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The role of foliar spraying of some organic fertilizers on the growth and yield parameters of the table beet crop (*Beta vulgaris* L.) CV. Detroit.

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Abstract:

Organic fertilizers supply many essential nutrients for plants, and table beet growth and yield respond positively to the application of organic fertilizers. To investigate the impact of (Fylloton and Nutrogreen) on the growth and yield of table beet CV. Detroit, a field experiment was carried out in the Horticulture and Landscape Department / Agriculture and Forestry College during the 2022-2023 season. The seed was planted on August 10, 2022, on both sides of a bed in sandy soil.

The two organic fertilizers (Fylloton and Nutrogreen) were sprayed three times, with the first application on 25 September, the second on 10 November, and the third on 25 November, at three concentrations (0, 3, 6 ml/L). A factorial experiment was conducted in an RCBD with three replicates.

The results illustrated that spraying Fylloton increased the leaf number, leaf area per plant, chlorophyll content (35.28 SPAD), root length (79.17mm.), root diameter (91.97mm.), taproot length (14.76 mm.), root average weight, and total yield of roots, significantly, and also spraying Nutrogreen at 6 ml.L.$^{-1}$ gave the highest values of the number of leaves, 19.68, leaf area 2274.8 cm^2, and dry matter percentage of 10.29%, chlorophyll content (35.28 SPAD), root average weight, and total yield of roots.

The interaction treatments between 6 mL L-1 Fylloton and 6 mL L-1 Nutrogreen illustrate significant differences in the parameters (leaf number, leaf area, dry matter, chlorophyll content, root length, root diameter, root average weight, total yield of roots, and dry matter percentage in leaves).

Keywords: Beet, Fylloton, Nutrogreen, Chlorophyll, Root.

Introduction:

Beetroot or table beet (Beta vulgaris L.) is an important root vegetable in the Chenopodiaceae family. It is consumed as salad through leaves, or by cooking the roots; it contains many compounds such as carotenoids, phenolic acids, ascorbic acid, and flavonoids, as well as high levels of beta-carotene pigments. Also, it is rich in phosphorus, calcium, copper, magnesium, iron, and vitamins A, C, B1, B2, and B6 (1).

Beetroot is a good source of fiber, folate, Mn, P, Fe, and vitamin C. The carbohydrates in beetroot are mainly simple sugars like glucose and fructose (2).

In recent years, organic farming has experienced rapid development. (3). Organic fertilizers are produced through simple fermentation processes that utilize organic waste as a carbon substrate. Liquid organic fertilizers comprise a range of essential plant nutrients and beneficial microorganisms that help recycle organic matter.

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In recent years, the use of organic manures like FYM, vermicompost, and other organic compounds has been used to improve crop productivity of crops, biological traits, and maintain soil fertility and productivity (4).

Humic acid, as an organic fertilizer, plays an important role in growth by stimulating nutrient uptake and photosynthesis (5- 9). (10) revealed that foliar application of humic acid significantly enhanced growth, root yield/fed, and sucrose content of sugar yield. (11) revealed that spraying humic acid increased leaf area, relative growth rate, and total yield. (12) found that spraying Humic acid increased growth and yield traits. (13) revealed that the application of compost gave better results across most vegetative growth and yield traits compared to control or vermicompost.

(2) found that poultry manure had the highest values of vegetative growth and yield parameters of beetroot compared to green manure, Neem cake, Vermicompost, and FYM.

This study aims to enhance beetroot crop growth, yield, and quality through spraying organic fertilizers (Fylloton and Nutrogreen).

Materials and Methods:

To investigate the impact of Fylloton and Nutrogreen on the growth and yield of table beet CV. Detroit, a field experiment was conducted in the Horticulture and Landscape Department / Agriculture and Forestry College during the 2022-2023 season. The seed was planted on August 10, 2022, on both sides of a bed in sandy soil.

The two organic fertilizers (Fylloton and NutroGreen) were sprayed three times: the first on 25 September, the second on 10 November, and the third on 25 November, with three concentrations (0, 3, and 6 mL/L). The Factorial experiment was conducted according to an RCBD with three replicates.

The following parameters were recorded:

1- Plant height (cm).

2 – Leaf number /plants.

3 - Leaf area/plant (cm2).

4- Dry matter percentage of leaves.

5 - Chlorophyll content (SPAD).

6 - Root length (mm).

7 - Root diameter (mm)

8 -Tap root length (mm).

9-Root average weight (gr.)

10- Total yield of roots (ton. Ha. $^{-1}$).

11- Total soluble solids in root (TSS).

Results:

The data in Table 1 reveal the impact of Fylloton and Nutrogreen and their interaction on growth traits. It was found that spraying Fylloton increased the leaf number and leaf area per plant significantly, and the highest value (19.11, 2274.8) was recorded from spraying with 6 ml.L.$^{-1}$, on the other hand, no significant impact of Fyllaton on plant height and dry matter percentage. Spraying Nutrogreen at 6 ml.L.$^{-1}$ gave the highest values of the leaf number 19.68, leaf area 2274.8 cm^2, and dry matter % 10.29%.

The interaction treatments between Fylloton and Nutrogreen illustrate significant differences between treatments, the highest values of the number of leaves 20.80, leaf area of 2722.1 cm^2, and dry matter 11.77% from interaction treatment between 6 ml.L.$^{-1}$ Fylloton and 6 ml.L.$^{-1}$ Nutrogreen, while the lowest values of number of leaves 16.55, and leaf area of 1073.7 cm^2, was from interaction treatment between 0 ml.L.$^{-1}$ Fylloton and 0 ml.L.$^{-1}$ Nutrogreen and lowest value of dry matter 7.95% was from combination treatments of 3 ml.L.$^{-1}$ Fylloton and 0 ml.L.$^{-1}$ Nutrogreen.

Table 1: Effect of Fylloton and Nutrogreen and their interaction on vegetative growth parameters.

Treatment		Plant height (cm.).	Leaf Numbers /plant.	Leaf area/plant (cm2).	Dry matter % of leaves.
Fyloton concentration ml.L.$^{-1}$					
0		45.62 a	17.35 c	1587.7 c	9.29 a
3		47.87 a	18.36 b	2066.2 b	9.63 a
6		49.70 a	19.11 a	2468.8 a	9.90 a
Nutrogreen concentration ml.L.$^{-1}$					
0		47.23 a	17.09 b	1660.6 c	8.50 b
3		48.24 a	18.32 ab	2187.3 b	10.03 a
6		47.72 a	19.68 a	2274.8 a	10.29 a
Combination treatments between Fyloton and Nutrogreen					
Fyloton	Nutrogreen				
0	0	43.85 a	16.55 c	1073.7 h	9.00 bc
	3	46.06 a	18.46 abc	1922.6 e	9.45 abc
	6	46.96 a	17.05 bc	1766.7 f	9.44 abc
3	0	46.45 a	16.55 c	1185.8 g	7.95 c
	3	47.86 a	19.80 ab	2529.6 bc	11.29 ab
	6	49.30 a	19.55 ab	2483.1 c	9.66 abc
6	0	51.40 a	18.18 abc	2574.7 b	8.56 c
	3	50.80 a	18.36 abc	2109.7 d	9.36 abc
	6	46.90 a	20.80 a	2722.1 a	11.77 a

The data in Table 2 illustrate the effect of Fylloton and Nutrogreen, as well as their interaction, on chlorophyll content (SPAD) and root parameters. It was found that spraying Fylloton 6 ml.L.$^{-1}$ gave the highest values of Chlorophyll content (35.28 SPAD), Root length (79.17mm.), Root diameter (91.97mm.), and Taproot length (14.76 mm), with significant superiority to the other treatments (0, and 3 ml.L.$^{-1}$)

Spraying Nutrogreen 6 ml L.$^{-1}$ gave the highest values of Chlorophyll content (35.28 SPAD). with a significant superiority to the other treatments (0 and 3 ml.L.$^{-1}$), while there was no significant effect of Nutrogreen on root parameters (root length, root diameter, and taproot length.

The interaction treatments between Fylloton and Nutrogreen illustrate significant differences between treatments, with the highest values of Chlorophyll content (39.45 SPAD), root length (82.82 mm.), and root diameter (92.72 mm.) was from interaction treatment between 6 ml.L.$^{-1}$ Fylloton and 6 ml.L.$^{-1}$ Nutrogreen, while the highest value of taproot length 15.64 mm. was from interaction treatment between 3 ml.L.$^{-1}$ Fylloton and 0 ml.L.$^{-1}$. On the other hand, the lowest values were observed for chlorophyll content (29.06 SPAD), root length (66.36 mm), root diameter (80.06mm), and taproot length (12.15 mm).

The data in Table 3 illustrate the effect of Fylloton and Nutrogreen and their interaction on root average weight, total yield of roots, dry matter percentage of leaves, and total soluble solids in roots (TSS).

It was found that spraying Fylloton significantly increased root average weight, total yield of roots, and the highest value (314.11, 45.231) was recorded from spraying with 3 ml.L.$^{-1}$, but there was no significant effect of Fylloton on dry matter percentage of leaves and total soluble solids in roots (TSS).

Regarding Spraying Nutrogreen, there were no significant effects on all studied parameters.

The interaction treatments between Fylloton and Nutrogreen illustrate significant differences between treatments, with the highest values of root average weight (322.14 g.), total yield of roots (46.388 ton.h^{-1}), from interaction treatments of 3 ml.L.$^{-1}$ fylloton and 0 ml.L.$^{-1}$ Nutrogreen, and the highest dry matter percentage in leaves 17.70% from interaction treatments of 6 ml.L.$^{-1}$ fylloton and 6 ml.L.$^{-1}$, in the other hand no significant effect on TSS. were found.

Table 2: Effect of Fylloton and Nutrogreen and their interaction on chlorophyll content and root parameters.

Treatment		Chlorophyll content (SPAD).	Root length (mm).	Root diameter (mm)	Taproot length (mm).
Fyloton concentration ml.L.$^{-1}$					
0		33.03 b	70.81 b	83.90 b	12.74 b
3		33.48 b	78.52 a	85.55 b	12.93 b
6		35.28 a	79.17 a	91.97 a	14.76 a
Nutrogreen concentration ml.L.$^{-1}$					
0		30.25 c	74.73 a	86.06 a	13.94 a
3		34.78 b	76.28 a	89.53 a	1346 a
6		36.77 a	77.50 a	85.83 a	13.03 a
Combination treatments between Fyloton and Nutrogreen					
Fyloton	Nutrogreen				
0	0	31.80 cd	66.36 b	84.46 bc	12.65 cd,
	3	33.35 c	77.71 ab	87.20 abc	12.15 cd
	6	33.96 bc	73.38 ab	80.06 c	13.42 bcd
3	0	29.90 d	74.23 ab	81.01 c	15.64 a
	3	33.65 c	79.66 a	90364 ab	14.62 ab
	6	36.90 ab	81.66 a	85.00 bc	14.05 abc
6	0	29.06 d	77.24 ab	92.43 a	13.53 bc
	3	37.35 a	77.46 ab	90.75 ab	13.62 bc
	6	39.45 a	82.82 a	92.72 a	11.65 d

Table 3: Effect of Fylloton and Nutrogreen and their interaction on root average weight, total yield of roots, dry matter percentage of leaves, and total soluble solids in root (TSS).

Treatment		Root average weight (gr.)	Total yield of roots (ton. Ha.$^{-1}$).	Dry matter percentage of leaves.	Total soluble solids in the root (TSS).
Fyloton concentration ml.L.$^{-1}$					
0		211.61 c	30.471 c	16.66 a	12.25 a
3		314.11 a	45.231 a	16.56 a	11.95 a
6		270.70 b	38.980 b	16.53 a	12.76 a
Nutrogreen concentration ml.L.$^{-1}$					
0		255.70 a	36.820 a	16.24 a	12.35 a
3		275.00 a	39.600 a	16.64 a	12.23 a
6		265.71 a	38.262 a	16.87 a	12.37 a
Combination treatments between Fyloton and Nutrogreen					
Fyloton	Nutrogreen				
0	0	205.38 c	29.574 c	15.99 ab	11.75 a
	3	214.62 c	30.905 c	16.67 ab	12.75 a
	6	214.83 c	30.935 c	17.31 ab	12.25 a
3	0	322.14 a	46.388 a	17.22 ab	12.62 a
	3	318.06 a	45.800 a	16.87 ab	11.87 a
	6	302.14 ab	43.508 ab	15.58 b	11.37 a
6	0	239.59 c	34.500 c	15.51 b	12.70 a
	3	292.34 ab	42.096 ab	16.38 ab	12.08 a
	6	280.17 b	40.344 b	17.70 a	11.50 a

Discussion:

The results showed that the spraying of organic fertilizers (Fylloton and Nuterogreen) had a positive influence on various growth traits of beetroot (plant height, leaf number, leaf area per plant, and dry matter of leaves. This might be due to organic fertilizers enhancing beetroot vegetative parameters due to increased nutrients in plants, which may be due to the integrated use of nutrients (1). These results are in harmony with (14).

The increase in root diameter may be due to stimulating cell division and quick cell multiplication. (15,16).

The increase in yield may be due to the availability of nutrients, which increased the synthesis of carbohydrates. It can also be due to improved carbon assimilation, which stimulates carbohydrate accumulation in the plants. Similar results were observed by (4).

The translocation of photosynthetic products from the source (leaves) to the sink (roots) may be due to increased root diameter and length, resulting in higher root yield. These conform to (13).

The photosynthetic products increased leaf number per plant and the availability of nutrients. Nutrition plays a crucial role in enhancing productivity and the quality of the root. Increased vigor of plants, assimilation area, and root size of roots, thereby resulting in a higher weight of roots. These results are in harmony with the findings of (17-19).

Conclusion:

From the results, it was found that spraying Fylloton increased the leaf number, leaf area per plant, chlorophyll content, root length, root diameter, taproot length, root average weight, and total yield of roots significantly; also, spraying Nutrogreen at 6 $ml.L.^{-1}$ gave the highest values of the number of leaves, leaf area, and dry matter percentage, Chlorophyll content, root average weight, and total yield of roots.

The interaction treatments between 6 mL L-1 Fylloton and 6 mL L-1 Nutrogreen illustrate significant differences in the parameters (leaf number, leaf area, dry matter, Chlorophyll content, root length, root diameter, root average weight, total yield of roots, and dry matter percentage in leaves.

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