



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.2.330>

EFFECT OF NANO UREA PLUS AND NANO DAP ON GROWTH AND YIELD OF OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH) CULTIVARS DURING SUMMER

A. Sahasra^{1*}, T. Suresh Kumar², A. Bhagwan³, D. Anitha Kumari⁴ and R. Preetham Goud⁵

¹Department of Vegetable Science, Post graduate institute for horticultural Sciences, SKLTGHU, Mulugu, Siddipet, Telangana, India.

²Director of extension, Sri Konda Laxman Telangana Horticultural University, Telangana, India.

³Registrar and Comptroller, SKLTGHU, Mulugu, Siddipet, Telangana, India

⁴Principal Scientist (Ento) and Head Vegetable Research Station, SKLTGHU, Rajendranagar, Hyderabad, Telangana, India

⁵Department of Agronomy, Vegetable Research Station, SKLTGHU, Rajendranagar, Telangana, Hyderabad, India

*Corresponding author E-mail: sahasras660@gmail.com

(Date of Receiving : 11-07-2025; Date of Acceptance : 22-09-2025)

ABSTRACT

A field experiment was conducted at Centre of Excellence, SKLTGHU, Mulugu, Siddipet, Telangana, India to study the “Effect of Nano Urea Plus and Nano DAP on okra (*Abelmoschus esculentus* L. Moench) cultivars during summer”. The experiment was laid down using a Factorial Randomized Block (FRBD) Design with two factors: Factor 1–Varieties (V₁- Arka Anamika, V₂-Kashi Lalima) and Factor 2–Six Nutrient levels (N₁ – 100% RDF, N₂–100% RDF with 1foliar spray of nano urea plus and nano DAP, N₃–100% RDF with 2 foliar sprays of nano urea plus and nano DAP, N₄–75% RDF, N₅–75% RDF with 1 foliar spray of nano urea plus and nano DAP, N₆–75% RDF with 2 foliar sprays of nano urea plus and nano DAP). Study comprised twelve treatment combinations, each replicated thrice. Arka Anamika exhibited better growth and recorded maximum plant height (64.31 cm), maximum number of branches per plant (16.29), more number of leaves per plant (19.39) at 60 DAS, significantly superior yield attributes fruit length (18.59 cm), fruit girth (1.50 cm), number of fruits per plant (20.93), mean fruit weight (13.35) and higher fruit yield per plant (279.78 g) when compared to Kashi Lalima. Of the six nutrition levels tested N₃ (100% RDF along with 2 foliar sprays of nano urea plus and nano DAP) resulted in better growth, yield attributes and yield compared to other nutrition levels. In the interactions V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of nano urea plus and nano DAP) resulted in better growth in terms of plant height, number of branches per plant, number of leaves per plant, maximum fruit length, fruit girth, more number of fruits per plant, maximum mean fruit weight and also recorded maximum fruit yield per plant (316.35 g) and fruit yield per hectare (187.00 q). 75% RDF along with 2 foliar sprays of nano urea plus and nano DAP resulted in on par growth, yield attributes and yield of 100% RDF. The 25% reduction in chemical fertilizers of nitrogen and phosphorous can be compensated with 2 foliar sprays of NUP and NDAP.

Keywords: nano urea plus, nano DAP, growth, yield attributes and yield.

Introduction

Abelmoschus esculentus L. Moench commonly known as lady’s finger or okra, is an economically important vegetable crop belonging to the Malvaceae family (Narayan *et al.*, 2021) with chromosome number 2n=130 and is native to Africa. It is cultivated in tropical, subtropical and warm temperate regions across continents such as Africa, Asia, southern

Europe, and the America. Okra has been recognized for its therapeutic properties in the management of genito-urinary disorders and chronic dysentery. The fruit is a significant source of essential nutrients, including vitamins, calcium, potassium, and various minerals. Additionally, the mature fruits and stems of okra are rich in crude fibre, which is utilized in the paper manufacturing industry (Singh *et al.*, 2014).

The growth and yield of okra primarily depend on the quality and quantity of fertilizers applied. However, the loss of mineral nutrients through leaching, surface runoff and significant volatilization is a growing concern due to its economic impact and contribution to environmental pollution (Rameshaiah *et al.*, 2015). Nanotechnology is a promising research field that utilizes nano materials smaller than 100 nm, offering a unique opportunity to develop concentrated plant nutrient sources with higher absorption rates, improved utilization efficiency, and minimal losses (Mahanta *et al.*, 2019). One of the key applications of nano fertilizers is to enhance plants ability to absorb nutrients (Ditta, 2012). Nano-urea, developed by the Indian Farmers Fertilizer Cooperative (IFFCO), features nano-meter sized particles, an extended shelf life and a reduced environmental impact. Its use offers significant potential for sustainable agriculture by minimizing agro-chemical use and improving soil health. In comparison to conventional urea, nano urea provides greater efficiency, lowers environmental impact, ensures a controlled nutrient release and delivers economic advantages (Preetha *et al.*, 2017). Embracing energy-efficient novel fertilizers, such as nano-fertilizers is crucial for achieving sustainable agriculture and meeting global food demands while mitigating environmental impacts (Kumar *et al.*, 2023). In view of the above a study was conducted “Effect of Nano Urea Plus and Nano DAP okra (*Abelmoschus esculentus* L. Moench) cultivars during summer to find out the response of okra cultivars to varying levels of chemical fertilizers along with or without Nano Urea Plus and Nano DAP.

Material and Methods

The experiment entitled “Effect of Nano Urea Plus and Nano DAP on okra (*Abelmoschus esculentus* L. Moench) cultivars during summer”. was conducted during summer 2025 at Centre of Excellence, Sri Konda Laxman Telangana Horticultural University SKLTGHU, Mulugu, Siddipet district, Telangana, located at 17°43’16’’ N latitude, 78°37’30’’ E longitude and 451 m altitude. A field experiment was laid out in a Factorial Randomized Block (FRBD) Design with two factors: Factor 1–Varieties (V₁- Arka Anamika, V₂-Kashi Lalima) and Factor 2–Six Nutrient levels (N₁ – 100% RDF, N₂–100% RDF with 1foliar spray of nano urea plus and nano DAP, N₃–100% RDF with 2 foliar sprays of nano urea plus and nano DAP, N₄–75% RDF, N₅–75% RDF with 1 foliar spray of nano urea plus and nano DAP, N₆–75% RDF with 2 foliar sprays of nano urea plus and nano DAP). Plots were prepared with a size of 2.7 m × 3 m and sixty plants were accommodated in each plot by following

the spacing of 45 cm × 30 cm. The seeds of okra variety Arka Anamika and Kashi Lalima were obtained from IIHR Bangalore and NSC, Hyderabad. The dibbling of seeds was done at a spacing of 45×30 cm. Before sowing, farmyard manure (FYM) was incorporated into the soil. Recommended dose of fertilizers 120:60:60 N: P₂O₅: K₂O kg/ha were applied. Nitrogen (N), phosphorus (P) and potassium (K) were supplied using Urea, Single super phosphate (SSP) and Muriate of potash (MOP). SSP and MOP were entirely applied as a basal dose, whereas nitrogen was administrated in varying treatments, with 100%, 75% applied at the basal stage. Nano fertilizers were sprayed according to the prescribed treatments at pre flowering and second at 15 days after first spray @ 4.0 ml/L. All the package of practices followed to raise a good crop. Need based plant protection measures were also taken up. The data was statistically analysed as per the procedure of Panse and Sukhatme (1985).

Details of Biometric Observations Sampling Technique:

To evaluate the growth parameters, five healthy plants were randomly chosen from each net plot. These plants were labelled for easy identification, and biometric observations were recorded.

Growth Parameters:

Plant height:

The height of plants from the ground level to the top most leaf was recorded at 60 DAS from all the tagged plants and average was worked out.

Number of branches per plant:

The number of branches produced per plant was periodically recorded from the five tagged plants and the mean values were computed at 60 DAS at the time of final harvest.

Number of leaves per plant

The total number of leaves produced in each tagged plant at 60 DAS were counted and average was worked out.

Yield parameters:

Average fruit length (cm)

Fruit length of five randomly selected plants from each treatment was recorded at harvest by measuring five randomly selected fruits using a scale. The average of these measurements was then calculated.

Average fruit girth (cm)

Fruit girth of five randomly selected plants from each treatment was measured at the time of harvest in

each treatment by vernier callipers and average value was calculated.

Number of fruits per plant

The total number of fruits produced per plant was recorded at each harvest from five tagged plants in each replication and the mean values were calculated to assess the yield performances.

Fruit yield per plant (g)

Fruit yield per plant was recorded by counting the total number of fruits harvested from each tagged plant in all pickings, the average yield was then determined and expressed in kilograms per plant.

Fruit yield per plot (kg)

The total yield was obtained from each plot at every picking and averages were worked out.

Fruit yield per hectare (q)

Fruits harvested in each treatment from all pickings were measured and Yield per hectare was calculated and expressed in tonnes per hectare.

Results and Discussion

Plant Growth:

Plant height, No. of branches and No. of leaves per plant:

The data (Table 1) showed that Significant variations were observed among the varieties, nutrient levels and varieties and nutrient level interaction on the plant growth with respect to plant height, number of branches and number of leaves per plant at 60 DAS.

V₁- Arka Anamika registered maximum plant height (64.31cm), maximum number of branches per plant (16.29) and maximum number of leaves per plant (19.39) and was significantly superior to variety V₂- Kashi Lalima (58.82 cm, 15.26 and 18.07).

Among the nutrient levels N₃ (100% Recommended dose of fertilizers along with 2 foliar sprays of NUP and NDAP) recorded the maximum plant height (65.37 cm), maximum number of branches per plant (16.65) and maximum number of leaves per plant (19.53) and was significantly superior to rest of the nutrient levels N₁, N₄, N₅ and N₆ but was at par with N₂ (100% RDF along with 1 foliar spray of nano urea plus and nano DAP).

In the interaction effect of varieties and nutrient levels maximum plant height (69.02 cm), more number of branches per plant (17.40) and maximum number of leaves per plant (20.43) was recorded by V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of

nano urea plus and NDAP) which was superior to other interactions but was at par with V₁N₂ (Arka Anamika with 100% RDF along with 1 foliar spray application of NUP and NDAP).

The significant difference in plant height, number of branches per plant and number of leaves per plant among the tested varieties may be due to different genetic makeup.

The enhanced plant growth in terms of plant height, number of branches and leaves per plant observed with nano urea application may be attributed to its greater penetration inside the plant body leading to higher nutrient use efficiency, which promotes increased cell division and tissue differentiation. These results align with findings of Ruban *et al.* (2023), Ajirloo *et al.* (2025) in tomato and Al Jabri *et al.* (2020) in okra.

Yield attributes and yield:

Fruit length and fruit girth (cm):

Significant variations were noticed among two varieties, nutrient levels and their interactions with respect to the average fruit length and fruit girth. Among the two varieties maximum average fruit length (18.59 cm) and fruit girth (1.50 cm) was recorded by the variety V₁ - Arka Anamika which was significantly higher to the variety V₂- Kashi Lalima (Table-2).

Among the different nutrient levels tested maximum fruit length (18.28 cm) and fruit girth (1.56 cm) was recorded in N₃ (100% RDF along with 2 foliar sprays of NUP and NDAP) which was significantly superior to N₅ (75% RDF along with 1 foliar spray of NUP and NDAP) and N₄ (75% RDF) but was at par with N₂ (100% RDF along with 1 foliar spray of NUP and NDAP), N₆ (75% RDF along with 2 foliar sprays of NUP and NDAP) and N₁ (100% RDF).

The interaction effect of varieties and nutrient levels had shown that there is significant variation with respect to average fruit length. Among all the combinations V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of NUP and NDAP) recorded maximum average fruit length (19.17cm) and fruit girth (1.69 cm) which was on par with V₁N₂(Arka Anamika with 100% RDF along with 1 foliar spray of NUP and NDAP), V₁N₁ (Arka Anamika with 100% RDF), V₁N₆- (Arka Anamika with 75% RDF along with 2 foliar sprays of NUP and NDAP), V₁N₅-(Arka Anamika with 75% RDF along with 1 foliar spray of NUP and NDAP) and was significantly superior to rest of the interactions. The minimum average fruit length (16.10 cm) and fruit girth (1.26 cm) was recorded with V₂N₄ (Kashi Lalima with 75 % RDF).

The significant difference in fruit girth among the tested varieties Arka Anamika and Kashi Lalima may be due to different genetic makeup. The differential response to nutrient levels can be attributed to greater nitrogen levels in nano urea plus and nano DAP applied treatments, which likely stimulated photosynthetic activity through increased leaf area. The resulting enhancement in photosynthetic production might have supported greater fruit development by promoting both cell division and cell expansion, thereby contributing to an increase in fruit diameter. These findings are in line with observations recorded by Subramani *et al.* (2023) in okra and Dattaraj *et al.* (2023) in red okra.

Number of fruits per plant

The number of fruits per plant was significantly influenced by varieties, nutrient levels and their interaction. Among the two varieties tested V₁-Arka Anamika recorded maximum number of fruits per plant (20.93) and was significantly superior to the variety V₂-Kashi Lalima (Table-2).

Significant variation was observed among the nutrient levels with respect to number of fruits per plant. The maximum number of fruits per plant was recorded in N₃ (100% RDF along with 2 foliar sprays of NUP and NDAP) which was significantly superior to rest of the nutrient levels and it was followed by N₂ (100% RDF along with 1 foliar spray of NUP and NDAP) and the minimum number of fruits per plant (17.72) was observed in N₄ (75% RDF).

Significant variation was observed in the interaction effect of varieties and nutrient levels. Maximum number of fruits per plant (22.93) was recorded in V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of NUP and NDAP) which was superior to rest of the interactions but was at par with V₁N₂ (Arka Anamika with 100% RDF along with 1 foliar spray of NUP and NDAP).

Average fruit weight:

The Average fruit weight per plant was significantly influenced by varieties, nutrient levels and their interaction.

Among the two varieties, maximum mean fruit weight (13.35 g) was recorded in the variety V₁-Arka Anamika which is significantly superior to the variety V₂-Kashi Lalima.

Among the different nutrient levels N₃ (100% RDF along with 2 foliar sprays of NUP and NDAP) recorded the maximum mean fruit weight (13.02 g) which was significantly superior to rest of the nutrient levels.

The interaction effect of varieties and nutrient levels had shown that there is significant variation with respect to mean fruit weight. Among all the combinations V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of NUP and NDAP) recorded the maximum mean fruit weight (13.80 g) which is on par with V₁N₂ (Arka Anamika with 100% RDF along with 1 foliar spray of NUP and NDAP) and significantly superior rest of the interactions.

Fruit Yield per plant and fruit yield per hectare:

The fruit yield per plant and fruit yield per hectare was significantly influenced by varieties, nutrient levels and their interaction.

Among the two varieties tested maximum fruit yield per plant (279.78 g) and fruit yield per hectare (165.39q) was recorded by the variety V₁-Arka Anamika which was significantly superior to the variety V₂-Kashi Lalima (Table-2).

Significant variation was noticed among the different nutrient levels tested on fruit yield per plant. The nutrient level N₃ (100% RDF along with 2 foliar sprays of NUP and NDAP) recorded maximum fruit yield per plant (277.20 g) and fruit yield per hectare (163.91q) which was significantly superior to all the other nutrient levels. It was followed by N₂-(100% RDF along with 1 foliar spray of NUP and NDAP), However N₆-(75%RDF along with 2 foliar sprays) recorded on par fruit yield per plant with N₁ (100% RDF).

Significant differences were noticed in the interaction of varieties and nutrient levels with respect to fruit yield per plant. Maximum fruit yield per plant (316.35) and fruit yield per hectare (187.00q) was recorded in V₁N₃ (Arka Anamika with 100% RDF along with 2 foliar sprays of NUP and NDAP) which was significantly superior to all the other interactions and it was followed by V₁N₂ (Arka Anamika with 100% RDF along with 1 foliar sprays of NUP and NDAP (Table-2).

The impact of nano urea plus and nano DAP on increasing fruit yield per plant may be attributed to improvement in yield components (fruit length, fruit girth, mean fruit weight and number of fruits per plant). The smaller size of nano urea plus and nano DAP might have provided a larger surface area, enabling more effective absorption and utilization of key nutrients like nitrogen and phosphorous. This improved nutrient uptake might have supported for stronger growth and more robust flowering, fruiting and ultimately leading to higher fruit yield. These results are consistent with the results align with the findings of

Dattaraj *et al.* (2023) in red okra as well as Panda *et al.* (2020) and Mishra *et al.* (2020) in tomato.

Conclusion

Arka Anamika and Kashi Lalima responded positively to combined spray application of nano urea plus and nano DAP twice with 75% or 100% RDF. Arka Anamika with nutrient level comprising of 100% RDF along with two foliar sprays of nano urea plus

and nano DAP showed superior plant growth (plant height, number of branches per plant, number of leaves per plant), superior yield attributes (fruit length, fruit girth, number of fruits per plant, mean fruit weight) and also recorded greater yields may be recommended for summer season in Telangana. 25% of recommended nitrogen and phosphorous can be substituted with 2 foliar sprays of nano urea plus and nano DAP.

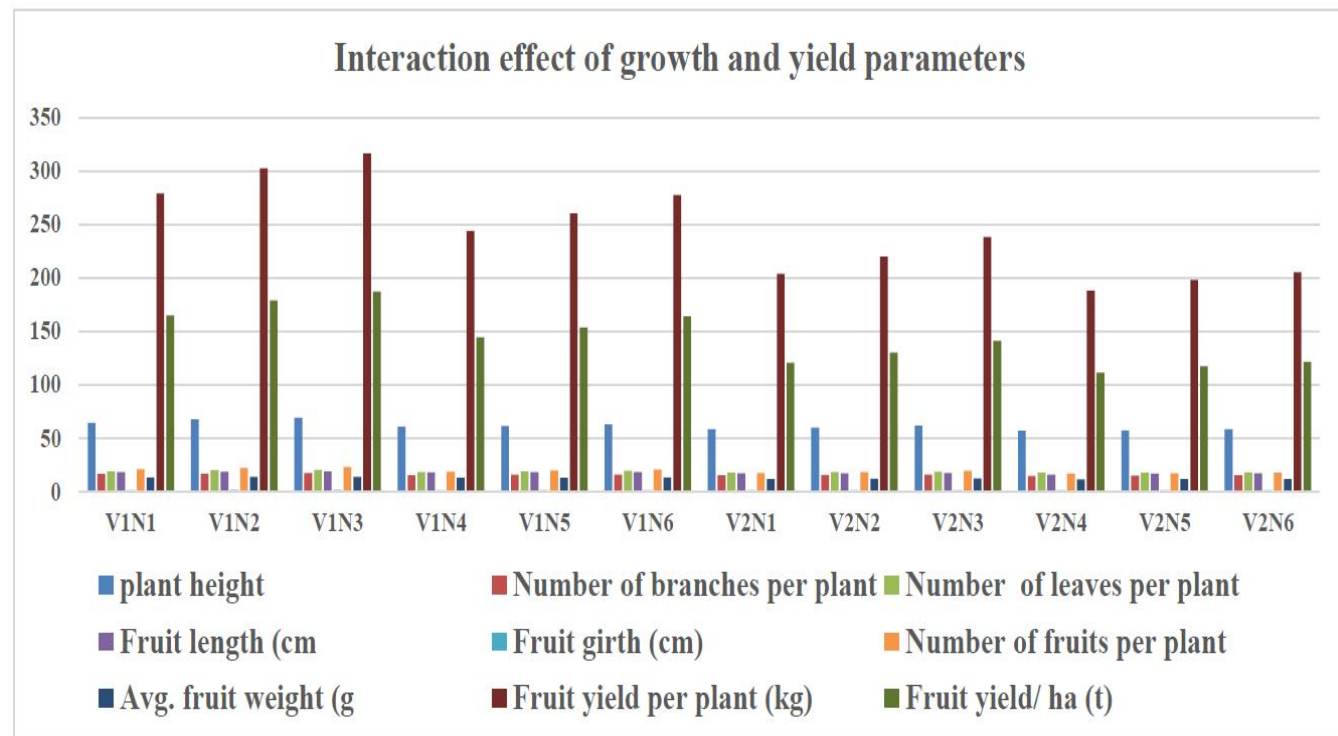
Table 1 : Effect of nano urea plus and nano DAP on growth of okra during summer 2025

Varieties	Growth at 60 DAS		
	Plant height (cm)	Number of branches per plant	Number of leaves per plant
V1-Arka Anamika	64.31	16.29	19.39
V2-Kashi Lalima	58.82	15.26	18.07
SEM	0.57	0.10	0.17
CD (p=0.05)	1.68	0.29	0.51
Nutrient Levels			
N1 (100% RDF)	61.20	15.80	18.53
N2 (N1+1FS of NUP + NDAP)	63.78	16.15	19.13
N3 (N1+2FS of NUP + NDAP)	65.37	16.65	19.53
N4 (75% RDF)	58.95	15.13	18.08
N5 (N3+1FS of NUP + NDAP)	59.40	15.52	18.47
N6 (N3+2FS of NUP + NDAP)	60.69	15.70	18.65
SEM	0.99	0.18	0.30
CD (p=0.05)	2.92	0.52	0.88
Interaction (VxN)			
V1N1	64.21	16.23	19.20
V1N2	67.59	16.60	19.97
V1N3	69.02	17.40	20.43
V1N4	60.76	15.47	18.43
V1N5	61.36	15.93	19.10
V1N6	62.92	16.13	19.23
V2N1	58.20	15.37	17.87
V2N2	59.96	15.70	18.30
V2N3	61.72	15.90	18.63
V2N4	57.14	14.80	17.73
V2N5	57.44	15.10	17.83
V2N6	58.46	15.27	18.07
SEm	1.41	0.24	0.42
CD (p=0.05)	4.13	0.73	1.24

Table 2 : Effect of nano urea plus and nano DAP on yield attributes and yield of okra during summer 2025

Varieties	Fruit length (cm)	Fruit girth (cm)	Number of fruits per plant	Avg. fruit weight (g)	Fruit yield per plant (kg)	Fruit yield/ ha (t)
V1-Arka Anamika	18.59	1.50	20.93	13.35	279.78	165.39
V2-Kashi Lalima	16.92	1.35	17.74	11.76	208.81	123.52
SEM	0.14	0.01	0.15	0.06	1.81	1.08
CD (p=0.05)	0.40	0.03	0.45	0.19	5.32	3.17
Nutrient Levels						
N1 (100% RDF)	17.77	1.41	19.15	12.53	241.25	142.65

N2 (N1+1FS of NUP + NDAP)	18.02	1.49	20.27	12.81	261.11	154.42
N3 (N1+2FS of NUP + NDAP)	18.28	1.56	21.20	13.02	277.20	163.91
N4 (75% RDF)	17.13	1.29	17.72	12.13	215.90	127.65
N5 (N3+1FS of NUP + NDAP)	17.53	1.37	18.47	12.35	229.02	135.41
N6 (N3+2FS of NUP + NDAP)	17.78	1.43	19.22	12.49	241.29	142.67
SEM	0.23	0.02	0.27	0.06	3.14	1.87
CD (p=0.05)	0.70	0.06	0.79	0.19	9.21	5.49
Interaction (VxN)						
V1N1	18.47	1.48	20.90	13.34	278.72	164.77
V1N2	18.83	1.59	22.20	13.62	302.38	178.81
V1N3	19.17	1.69	22.93	13.80	316.35	187.00
V1N4	18.17	1.32	18.87	12.92	243.87	144.12
V1N5	18.40	1.42	19.83	13.10	259.90	153.66
V1N6	18.50	1.50	20.87	13.30	277.45	163.99
V2N1	17.07	1.35	17.40	11.72	203.79	120.53
V2N2	17.20	1.39	18.33	12.00	219.85	130.04
V2N3	17.40	1.43	19.47	12.24	238.05	140.82
V2N4	16.10	1.26	16.57	11.34	187.93	111.19
V2N5	16.67	1.31	17.10	11.59	198.13	117.16
V2N6	17.07	1.36	17.57	11.68	205.14	121.36
SEm	0.33	0.03	0.38	0.16	4.44	2.64
CD (p=0.05)	0.99	0.08	1.12	0.45	13.03	7.76



Factor 1: Varieties
Factor 2: Nutrition levels

V₁ – Arka Anamika,
N₁ (100% RDF),
N₄ (75% RDF),

V₂ - Kashi Lalima
N₂ (N₁+1FS of NUP + NDAP),
N₅ (N₃+1FS of NUP + NDAP),

N₃ (N₁+2FS of NUP + NDAP)
N₆ (N₃+2FS of NUP + NDAP)

Fig. 1: Interaction effect of growth and yield parameters in Okra influenced by varied levels of nutrition and varieties



Plate 1: Growth stages of okra (*Abelmoschus esculentus* L. Moench)



V_1N_3



V_2N_3

Plate 2: Fruits obtained in different treatment combinations in Okra

References

- Ajirloo, A. R., Shaaban, M and Motlagh, Z. R. (2015). Effect of K nano-fertilizer and N bio-fertilizer on yield and yield components of tomato (*Lycopersicon esculentum* L.). *International Journal of Advanced Biological and Biomedical Research*, **3**(1), 138-143.
- Al Jabri, A. R. A., Jassim, R. A and Jabar, A. K. (2020). The effect of nano nitrogen and bio-fertilizer types on npk concentration in soil and okra plant. *Plant Archives*, **20**(2), 4031-4037.
- Dattaraj, N., Topno, S. E., Prasad, V. M., Bahadur, V and Kerketta, A. (2023). Effect of Different Levels of Controlled Release Fertilizers on Growth, Yield and Quality of Red Okra (*Abelmoschus esculentus*) Var Kashi Lalima under Prayagraj Agro-climatic Condition. *International Journal of Environmental Climatic Change*, **13**(8), 1516-1528.
- Ditta, A. (2012). How helpful is nanotechnology in agriculture. *Advances in natural sciences, Nanoscience and Nanotechnology*, **3**(3), 1-8.
- Kumar, A., Ram, H., Kumar, S., Kumar, R., Yadav, A., Gairola, A and Sharma, T. (2023). A comprehensive review of nano-urea vs. conventional urea. *International Journal of Plant and Soil Science*, **35**(23), 32-40.
- Mishra, A., Nandi, A., Sahu, G. S., DAS S, M. I., Pattanayak, S. K and Tripathy, P. (2020). Studies of combining ability in tomato (*Solanum lycopersicum* L.) for vegetative growth, yield and quality traits. *Journal of Pharmacognosy Phytochemistry*, **9**(1), 466-73.
- Narayan, S., Javeed, I., Hussain, K., Khan, F. A., Mir, S. A., Bangroo, S. A and Malik, A. A. 2021. Response of okra (*Abelmoschus esculentus*) to foliar application of micro nutrients. *Indian Journal of agricultural Sciences*, **91**, 749-752.
- Panse, V. G. and Sukhatme, P. V. 1985. Statistical Methods for Agricultural Workers. ICAR, New Delhi.
- Preetha, P. S., and Balakrishnan, N. 2017. A review of nano fertilizers and their use and functions in soil. *International journal of Curent Microbiology and Applied Sciences*, **6**(12), 3117-3133.
- Panda, J., Nandi, A., Mishra, S. P., Pal, A. K., Pattnaik, A. K and Jena, N. K. (2020). Effects of nano fertilizer on yield, yield attributes and economics in tomato. (*Solanum lycopersicum* L.). *International Journal of Current Microbiology and Applied Sciences*, **9**(5), 2583-2591.
- Rameshaiah, G. N., Pallavi, J and Shabnam, S. (2015). Nano fertilizers and nano sensors—an attempt for developing smart agriculture. *International Journal of Engineering and Research and General Science*, **3**(1), 314-320.
- Ruban, J.S. (2023). Effect of Nano DAP on Growth and Yield of Bhendi (*Abelmoschus esculentus* L. Moench). *Indian Journal of Natural Sciences*, **14**(81), 0976 – 0997.
- Singh, P., Chauhan, V., Tiwari, B. K., Chauhan, S. S., Simon, S., Bilal, S and Abidi, A. B. (2014). An overview on okra (*Abelmoschus esculentus*) and it's importance as a nutritive vegetable in the world. *International Journal of Pharmacy and Biological Sciences*, **4**(2), 227-233.
- Singh, M. D. (2017). Nano-fertilizers is a new way to increase nutrients use efficiency in crop production. *International Journal of Agriculture Sciences*, **9**(7), 0975 3710.
- Subramani, T., Velmurugan, A., Bommayasamy, N., Swarnam, T. P., Ramakrishna, Y., Jaisankar, I and Singh, L. (2023). Effect of Nano Urea on growth, yield and nutrient use efficiency of Okra under tropical island ecosystem. *International Journal of Agricultural Sciences*, **19**(1), 134-1.