Effect of foliar feeding of nano DAP fertilizers on growth, yield and quality parameters on eggplant (Solanum melongena L.)

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Abstract

A field experiment was conducted on eggplant at the agricultural research station, Faculty of Agricultural Sciences, SOADU, Bhubaneswar, during summer season of 2024 in order to assess the efficacy of nano DAP fertilizers through foliar feeding and reduce the use of conventional fertilizers, which have significant adverse effects on the soil and the environment. It was laid out in the randomized block design (RBD) with 3 replications and 10 treatments. The treatments comprised of different concentrations of nano DAP formulations (8:16:0 and 2:5:0) at varied concentrations, 100% recommended dose of fertilizer (RDF) (125 kg N, 50 kg P_2O_5, 75 kg K_2O/ha), and 75% N and P_2O_5 with 100% K. FYM was uniformly applied at 10 t/ha. The treatment T_5 (75%% of N & P of RDF + nano DAP (8:16:0) foliar spray @ 4ml/l) recorded the highest plant height (70.29 cm), stem girth (4.11 cm), fruits per plant (18.48), fruit yield per plant (920g), fruit weight (27.62 g), produced the highest yield (301.83 q/ha) which was at par with T_5 (75% RDN (recommended dose of nitrogen) + nano-Urea foliar spray @4ml/l) and T_3(100% RDN as conventional fertilizer in soil). The highest total phenol was recorded in T_5 (1.75 mg GAE/g) and the lowest (0.93 mg GAE/g) in T_1(100% RDF). The highest glucose concentration of fruit was observed in T_7 (7.38%). Thus, applying 75% of N & P of RDF + nano DAP (8:16:0) foliar spray @ 4ml/l (T_5) proved most effective for improving growth, yield and quality in eggplant.

Keywords: Eggplant, Nano-DAP Nitrogen, foliar feeding.

Introduction

Nanotechnology is a new scientific technique that employs equipment and materials capable of exploiting the physical and chemical characteristics of things at the molecular and nano scales. It permits nanoscale investigation of the biological and material worlds and has applications in a variety of sectors, including medicine and agriculture. Nanotechnology involves studying and manipulating extremely tiny things, often less than 100 nm (1 nm = 10^{-9} m). The notion of nanotechnology was initially proposed in 1959 by famous physicist Richard Feynman in his lecture "There's Plenty of Room at the Bottom," in which he highlighted the possibility of manufacturing materials by direct atom manipulation. Inspired by Feynman's theories, K. Eric Drexler developed the term "nanotechnology" and established the conceptual groundwork for its advancement. (1)

Eggplant (Solanum melongena L.) is a nonwoody annual plant that may reach a height of 120 cm. It has purple to white flowers and big lobed leaves with bushy foliage. The primary uses of eggplant are as a vegetable and for therapeutic purposes. Aspartic acid, tropane, flavonoids, lanosterol, gramisterol, steroid alkaloids, glycoalkaloids, histidine, nasunin, oxalic acid, solasodine, ascorbic acid, and tryptophan are among the essential compounds found in eggplant's fruits and leaves, according to phytochemical analysis. It also has a high moisture content and little calories. These substances have been shown to be beneficial in the treatment of a number of illnesses, including cancer, anti-inflammatory, anti-asthmatic, anti-platelet hypo-lipidemic, and hypotensive conditions. Even though the majority of people on the planet still rely on traditional herbal remedies and practices, the most advanced scientific methods are now accessible to treat a wide range of health issues. This review primarily describes S. melongena nutritional value, therapeutic uses, and health advantages (2). Foliar spray of nano fertilizer increases the total phenol content of the fruit. (3)

Materials & methods

The experiment was conducted at the agriculture research station, Binjhagiri, Chatabara, Institute of Agricultural Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, during winter season of 2023-24. The experiment was set up in a randomized block design (RBD) with 10 treatments and 3 replications (Table 1). Nano DAP (8:16:0) used in the present experiment was manufactured by IFFICO (Indian farmers fertilizer cooperative limited). Another nano DAP fertilizer namely Gromor (2:5:0) was used in the experiment. The frequency of fertilizers was applied as foliar application in 3 doses in 15 days interval after transplanting.

By encouraging effective nutrient management, lowering environmental pollution, and increasing crop output, nano fertilizers are essential to sustainable agriculture. They have a number of benefits, such as better crop resilience, regulated nutrient release, less fertilizer consumption, decreased environmental contamination, and increased nutrient absorption efficiency. These benefits promote sustainable agricultural production by minimizing negative environmental consequences and optimizing resource usage. By adopting nano fertilizers, farmers can boost crop yield while using less traditional fertilizer (26,27). This reduces the negative environmental impacts of excessive fertilizer usage while also saving farmers money on output. Using nano fertilizers in sustainable agriculture production has a number of benefits (28). According to Astaneh et al. (2021), the use of nano fertilizers generally lowers production costs for farmers while simultaneously increasing crop tolerance to abiotic challenges, reducing environmental pollution, increasing nutrient use efficiency, and minimizing the negative effects that excessive fertilizer use has on the environment (28). Nano fertilizers offer several benefits for sustainable crop development. nutrients in a controlled manner while reducing the overall amount of fertilizer used (29).

IFFCO Nano DAP

- Nutrient Profile: Provides essential Nitrogen (N) for vegetative growth and Phosphorus (P_2O_5) for root development, flowering, and energy transfer.
- Nutrient Content: 8.0% Nitrogen (N) w/v and 16.0% Phosphorus (P_2O_5) w/v.
- Form: Liquid formulation intended for foliar spray and seed treatment, not soil application.
- Particle Size: Less than 100 nanometres (nm), allowing easy absorption through plant stomata and leaves.
- Components: Contains nitrogen and phosphorus nanocrystals functionalized with biopolymers and excipients.

Gromor Nano DAP

- Nutrient Content: 2% Nitrogen (N) and 5% Phosphorus (P_2O_5) w/v (minimum).
- Particle Size: Nano-sized particles (< 100 nm), with 60–80% below 50 nm.
- Formulation: Polymer-encapsulated liquid suspension.
- Application: Suitable for foliar spray at a dosage of 1 liter per acre.

Treatment details

Table 1

Sl. No.	**Treatment**	**Symbol Used**
1	100% RDF (Recommended Dose of Fertilizer)	$\mathbf{T_1}$
2	75% N & P of RDF	$\mathbf{T_2}$
3	T_2 + nano DAP (8:16:0) foliar spray @ 2ml/l	$\mathbf{T_3}$
4	T_2 + nano DAP (8:16:0) foliar spray @ 3ml/l	$\mathbf{T_4}$
5	T_2 + nano DAP (8:16:0) foliar spray @ 4ml/l	$\mathbf{T_5}$
6	T_2 + nano DAP (8:16:0) foliar spray @ 5ml/l	$\mathbf{T_6}$
7	T_2 + nano DAP (2:5:0) foliar spray @ 2ml/l	$\mathbf{T_7}$
8	T_2 + nano DAP (2:5:0) foliar spray @ 3ml/l	$\mathbf{T_8}$
9	T_2 + nano DAP (2:5:0) foliar spray @ 4ml/l	$\mathbf{T_9}$
10	T_2 + nano DAP (2:5:0) foliar spray @ 5ml/l	$\mathbf{T_{10}}$

Spacing of 60 cm × 45 cm was adopted. Recommended Fertilizer dose was 125 Kg N_2, 50 Kg P_2O_5, 75 Kg K_2O/ ha. Observations were recorded on plant height, stem girth, branches per plant, leaves per plant, leaf length, leaf width, leaf area, plant spread east-west, plant spread north-south, days to first flowering, days to 50% flowering, fruit girth, fruit length, fruit weight, fruits per plant, fruit yield per plant, fruit yield, glucose concentration, refractive index, total phenol. Data were analysed by following the procedure of (3).

Results and Discussion

Growth parameters

Plant Height (cm)

At 30 DAS

The data presented in Table 2 shows that the maximum plant height (28.41 cm) was recorded in treatment T_5 (T_2 + nano DAP (8:16:0) foliar spray @ 4ml/l), which was significantly superior to treatments T_1, T_3, T_4, T_5, T_6, T_8, T_9 and T_{10}. A consistent increase in plant height was observed with increasing nano DAP concentration up to 4 ml/l. However, a further increase to 5 ml/l showed a detrimental effect. The minimum plant height (14.43 cm) was recorded in T_2 (75% N & P of RDF). Similar results were reported by (4,9-11,14-16,18-20,22,24).

At 60 DAS

The data presented in Table 2 shows that the maximum plant height (54.67 cm) was recorded in treatment T_5 (T2 + nano DAP (8:16:0) foliar spray @ 4ml/l), which was significantly superior to treatments T_1, T_3, T_4, T_5, T_6, T_8, T_9 and T_{10}. A consistent increase in plant height was observed with increasing nano DAP concentration up to 4 ml/l. However, a further increase to 5 ml/l showed a detrimental effect. The minimum plant height (26.56 cm) was recorded in T_2 (75% N & P of RDF). Similar results were reported by (4,9-11,14-16,18-22,24).

At 90 DAS

The data presented in Table 2 shows that the maximum plant height (70.29 cm) was recorded in treatment T_5 (T2 + nano DAP (8:16:0) foliar spray @ 4ml/l), which was significantly superior to treatments T_1, T_3, T_4, T_5, T_6, T_8, T_9 and T_{10}. A consistent increase in plant height was observed with increasing nano DAP concentration up to 4 ml/l. However, a further increase to 5 ml/l showed a detrimental effect. The minimum plant height (41.37 cm) was recorded in T_2 (75% N & P of RDF). Similar results were reported by (4,9-11,14-16,18-22,24).

Stem Girth (cm)

At 30 DAS

According to table-2 the maximum stem girth (1.45 cm) was observed in T_5 which was significantly better than treatments T1, T3, T6, T7, and T10, but statistically similar to T_4 and T_9. Stem girth increased steadily with nano DAP application up to 4 ml/l but declined at 5 ml/l. The minimum stem girth (0.61 cm) was recorded in T_2.

At 60 DAS

As described in table-2 showed that the maximum stem girth (2.76 cm) was observed in T_5 which was significantly better than treatments T1, T3, T6, T7, and T10, but statistically similar to T_4 and T_9. Stem girth increased steadily with nano DAP application up to 4 ml/l but declined at 5 ml/l. The minimum stem girth (1.08 cm) was recorded in T_2.

At 90 DAS

As presented in table-2 the maximum stem girth (4.11 cm) was observed in T_5 which was significantly better than treatments T1, T3, T6, T7 and T10, but statistically similar to T_4 and T_9. Stem girth increased steadily with nano DAP application up to 4 ml/l but declined at 5 ml/l. The minimum stem girth (1.75 cm) was recorded in T_2.

Branches per Plant

At 30 DAS

As stated in table-2 T_5 having the maximum number of branches per plant (11.2), significantly out performing T1, T3, T4, T6, T7, T8 and T10 and was statistically on par with T9. A concentration of 4 ml/l of nano DAP showed a positive effect, but 5 ml/l led to a decline. The lowest branch count (5.6) was observed in T_2. Similar result was reported by (5-8,13,14,16,19,20,22).

At 60 DAS

As presented in table-2 T_5 showed that the maximum number of branches per plant (17.33), significantly outperforming T1, T3, T7 and T10 and was statistically on par with T4, T6, T8 and T9. A concentration of 4 ml/l of nano DAP showed a positive effect, but 5 ml/l led to a decline. The lowest branch count (10.8) was observed in T_2. Similar result was reported by (5-8,13,14,16,19,20,22).

At 90 DAS

According to table-2 T_5 viewed that the maximum number of branches per plant (21.13), significantly T1, T3, T6, T7 and T10 and was statistically on par with T4, T8 and T9. A concentration of 4 ml/l of nano DAP showed a positive effect, but 5 ml/l led to a decline. The lowest branch count (12.8) was observed in T_2. Similar result was reported by (5-8,14,16,19,20,22).

Leaves per Plant

At 30 DAS

Based on the datas provided in table-2 the highest number of leaves per plant (26.87) was recorded in T_5, significantly higher than T1, T3, T4, T6, T7, T8 and T10, and at par with T9. Again, the optimal concentration was 4 ml/l, with detrimental effects observed at 5 ml/l. The lowest leaf count (14.20) was found in T_2. Similar result was reported by (9,11,14,18-20).

At 60 DAS

The datas provided in table-2 showed that the highest number of leaves per plant (56.73) was recorded in T_5, significantly higher than T1, T3, T4, T6, T7, and T10 and at par with T8 and T9. Again, the optimal concentration was 4 ml/l, with detrimental effects observed at 5 ml/l. The lowest leaf count (31.8) was found in T_2. Similar result was reported by (56.73). (9,11,14,18-20,23).

At 90 DAS

As per table-2 the highest number of leaves per plant (65.8) was recorded in T_5, significantly higher T1, T3, T4, T6, T7 and T10 and at par with T8 and T9. Again, the optimal concentration was 4 ml/l, with detrimental effects observed at 5 ml/l. The lowest leaf count (35.93) was found in T_2. Similar result was reported by (9,11,14,18-20,23).

Leaf Length (cm)

As reported by table-3 The highest leaf length (13.53 cm) was observed in T_5, significantly higher than T1, T3, T4, T6, T7, T8, T9 and T10. Leaf length increased up to 4 ml/l nano DAP, with a decline at higher concentrations. T_2 recorded the minimum (8.76 cm).

Leaf Width (cm)

As masoned by the datas on table-3 T_5 had the highest leaf width (6.89 cm), significantly different from T1, T3, T4, T6, T7, T8 and T10 and at per with T9. The detrimental effect of nano DAP at 5 ml/l was evident, especially with reduced conventional urea. T_2 had the minimum (4.51 cm).

Leaf Area (sq. cm)

As per table-3 T_5 recorded the maximum leaf area (70.91 sq. cm), significantly better than T1, T3, T4, T6, T7, T8, T9 and T10. The increase in leaf area may be attributed to better absorption and utilization of nano DAP, even when the conventional urea dose was reduced by 25%. The lowest leaf area (26.39 sq. cm) was in T_2. Similar results were reported by (4-6,8-10,15-18,20,23,24)

Plant Spread (cm) East-West

The datas given in table-3 T_5 recorded the highest plant spread (101.73 cm), significantly superior to T1, T2, T4, T6, T7, and T9, and statistically similar to T3, T5, and T8. The minimum spread (59.71 cm) was found in T_2. Similar result was reported by (10,17).

Plant Spread (cm) North-South

Table-3 show that the highest plant spread (100.51 cm) was also recorded in T_5, significantly different from T1, T3, T4, T6, T7, T8, T9 and T10. The minimum spread (59.82 cm) was recorded in T_2. Similar result was reported by (10,17).

Flowering, Yield and Yield Attributes

Days to First Flowering

According to table-4 T_8 required the minimum days to first flowering (79 DAS), while T_6 required the maximum (87.33 DAS). All treatments were statistically similar. Similar findings were reported by (19).

Days to 50% Flowering

As per table-4 The earliest 50% flowering was seen in T_8 (93 DAS), while T_6 took the longest (99.33 DAS), though differences were not statistically significant (19).

Quality analysis of fruit

Glucose Concentration (%)

As per the datas provided in table-5 The highest glucose concentration was recorded in T_5 (6.29%), significantly better than all the treatments. The lowest concentration (4.38%) was in T_1.

Refractive Index (°Brix)

In table-5 show the highest refractive index T_5 (1.35 °Brix) was recorded significantly better than T2, T3, T4, T7, T8 and T10 and at par with T6 and T9. T_1 had the lowest value (1.31 °Brix).

Sucrose Conc. (%)

As per the datas provided in table-5 The highest sucrose concentration was recorded in T_5 (6.13%), significantly better than all the treatments. The lowest concentration (4.25%) was in T_1.

Total Phenol (mg GAE/g)

As reported in table-5 The highest total phenol content was found in T_5 (1.75 mg GAE/g), significantly better than all other treatments. The lowest (0.98 mg GAE/g) was recorded in T_1. Similar findings were reported by (4).

TSS (brix^0)

In table-5 show the highest refractive index T_5 (7.28 °Brix) was recorded in T2, T3, T4, T6, T7, T8, and T10, significantly better than T1, and at par with the T_9. T_1 had the lowest value (5.13 °Brix). (4,6,11,24)

Fruit yield and yield attributes

Fruit Girth (cm)

As datas masoned in table-6 T_5 had the largest fruit girth (8.71 cm), significantly better than T1, T3, T4, T6, T7, T8, T9 and T10. The lowest (5.12 cm) was recorded in T_2. Similar findings were reported by (5,7,9-11,14).

Fruit Length (cm)

As per table-6 maximum fruit length (10.72 cm) was observed in T_5, significantly higher than T1, T3, T4, T6, T7, T8, T9 and T10. The shortest fruits (6.34 cm) were in T_2. Similar findings were reported by (11,14).

Fruit Weight (g)

Based on the datas in table-6 T_5 produced the heaviest fruits (27.62 g), significantly more than T1, T3, T4, T6, T7, T8, T9 and T10. The lowest fruit weight (16.49 g) was in T_2. Similar findings were reported by (11,14).

No of Fruits per Plant

As masoned datas on table-6 T_5 had the highest number of fruits per plant (18.48), significantly more than the treatments T1, T3, T4, T6, T7, T8 and T10 and at par with T_9. The minimum (3.64) was found in T_2. Similar findings were reported by (11,14,24).

Fruit Yield per Plant (g)

The table-6 viewed that the highest fruit yield per plant (0.92 g) was observed in T_2, significantly better than the treatments T1, T3, T4, T6, T7, T8 and T10 and at par with T_9. The lowest yield (0.18 g) was in T_2. Similar findings were reported by (5,6,14)

Fruit Yield (q/ha)

As reported in table-6 T_5 gave the highest yield (228.08 q/ha), significantly superior to T1, T3, T4, T6, T7, T8 and T10 and at par with T_9. The minimum yield (44.87 q/ha) was in T_2. Similar findings were reported by (4,6-9,11-16,18,20-25).

Soil parameters

pH

A reference to Table 7 indicates that the highest pH value (6.95) was observed in T_5 which was followed by T_9. The lowest pH (6.21) was recorded in T_1.

Electrical conductivity (dSm^{-1})

The maximum EC value (0.71dSm^{-1}) was recorded in T_7 (Table 7). The minimum EC was recorded by T_4 (0.47dSm^{-1}). (12)

Organic carbon (g/kg)

A perusal of Table 7 reveals that the highest soil organic carbon (7.53 g/kg) was recorded in T_5 which was followed by $T_{1,}$ T_8 and T_9. The lowest soil organic carbon was recorded T_2 (5.44 g/kg).

Available P (kg/ha)

The highest available phosphorus was seen in the treatment T_9 (28.4 kg/ha) which was followed by T_5. T_7 has recorded the lowest available soil phosphorus content 24.8 kg/ha (Table 7). (12)

Available K (kg/ha)

It is evident from Table 7 that the maximum available soil potassium content was observed in treatment T_6 (489 kg/ha) which was followed by T_9 and the minimum available soil potassium content was observed in T_7 (349 kg/ha). (12)

Conclusion

The treatment T_5 (75% N & P of RDF + nano DAP (8:16:0) foliar spray @ 4ml/l) produced the highest yield (228.08 q/ha) which was at par with T_9 (75% N & P of RDF + nano DAP (2:5:0) foliar spray @ 4ml/l). The research on eggplant on acknowledged that conventional fertiliser is required more amount in soil for batter growth and development, but the nano-nitrogen fertiliser foliar spray reduces the application of conventional fertiliser which is helpful to make good soil tilth.

Table- 2 Effect of Nano-DAP fertilizers on vegetative growth of brinjal. (Summer 2024)

Treatment Details	Plant height (cm)			Stem girth (cm)			Branches per plant			Leaves per plant		
	30DAS	60DAS	90DAS	30DAS	60DAS	90DAS	30DAS	60DAS	90DAS	30DAS	60DAS	90DAS
100% RDF	15.37	33.00	45.87	0.68	1.23	2.00	6.07	12.07	14.00	15.33	35.33	40.40
75% N & P of RDF	14.43	26.56	41.37	0.61	1.08	1.75	5.60	10.80	12.80	14.20	31.80	35.93
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	20.60	42.50	57.03	0.84	1.47	2.91	7.67	12.93	15.80	19.27	41.80	50.73
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	24.79	49.32	64.15	1.29	2.46	3.59	9.67	14.73	18.07	22.60	47.93	58.20
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	28.41	54.67	70.29	1.45	2.76	4.11	11.20	17.33	21.13	26.87	56.73	65.80
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	21.81	42.24	55.59	0.91	2.09	3.07	8.87	16.13	17.07	20.00	42.47	52.53
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	18.37	37.23	46.78	0.61	1.23	2.16	7.07	11.27	13.93	17.07	36.33	43.40
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	22.30	45.44	60.14	1.11	2.35	3.18	9.27	15.07	18.47	23.37	49.80	60.33
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	24.57	50.49	64.97	1.31	2.61	3.69	10.67	15.93	19.93	26.20	54.27	64.73
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	19.71	39.54	53.03	0.89	1.78	2.76	8.47	13.33	16.27	19.00	40.47	50.00
SE(m)±	0.29	0.79	1.51	0.06	0.13	0.23	0.46	1.13	1.29	1.17	2.93	2.41
CD (0.05)	0.86	2.35	4.47	0.17	0.39	0.68	1.38	3.35	3.83	3.48	8.71	7.16

NB: RDF (Recommended Dose of Fertilizer) (N_2: P_2O_5: K_2O) = 125:50:75 Kg/ha

NB: 100% K will be applied in all the treatments

Table-3

Treatment Details	Leaf length (cm)	Leaf width (cm)	Leaf area (sq. cm)	Plant Spread(cm)	
				East-West	North-South
100% RDF	9.94	4.98	34.16	66.60	66.93
75% N & P of RDF	8.76	4.51	26.39	59.71	59.82
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	11.10	5.50	44.72	73.42	71.13
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	12.22	6.10	55.39	83.02	81.23
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	13.53	6.89	70.91	101.73	100.51
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	10.49	5.33	38.66	70.32	79.81
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	10.95	5.53	41.78	75.19	70.09
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	11.40	5.74	45.55	83.05	83.41
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	12.61	6.55	60.47	90.91	97.13
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	10.39	5.31	38.52	77.42	76.48
SE(m)±	0.29	0.16	3.29	3.13	1.03
CD (0.05)	0.85	0.49	9.76	9.30	3.07

NB: 100% K was applied in all the treatments.

RDF - Recommended Dose of Fertilizer.

Table-4 Effect of Nano-DAP fertilizers on flowering of brinjal. (Summer 2024)

Treatment Details	Days to first flowering (DAS)	Days to 50% flowering (DAS)
100% RDF	81.33	94.33
75% N & P of RDF	85.00	96.33
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	83.33	96.33
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	85.67	98.67
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	84.67	97.67
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	82.67	95.67
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	87.33	99.33
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	78.67	91.67
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	79.00	92.00
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	80.00	93.00
SE(m)±	1	1.02
CD (0.05)	2.97	3.05

NB: 100% PK was applied in all the treatments.

DAS - days after sowing

Table-5 Effect of Nano-DAP fertilizers on fruit quality parameters of brinjal. (Summer season 2024)

Treatment Details	Glucose Conc. (%)	Refractive Index(brix^0)	Sucrose Conc. (%)	Total Phenol (mg GAE/g)	TSS (brix^0)
100% RDF	4.38	1.31	4.25	0.98	5.13
75% N & P of RDF	5.44	1.32	5.17	1.13	5.93
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	5.42	1.32	5.31	1.30	6.23
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	5.72	1.33	5.59	1.48	6.44
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	6.29	1.35	6.13	1.75	7.28
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	5.53	1.34	5.36	1.49	6.30
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	5.36	1.32	5.16	1.40	5.83
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	5.67	1.33	5.48	1.54	6.23
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	5.91	1.34	5.84	1.65	6.84
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	5.55	1.32	5.29	1.49	6.24
SE(m)±	0.12	0.00	0.08	0.03	0.19
CD (0.05)	0.35	0.01	0.25	0.08	0.56

NB: 100% PK was applied in all the treatments.

Table-6 Effect of nano fertilizer on fruit yield and yield attributes of brinjal. (Summer season 2024)

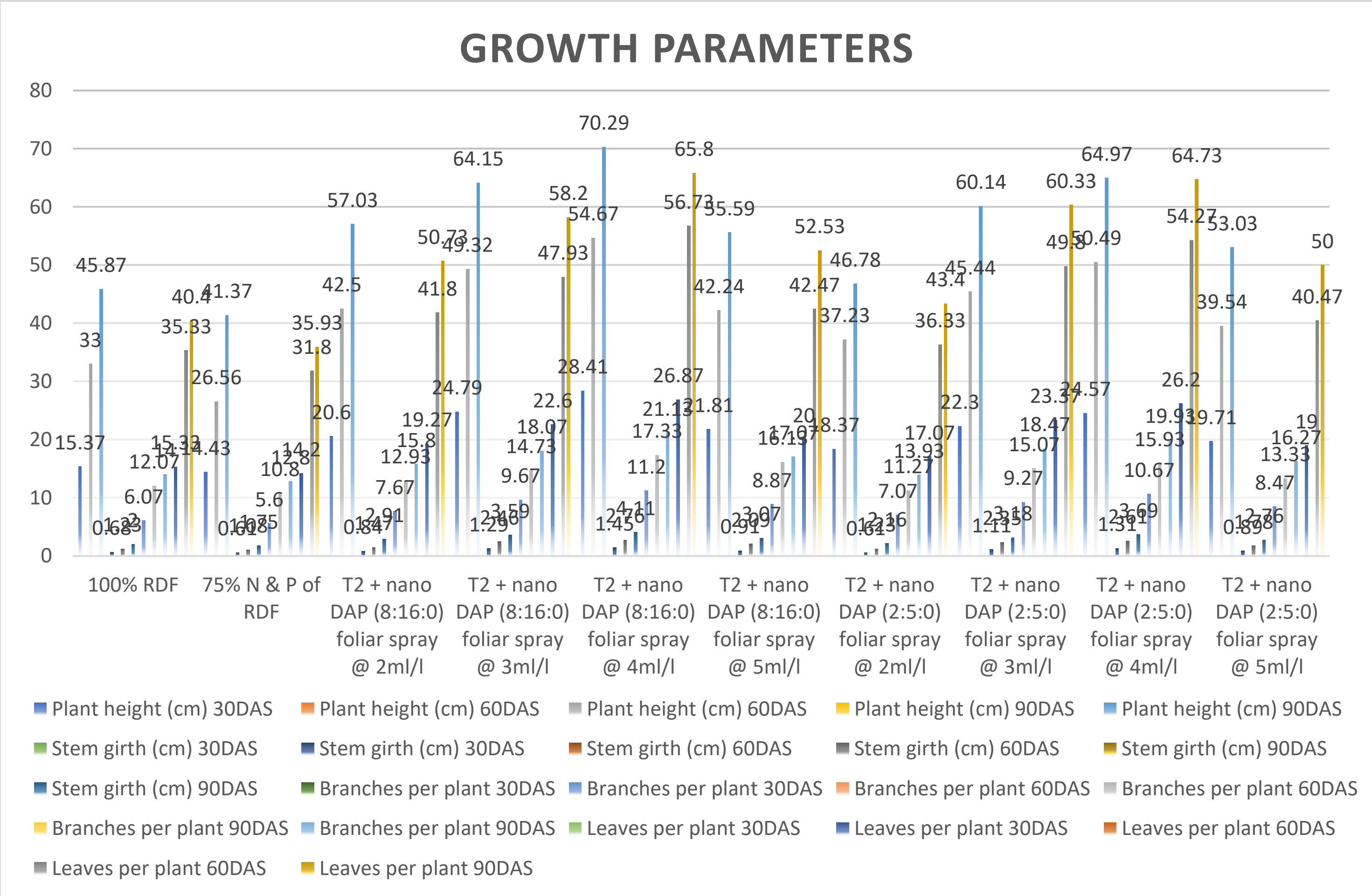
Treatment Details	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	No of Fruits per plant	Fruit yield per plant (g)	Fruit yield (q/ha)
100% RDF	7.18	5.81	18.81	4.73	0.23	58.409
75% N & P of RDF	6.34	5.12	16.49	3.64	0.18	44.876
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	7.49	6.07	19.36	6.74	0.34	83.213
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	8.55	7.02	22.43	11.94	0.60	147.34
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	10.72	8.71	27.62	18.48	0.92	228.08
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	7.49	5.74	18.19	9.80	0.49	120.89
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	7.44	5.98	18.97	6.73	0.34	83.007
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	8.26	6.48	20.31	11.55	0.57	142.57
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	9.87	7.61	24.51	17.17	0.86	211.92
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	7.64	6.42	19.44	9.93	0.50	122.54
SE(m)±	0.24	0.33	0.67	0.69	0.03	8.51
CD (0.05)	0.70	0.97	1.98	2.05	0.1	25.29

NB: 100% PK was be applied in all the treatments.

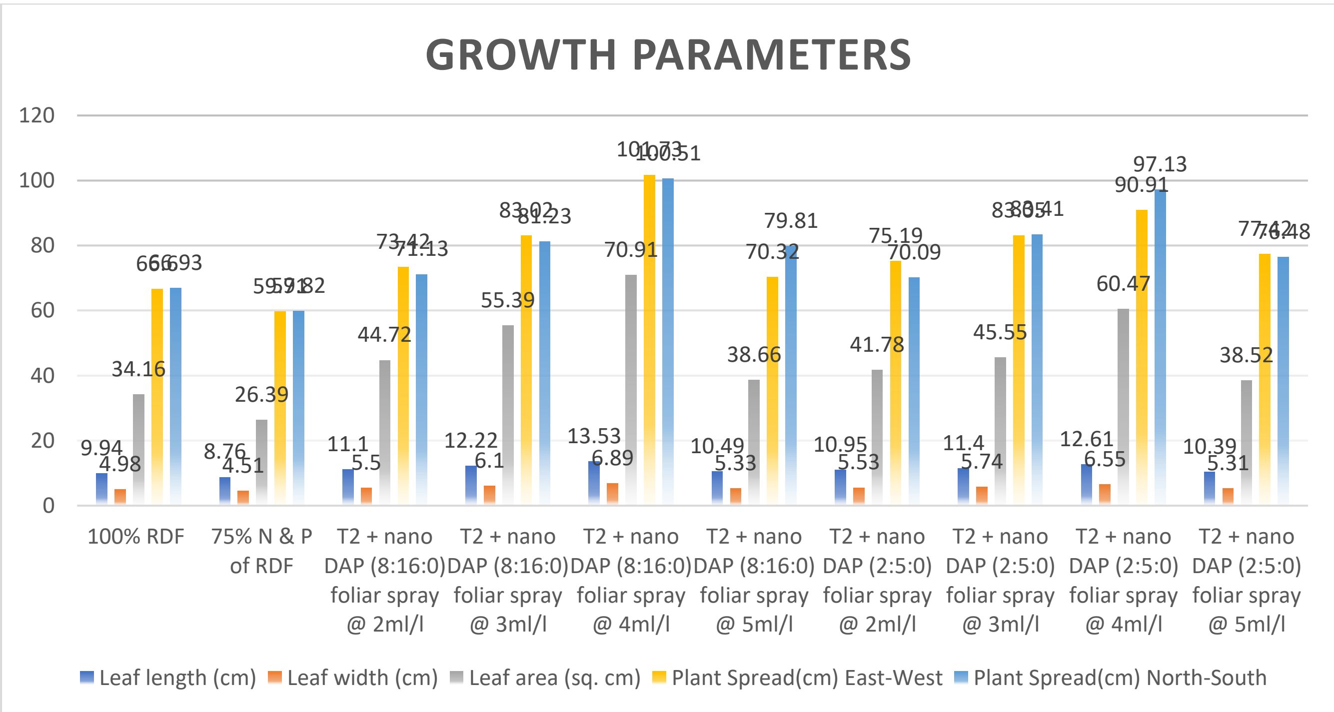
Table 7: Analysis of final soil samples

Treatment Details	pH	Electrical conductivity (dSm^{-1})	Organic Carbon (g/kg soil)	Available P(kg/ha)	Available K(kg/ha)
100% RDF	6.21	0.52	7.21	26.3	438.0
75% N & P of RDF	6.32	0.57	5.44	25.8	375.0
T2 + nano DAP (8:16:0) foliar spray @ 2ml/l	6.65	0.61	5.73	26.7	358.0
T2 + nano DAP (8:16:0) foliar spray @ 3ml/l	6.49	0.47	6.25	25.2	465.0
T2 + nano DAP (8:16:0) foliar spray @ 4ml/l	6.77	0.66	7.53	28.1	367.0
T2 + nano DAP (8:16:0) foliar spray @ 5ml/l	6.62	0.53	6.12	25.1	489.0
T2 + nano DAP (2:5:0) foliar spray @ 2ml/l	6.45	0.71	5.52	24.8	349.0
T2 + nano DAP (2:5:0) foliar spray @ 3ml/l	6.59	0.59	7.33	26.7	463.0
T2 + nano DAP (2:5:0) foliar spray @ 4ml/l	6.73	0.68	7.19	28.4	478.0
T2 + nano DAP (2:5:0) foliar spray @ 5ml/l	6.63	0.51	6.23	26.5	352.0

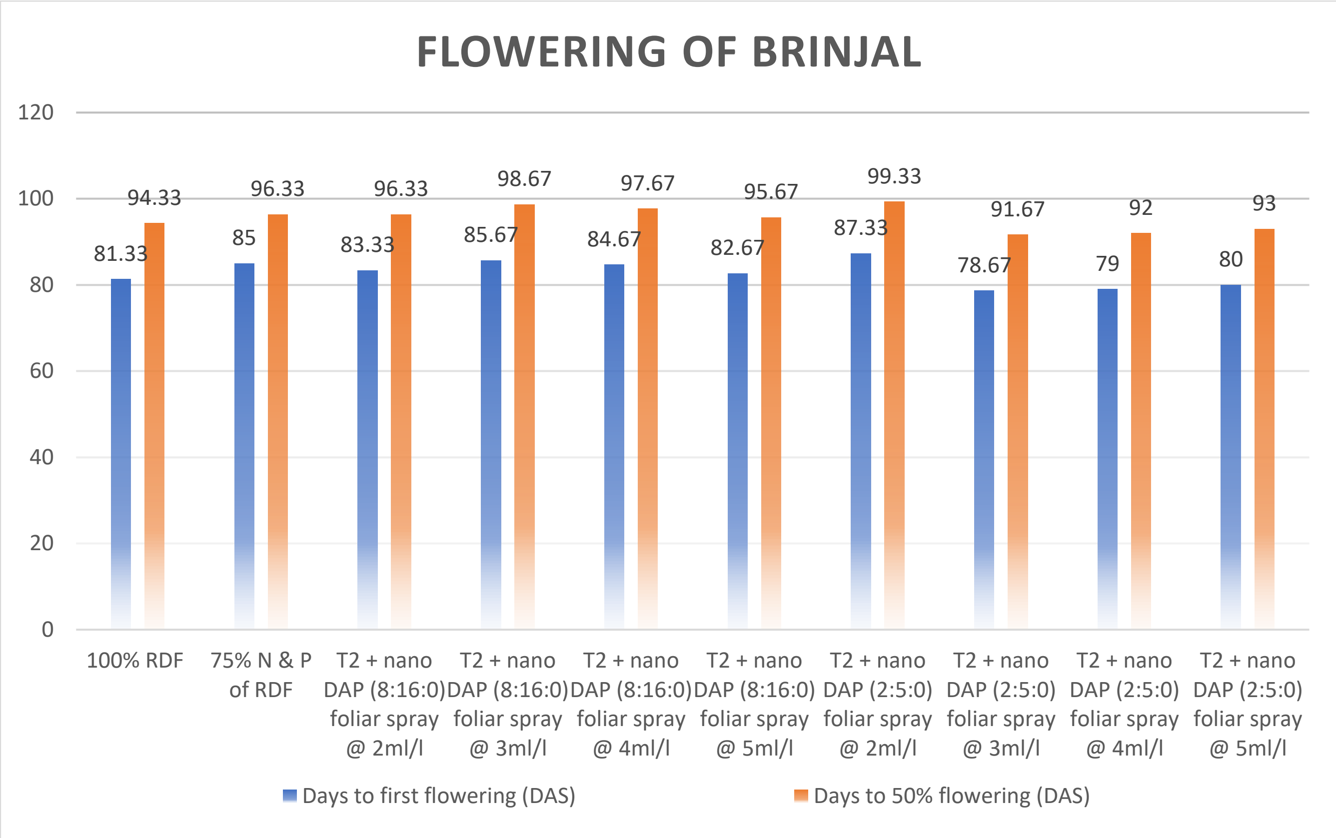
Graph-1 vegetative growth of brinjal



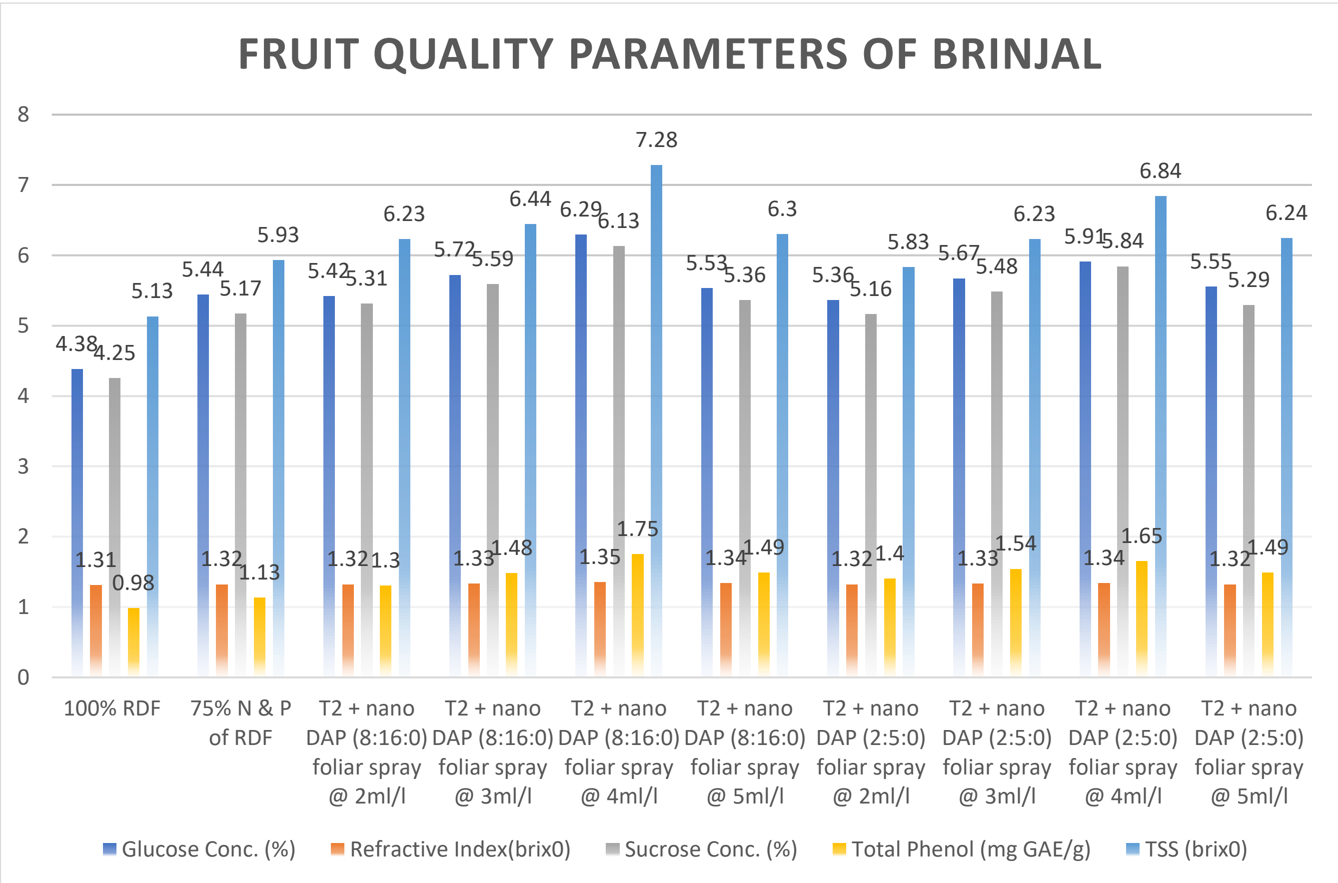
Graph-2 vegetative growth of brinjal



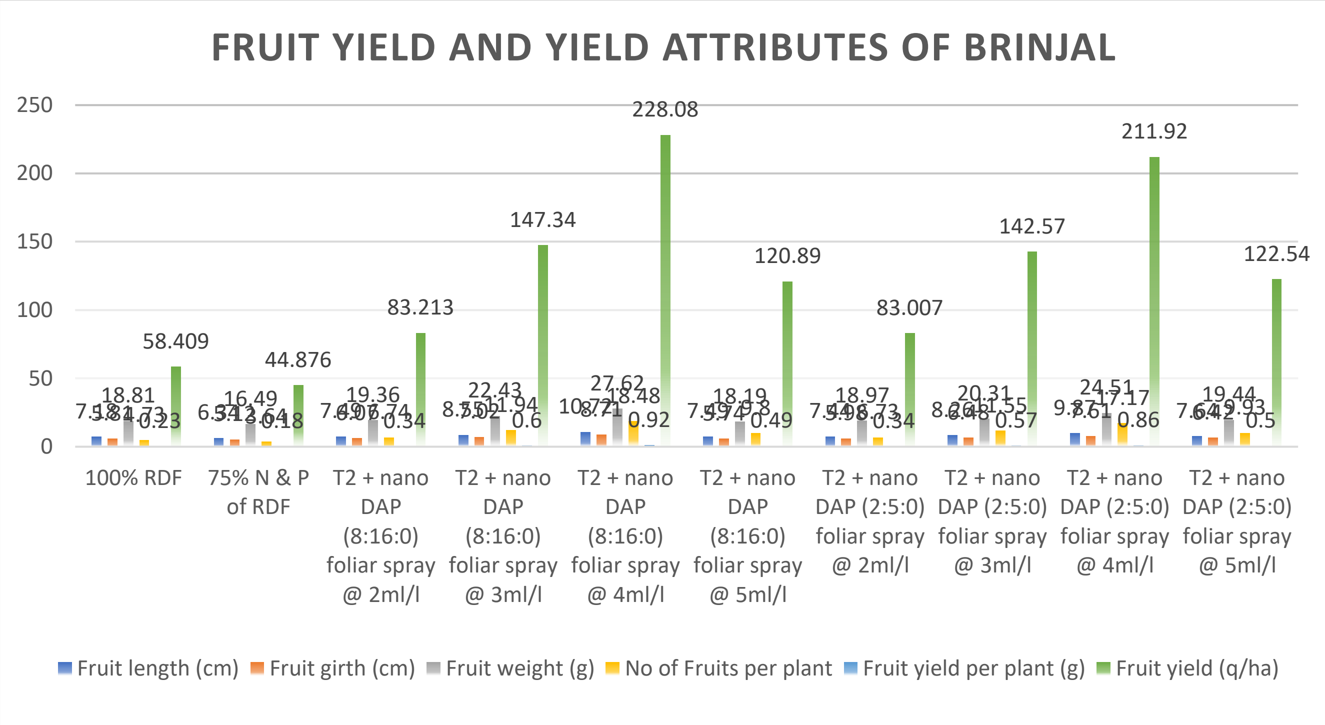
Graph-3 flowering of brinjal



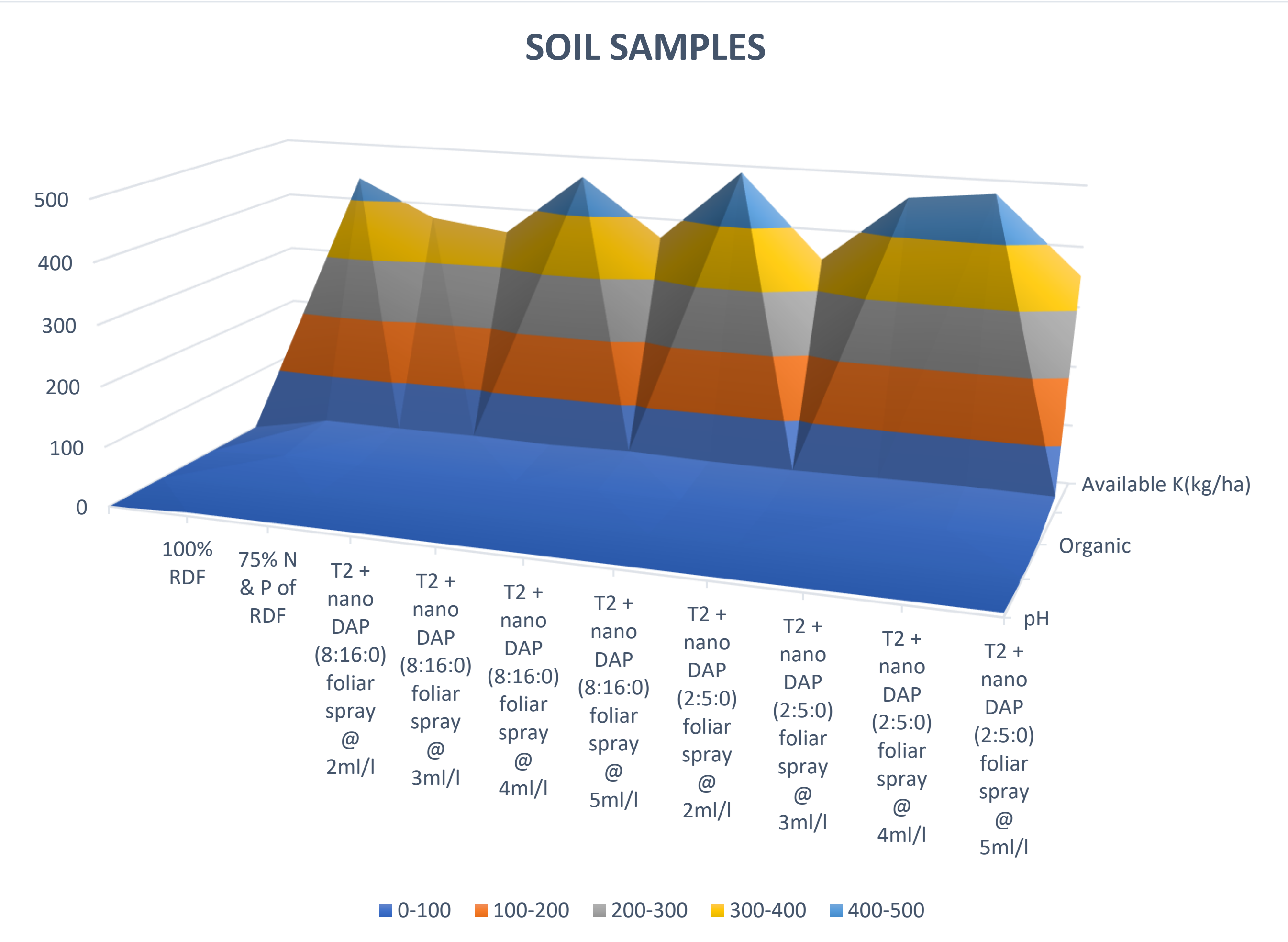
Graph-4 fruit quality parameters of brinjal



Graph-5 fruit yield and yield attributes of brinjal



Graph-6 soil samples



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Author contributions

N.D. and A.N.: Conceptualized and designed the work; A.N. and N.D.: Designed and performed the experiment; N.D.: Writing of original draft, Final correction; A.N.: Final editing and proof reading; N.D. and A.S.: data analysis; N.D. and A.N.: Data analysis and data correction; A.S. and A. N.: Correction in the manuscript, Correction of language.

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Competing interests

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Data Availability

- All data analysed during this study are included in this published article.
- The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.