock. It produces green tops and swollen root used both as vegetable and salad. Vegetable often eaten without any processing are more vulnerable to contamination with chemical due to their residual toxicity as compared to cereals and pulses. Thus, organic production of vegetable is becoming more popular than other crops. Biostimulents are natural substances derived from plants and animals influence plants metabolic processes such as respiration, photosynthesis, nucleic acid synthesis and ion uptake (Khan et al 2009). NOVEL organic liquid nutrient is the byproduct of banana pseudo stem and contains good amount of essential macro and micro nutrients as well as growth boosters (Salunkhe 2010). Integrated nutrient management is an alternative for sustainable crop production rather than use of inorganic fertilizers only. The combined use of organic manures, biostimulant, novel organic liquid nutrient with a reduced dose of chemical fertilizers, not only pave the way for higher yield and quality produce, but also help to maintain the soil health and reduce pollution problems. The prevent study was conducted on influence of different fertilizer levels, biostimulant and novel organic liquid nutrient on growth and yield attributes parameters of beet root (*Beta vulgaris* L.).

MATERIAL AND METHODS

Field experiment was conducted at Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Mehsana during the years 2020-21 and 2021-22 on beet root. The soil of the experimental location was loamy sand with normal pH (7.91), low in available nitrogen (185.25 kg ha^{-1}), medium in available phosphorus (46.29 kg ha^{-1}) and high in available potassium (275.45 kg ha^{-1}). The experiment was laid out in randomized block design with factorial concept keeping three factor *viz*., different fertilizer levels, biostimulant and different concentration of novel organic liquid nutrient. The twenty-seven treatments were replicated thrice . Beet root was sown by. In this experiment beet root crimson glob cultivar was sown on 25 October in both the years by hand dibbling method / FYM @ 20 t/ha was applied in all the treatments at the time of land preparation. Half dose of N and full dose of P and K was given as per treatment as a basal dose. Remaining half dose of N was applied in two split as a top dressing at 30 and 45 DAS. *Jeevamruta* was applied in soil as per treatment through drenching @ 500 l/ha at the time of sowing and 30 DAS, *Panchgavya* was sprayed as per treatment @ 3 % at 20, 35 and 50 DAS, Bio NPK consortium was applied in soil as per treatment @ 1.5 l/ha at the time of sowing by mix with required quantity of FYM and Novel

organic liquid nutrient was sprayed as per treatment (1.0 %, 1.5 % and 2.0 %) at 20, 35 and 50 DAS.

RESULTS AND DISCUSSION

Growth parameters: The 80 % RDF recorded significantly higher plant height at 30 DAS and at harvest on number of leaves per plant at harvest, leaf area per plant and leaf area index Significantly minimum days for harvest were observed with application of 80 % RDF. The larger canopy and plant height under the application of higher dose of fertilizer might have increased interception, absorption and utilization of solar energy which in turn increased overall growth, photosynthesis and finally accumulation of dry matter per plant. The observed improvement in overall vegetative growth of the crop with the application of NPK in the present investigation were in conformity with those of Anuradha et al (2017) in cluster bean. The application of @ 3 % *Panchagavya* recorded significantly higher plant height at 30 DAS and at harvest, number of leaves per plant at harvest, leaf area per plant and leaf area index (Table 1, 2). Significantly minimum days for harvest was with application of @ 3 % *Panchagavya*. The increase in plant height might be due to application of nutrients through foliar spray of *Panchagavya* enhanced the growth rate of plant since it contains the favorable macro and micronutrients, growth hormones and bio-fertilizers in liquid formulation. Moreover, the presence of growth enzymes in *Panchagavya* might have favored rapid cell division and elongation. Similar findings were also reported by Jabeen et al (2018) in spinach beet and Jagadeesh (2018) in beet root. The application of novel organic liquid nutrient @ 2.0 % recorded significantly higher plant height at 30 DAS and at harvest, number of leaves per plant at harvest, leaf area per plant and leaf area index. Significantly minimum days for harvest were with the application of novel organic liquid nutrient @ 2.0 %. This might be due to nitrogen which present in novel organic liquid fertilizer is responsible for the formation, growth and development of the cells and accelerating the synthesis of chlorophylls which are associated with major photosynthesis process of plants, which enhances the formation of meristematic tissues as observed by Deore et al (2010) in chilli. Similar findings were observed by Champaneri (2020) in Indian bean. The different fertilizer levels, biostimulant and novel organic liquid nutrient application had non-significant influence on number of leaves per plants at 30 DAS. The interaction between different combination of treatments (f × n, b × n and f × b × n) exhibits non-significant effect on different growth parameters, except plant height at

Table 1. Effect of fertilizer levels, biostimulant and novel organic liquid nutrient on plant height at 30 DAS, plant height at harvest, number of leaves per plant at 30 DAS and number of leaves per plant at harvest

Treatment	Plant height at 30 DAS (cm)	Plant height at harvest (cm)	Number of leaves per plant at 30 DAS	Number of leaves per plant at harvest
Fertilizer levels (f)				
f_1	14.71	29.90	5.93	11.07
f_2	15.93	31.82	6.08	12.67
f_3	16.77	33.10	6.11	13.73
CD (p=0.05)	0.38	0.86	NS	0.30
Biostimulant (b)				
b_1	15.29	30.34	5.93	11.83
b_2	16.33	32.90	6.14	13.18
b_3	15.79	31.57	6.05	12.46
CD (p=0.05)	0.38	0.86	NS	0.30
Novel organic liquid nutrient (n)				
n_1	15.42	30.82	5.94	12.22
n_2	15.79	31.55	6.06	12.46
n_3	16.20	32.45	6.12	12.79
CD (p=0.05)	0.38	0.86	NS	0.30
Interaction effect				
f × b	0.65	1.50	NS	0.52
	6.25	7.16	7.77	6.25
CV (%)				

The interaction fxn, bxn and fxbxn was not significant

Table 2. Effect of fertilizer levels, biostimulant and novel organic liquid nutrient on days taken for harvest, leaf area per plant and leaf area index

Treatment	Days taken for harvest	Leaf area per plant (cm^2)	Leaf area index
Fertilizer levels (f)			
f_1	76.38	1260.05	2.80
f_2	71.66	1307.38	2.91
f_3	68.39	1341.17	2.98
CD (p=0.05)	2.06	36.18	0.08
Biostimulant (b)			
b_1	74.21	1270.01	2.82
b_2	70.07	1337.16	2.97
b_3	72.14	1301.43	2.89
CD (p=0.05)	2.06	36.18	0.08
Novel organic liquid nutrient (n)			
n_1	74.08	1271.04	2.82
n_2	71.89	1299.62	2.89
n_3	70.45	1337.94	2.97
CD (p=0.05)	2.06	36.18	0.08
Interaction effect			
CV (%)	7.49	7.28	7.28

The interaction fxb, fxn.bxn and fxbxn was not significant

Table 3. Effect of fertilizer levels, biostimulant and novel organic liquid nutrient on root length, root width, root weight per plant and marketable yield

Treatment	Root length (cm)	Root width (cm)	Root weight per plant (g)	Marketable root yield per plot (kg)
Fertilizer levels (f)				
f_1	6.78	6.65	132.60	3.64
f_2	7.33	6.82	157.64	4.31
f_3	7.69	6.86	173.78	4.79
CD (p=0.05)	0.15	NS	5.26	0.17
Biostimulant (b)				
b_1	7.04	6.66	144.20	3.96
b_2	7.49	6.88	165.27	4.54
b_3	7.27	6.79	154.55	4.23
CD (p=0.05)	0.15	NS	5.26	0.17
Novel organic liquid nutrient (n)				
n_1	7.12	6.71	148.83	4.08
n_2	7.26	6.75	154.52	4.24
n_3	7.42	6.87	160.68	4.42
CD (p=0.05)	0.15	NS	5.26	0.17
Interaction effect				
f × b	NS	NS	9.11	0.30
CV (%)	5.39	8.24	8.91	10.70

The interaction fxn, bxn and fxbxn was not significant

30 DAS and at harvest and number of leaves per plant at harvest where observed significant variation with treatment combination (f × b).

Yield parameters: The significantly higher root length, root weight per plant, marketable root yield per plot, total root yield per plot, marketable root yield per hectare and total root yield per hectare were recorded with 80 % RDF. The results of present investigation were in line with those of Raiger et al (2017) in cluster bean. The application of @ 3 % *Panchagavya* recorded significantly the higher root length, root weight per plant, marketable root yield per plot, total root yield per plot, marketable root yield per hectare and higher total root yield per hectare (Table 2). Milk in *Panchagavya* provides fat, carbohydrates, protein, amino acids and calcium and curd gives lactobacillus which act as catalyst in the decomposition of organic waste. Such finding is supported by Swain et al (2015) chilli. Amongst the yield parameters, significantly higher root length, root weight per plant, marketable root yield per plot, total root yield per plot, marketable root yield per hectare and total root yield per hectare were obtained with novel organic liquid nutrient @ 2.0 %. Kalariya et al (2018) also observed similar trend in okra. The root width and harvest index (%) was significantly

Table 4. Effect of fertilizer levels, biostimulant and novel organic liquid nutrient on total root yield per plot , marketable root yield per hectare , total root yield per hectare and harvest index

Treatment	Total root yield per plot (kg)	Marketable root yield per hectare (t)	Total root yield per hectare (t)	Harvest Index (%)
Fertilizer levels (f)				
f_1	4.26	25.26	29.61	53.95
f_2	5.03	29.92	34.92	52.08
f_3	5.57	33.24	38.66	50.62
CD (p=0.05)	0.21	1.20	1.43	NS
Biostimulant (b)				
b_1	4.62	27.47	32.09	53.27
b_2	5.29	31.55	36.74	51.33
b_3	4.96	29.40	34.41	52.05
CD (p=0.05)	0.21	1.20	1.43	NS
Novel organic liquid nutrient (n)				
n_1	4.77	28.32	33.12	51.99
n_2	4.93	29.41	34.25	52.22
n_3	5.16	30.68	35.83	52.44
CD (p=0.05)	0.21	1.20	1.43	NS
Interaction effect				
f × b	0.36	2.08	2.48	NS
CV (%)	10.91	10.70	10.91	13.86

The interaction fxn, bxn and fxbxn was not significant

not affected by different fertilizer levels, biostimulant and novel organic liquid nutrient application. The result showed that interaction between different combination of treatments (f × n, b × n and f × b × n) exhibits non-significant effect on different yield parameters, except root weight per plant, marketable root yield per plot, total root yield per plot, marketable root yield per hectare and total root yield per hectare. The significant effect with the treatment combination of (f × b) was observed.

CONCLUSION

The higher growth and yield can be obtained through combined application of 80 % recommended dose of fertilizer and foliar spray of *Panchagavya* 3 % at 20, 35 and 50 days after sowing of beet root during *rabi* season.

REFERENCES

Anuradha, Singh RK, Pareek B, Kumar D, Meena S and Dubey SK 2017. Different levels of fertilizers on growth and yield of cluster bean (*Cyamopsis tetragonoloba* L.) in rainfed area of Uttar Pradesh, India. *International Journal of Current Microbiology and Applied Sciences* **6**(4): 2029-2036.

Champaneri D 2020. *Response of novel and novel plus organic liquid nutrients on Indian bean [Lablab purpureus (L.) Sweet].* Thesis M.Sc. (Horti.) (Unpublished), Navsari Agricultural University, Navsari, India. pp. 64-89.

Deore GB, Limaye AS, Shinde BM and Laware SL 2010. Effect of novel organic liquid fertilizer on growth and yield in chilli (*Capsicum annum* L.). *Asian Journal of Experimental Biological Sciences* pp. 15-19.

Received 07 December, 2023; Accepted 11 May, 2024

Gore NS and Sreenivasa MN 2011. Influence of liquid organic manures on growth, nutrient content and yield of tomato (*Lycopersicon esculentum* Mill.) in the sterilized soil. *Karnataka Journal of Agricultural Sciences* **24**(2): 153-157.

Jabeen A, Narayan S, Hussain K, Mir SA and Khan FA 2018. Effect of organic manures and biofertilizers on quality of Spinach beet (*Beta vulgaris* var. *Bengalensis*). *International Journal of Current Microbiology and Applied Sciences* **7**(9): 1312-1317.

Jagadeesh M, Madhavi M, Siva P and Padmaja VV 2018. Effect of organic manures on growth and yield attributes of beet root cv. Crimson Globe. *International Journal of Current Microbiology and Applied Sciences* **7**(11): 3538-3553.

Kalariya VD, Bhanderi DR, Patel NK and Vaghashiya JM 2018. Effect of foliar application of micronutrients, novel organic liquid fertilizer and sea weed extract on yield of okra [*Abelmoschus esculentus* L. (Moench)]. *International Journal of Chemical Studies* **6**(3): 1834-1836.

Khan W, Rayirath UP, Subramanian S, Jithesh, MN, Rayorath P, Hodges DM, Critchley AT, Craigie JS, Norrie J and Prithiviraj B 2009. Seaweed extracts as biostimulant of plant growth and development. *Journal of Plant Growth Regulation* **28**: 386-399.

Raiger R, Kumawat BL, Sanwal RC and Kumawat SR 2017. Response of cluster bean [*Cyamopsis tetragonoloba* L.) *Taub.*] to phosphorus and sulphur in Torripsamments of Rajasthan, India. *International Journal of Current Microbial Applied Sciences* **6**(6): 2003-2008.

Salunkhe JR 2010. Feasibility of using banana pseudo stem sap as liquid fertilizer in onion, under drip irrigation. M.Sc. Thesis (Unpublished) submitted to Navsari Agricultural University, Navsari.

Swain SS, Sahu GS and Mishra N 2015. Effect of Panchagavya on growth and yield of chilli (*Capsicum annum* L. cv. Kuchinda Local). *Green Farming* **6**(2): 338-340.

Yadav M, Chawla H, Parle M and Sharma K 2016. Beetroot: A health promoting functional food. *Inventi Rapid : Nutraceuticals* **42**(1): 1-5.