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RESPONSE OF KHARIF GROUNDNUT TO FOLIAR APPLICATION OF NANO-DAP IN TERMS OF PRODUCTIVITY

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ABSTRACT

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop, and phosphorus plays a vital role in root development, nutrient uptake, nodulation and yield formation. The present investigation was conducted during the Kharif season of 2025 at KVK Sant Kabirnagar to evaluate the response of groundnut to different levels of phosphorus and foliar application of Nano-DAP. The experiment was laid out in a Randomized Block Design with nine treatments and three replications. The treatments consisted of different combinations of 50, 75 and 100 per cent recommended dose of P_2O_5 with one or two foliar sprays of Nano-DAP, along with Nano-DAP alone, 100 per cent recommended P_2O_5 and an absolute control. Groundnut variety GG-40 was sown at a spacing of 30 × 10 cm. Significant differences were observed among the treatments for number of pods plant^{-1}, test weight, shelling percentage, pod yield, kernel yield and haulm yield, while harvest index was non-significant. The treatment T_6, comprising 100 per cent recommended dose of P_2O_5 with two foliar sprays of Nano-DAP at 25–30 and 40–45 DAS, recorded the highest number of pods plant^{-1} (29.63), test weight (49.00 g), shelling percentage (74.00%), pod yield (2750 kg ha^{-1}), kernel yield (2009 kg ha^{-1}) and haulm yield (4770 kg ha^{-1}). However, T_6 was statistically at par with T_5, indicating that one foliar spray of Nano-DAP with 100 per cent recommended P_2O_5 also produced comparable yield performance. The absolute control recorded the lowest values for most of the yield attributes and yields. The study demonstrated that integration of recommended phosphorus fertilization with foliar Nano-DAP application improved productivity and yield-contributing traits of Kharif groundnut.

***Key words*:** Groundnut, Nano-DAP, phosphorus, foliar application, pod yield, kernel yield, productivity

Introduction

Groundnut (*Arachis hypogaea* L.) is an economically important oilseed crop cultivated widely in tropical and subtropical areas. It has considerable importance in agriculture because it provides edible oil and contributes to the nutritional and economic security of farming communities. As a leguminous crop, groundnut also contributes to soil fertility through biological nitrogen fixation. In India, the crop was introduced during the nineteenth century and subsequently became an important component of the country's oilseed production. It performs well in light-textured, well-drained soils, particularly sandy loam soils, whereas heavy and poorly drained clay soils are generally less suitable for its cultivation. Groundnut occupies the first position in area and second position in production after soybean in India (Anonymous 2026). It occupies an area of 5.6 m ha with a production of 13.14 mt and an average productivity of 2290 kg ha^{-1} (Anonymous 2025 - 26).

Groundnut is a versatile oilseed and food crop belonging to the family Leguminaceae and is believed to have originated in Brazil. Its seeds are nutritionally valuable, containing approximately 47–50 per cent oil, 26 per cent protein and 11.5 per cent starch. Groundnut oil is widely utilized as an edible oil and for various other purposes. Thus, improvement in groundnut productivity is important for meeting the increasing demand for edible oil.

A major constraint to the productivity of groundnut in many parts of India is inadequate availability of essential plant nutrients, particularly phosphorus. Pulses and oilseed crops are frequently grown on soils with low or inadequate nutrient availability, which can restrict plant growth and yield formation. Phosphorus is particularly important for groundnut because it supports early plant establishment, root development, nutrient acquisition and water utilization. Adequate phosphorus availability also promotes effective nodulation and contributes to healthy crop development and improved yield formation.

Foliar nutrient application provides an additional pathway for supplying nutrients directly to the plant. Foliar-applied phosphorus can contribute to the movement and utilization of photosynthates from vegetative tissues towards reproductive structures. This improved assimilate partitioning can facilitate the accumulation of photosynthetic products in developing seeds and thereby contribute to enhanced seed production and yield (Kumari *et al.,* 2017).

Nano-DAP is a liquid nano-fertilizer containing nitrogen and phosphorus and has been developed as an alternative and supplementary nutrient source for crop production. Its application through foliage provides nutrients directly to plant tissues and may improve nutrient-use efficiency. The use of Nano-DAP is also associated with the objective of promoting efficient fertilizer management and sustainable crop production. Foliar feeding is considered an effective and economical approach for correcting nutrient deficiencies and improving nutrient availability to crops (Dixit and Elamathi, 2007). Therefore, integrating soil-applied phosphorus with foliar Nano-DAP may provide an effective approach for improving nutrient utilization and productivity in groundnut.

Materials and Methods

The experiment was conducted at the KVK Sant kabirnager, during Kharif season of 2025. The experimental soil was characterised as sandy clay loam in texture with a neutral reaction (pH 7.4), a typical feature of the alluvial soils prevalent in the district. The soil exhibited low available nitrogen content (248.60 kg ha^{-1}), as estimated by the alkaline permanganate method. Available phosphorus was recorded at a medium level (14.8 kg ha^{-1}) using Olsen's method The potassium status

Table 1: Yield attributes of groundnut as influenced by varied levels of phosphorus and nano DAP.

Treatments	NPP	TW	SP
T_1 : 50% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	22.13	33	63
T_2 : 50% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 50-55 DAS	22.73	35	64
T_3 : 75% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	26.63	39	67
T_4: 75% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS	26.83	42	68
T_5: 100% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	29.43	48	73
T_6: 100% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS	29.63	49	74
T_7: Foliar application of Nano-DAP @ 2.5 ml l^{-1} twice at 25-30 and 40-45 DAS	21.93	28	58
T_8: 100% RDP (40 kg P_2O_5 ha^{-1})	26.93	45	69
T_9: Absolute control	21.23	27	55
S.Em ±	0.96	0.54	0.8
CD (p = 0.05)	3.2	1.9	2.1

NPP: Number of pods $plant^{-1}$; TW: Test weight (g); SP: Shelling percentage

Table 2: Yield attributes of ground nut as influenced as varied levels of phosphorus and nano DAP.

Treatments	PY	KY	HY	HI
T_1 : 50% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	1890	1237	3309	36.62
T_2 : 50% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 50-55 DAS	1898	1364	3401	37.31
T_3: 75% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	2231	1589	3829	37.37
T_4: 75% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS	2325	1600	3919	37.85
T_5: 100% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS	2733	1980	4636	39.04
T_6: 100% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS	2750	2009	4770	39.91
T_7: Foliar application of Nano-DAP @ 2.5 ml l^{-1} twice at 25-30 and 40-45 DAS	1479	1022	2719	36.84
T_8: 100% RDP (40 kg P_2O_5 ha^{-1})	2434	1785	4126	38.23
T_9: Absolute control	1457	992	2529	36.77
S.Em ±	81.0	60.7	161.7	2.07
CD (p = 0.05)	239	183	482	NS
PY: Pod yield (kg ha^{-1}); KY: Kernel yield (kg ha^{-1}); HY: Haulm yield (kg ha^{-1}); HI: Harvest index				

ranged from medium to moderately high (295.40 kg ha^{-1}), determined through the flame photometric method. These measurements were obtained from the 0–15 cm soil layer prior to the commencement of the experiment and are broadly representative of the Indo-Gangetic alluvial soils of the region. The field experiment was conducted in a Randomized Block Design (RBD) involving nine treatments and three replications with a plot size of 4.2 m × 5.0 m respectively. The treatments consist of 50% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS (T_1), 50% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS (T_2), 75% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS (T_3), 75% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS (T_4), 100% recommended dose of P_2O_5 + One spray of Nano-DAP at 25-30 DAS (T_5), 100% recommended dose of P_2O_5 + Two sprays of Nano-DAP at 25-30 and 40-45 DAS (T_6), Foliar application of Nano-DAP @ 2.5 ml l^{-1} twice at 25-30 and 40-45 DAS (T_7), 100% RDP (40 kg P_2O_5 ha^{-1}), (T_8) and absolute control (T_9). Recommended dose of fertilizer (20:40:50 kg of N: P_2O_5: K_2O ha^{-1}). Seeds of groundnut (GG-40) were sown in 30 × 10.0 cm spacing with ridge and furrow method. At the time of sowing N and K_2O (20: 50 kg ha^{-1}) was applied equally for all plots and P_2O_5 was applied as per the required quantities in 50, 75 and 100% doses. Five plants were randomly selected in each net plot was harvested separately and the values were converted into hectare basis and expressed in kilograms per hectare.

Results and Discussion

The data presented in the Table 1 revealed significant differences among the treatments for number of pods plant^{-1}, test weight and shelling percentage. The highest values for all the three characters were recorded under T_6 (100% recommended dose of P_2O_5 + two sprays of Nano-DAP at 25–30 and 40–45 DAS), with 29.63 pods plant^{-1}, 49.00 g test weight and 74.00% shelling percentage, respectively.

Data recorded on pods plant^{-1}, T_6 (29.63) recorded the highest value and was statistically at par with T_5 (29.43), as the difference between them (0.20) was less than the CD value of 3.20. The lowest number of pods plant^{-1} was recorded in T_9 (21.23), which was statistically at par with T_7 (21.93) and T_1 (22.13), as their differences from T_9. Similar findings were reported by Bhagavatha Priya (2014), Choudhary *et al*,, (2022) , Kumar *et al*,, (2021) and Aziz *et al*,, (2021).

Data pertaining to test weight, the maximum value was observed in T_6 (49.00 g), which was at par with T_5 (48.00 g), since the difference was lower than the CD value of 1.90. The minimum test weight was recorded under T_9 (27.00 g), which was statistically at par with T_7 (28.00 g). Similar results were reported by Kabir *et al.*, (2013)

Data recorded on shelling percentage, the highest value was recorded under T_6 (74.00%), which was at par with T_5 (73.00%), with a difference of only 1.00%, which was less than the CD value of 2.10. The lowest shelling percentage was observed under T_9 (55.00%), followed by T_7 (58.00%). The difference between T_9 and T_7 was 3.00%. Similar findings were recorded with Everest *et al.*, (2022), (Bhargavi and Sundari (2023) & Rajesh *et al.*, (2021)

Overall, T_6 proved to be the most effective treatment, producing the highest number of pods plant^{-1}, test weight and shelling percentage, whereas T_9 (absolute control) recorded the lowest values for all three characters. The results indicate that the combined application of 100% recommended P_2O_5 with two foliar sprays of Nano-DAP was superior for improving these yield-contributing and

quality traits.

The data presented in the table revealed that the treatments had a significant effect on pod yield, kernel yield and haulm yield, whereas the differences among treatments for harvest index were non-significant (NS).

For pod yield, the highest value was recorded under T_6 (100% recommended dose of P_2O_5 + two sprays of Nano-DAP at 25–30 and 40–45 DAS) with 2750 kg ha^{-1}, which was statistically at par with T_5 (2733 kg ha^{-1}). The lowest pod yield was recorded under T_9 (absolute control) with 1457 kg ha^{-1}, which was statistically at par with T_7 (1479 kg ha^{-1}). Treatments T_4, T_8, T_3, T_2 and T_1 recorded intermediate values of 2325, 2434, 2231, 1898 and 1890 kg ha^{-1}, respectively. Similar results were reported by (Bhargavi and Sundari, 2023 and Rajesh *et al.*, (2021)

For kernel yield, the maximum value was observed under T_6 (2009 kg ha^{-1}), which was statistically at par with T_5 (1980 kg ha^{-1}). The minimum kernel yield was recorded in T_9 (992 kg ha^{-1}), which was statistically at par with T_7 (1022 kg ha^{-1}). The other treatments recorded kernel yields ranging from 1237 to 1785 kg ha^{-1}. Similar findings were recorded with (Sahu, 2023)

For haulm yield, the highest value was recorded under T_6 (4770 kg ha^{-1}), followed by T_5 (4636 kg ha^{-1}). The difference between T_6 and T_5 was only 134 kg ha^{-1}, which was lower than the CD value of 482 kg ha^{-1}; hence, these treatments were at par with each other. The lowest haulm yield was recorded under T_9 (2529 kg ha^{-1}), which was statistically at par with T_7 (2719 kg ha^{-1}). Similar findings were reported with Rajput *et al.*, (2022) and Mallikarjuna (2021).

Regarding harvest index, the values ranged from 36.62% in T_1 to 39.91% in T_6. Although T_6 recorded the numerically highest harvest index, followed by T_5 (39.04%) and T_8 (38.23%), the treatment differences were non-significant (NS). Therefore, no treatment could be considered statistically superior or inferior for harvest index. Similar findings were reported with Sounda *et al.*, (2006) & (Sunil *et al.*, 2024)

Overall, T_6 proved to be the most effective treatment, recording the highest pod yield, kernel yield, haulm yield and numerically highest harvest index. However, for pod yield, kernel yield and haulm yield, T_6 was statistically at par with T_5, indicating that one spray of Nano-DAP with 100% recommended P_2O_5 produced a performance comparable to two sprays. In contrast, T_9 (absolute control) recorded the lowest values for all the yield attributes, with T_7 generally remaining statistically at par with the control.

Conclusion

The present investigation revealed that phosphorus fertilization combined with foliar application of Nano-DAP significantly influenced the yield attributes and productivity of Kharif groundnut. Among the treatments, T_6 (100% recommended dose of P_2O_5 + two foliar sprays of Nano-DAP at 25–30 and 40–45 DAS) was found to be the most effective, recording the highest number of pods plant^{-1} (29.63), test weight (49.00 g), shelling percentage (74.00%), pod yield (2750 kg ha^{-1}), kernel yield (2009 kg ha^{-1}) and haulm yield (4770 kg ha^{-1}).

References

Anonymous (2025-26). Source: Indiastat.com.

Anonymous (2026). Source: www.agricoop.gov.in.

Aziz, B.R. and Zrar D.B. (2021). Effect of foliar application of nano-NPK fertilizer on growth and yield of bean (*Vicia faba* L.). *Journal of Pure and Applied Science*; **33(4)**, 90-99.

Bhargavi, G, Sundari A. (2023). Effect of nano urea on growth and yield of rice (*Oryza sativa* L.) under SRI in the Cauvery delta zone of Tamil Nadu. *Crop Research*., **58(1-2)**, 12-17.

Bhagavatha, Priya T. (2014). Performance of groundnut varieties under different plant populations during early kharif [MSc thesis]. Tirupati: Acharya NG Ranga Agricultural University.

Choudhary, P., Singh D., Kaushik M.K., Sharma S.S., Jain H.K., Saharan V. *et al.* (2022). Production, productivity and quality of maize (*Zea mays* L.) as affected by foliar application of zinc based nano fertilizer and different fertility levels. *Pharma Innov J*., **11(2)**, 1878-1882.

Dixit, P.M. and Elamathi S. (2007). Effect of foliar application of DAP, micronutrients and NAA on growth and yield of green gram (*Vigna radiata* L.). *Legume Research*., **30(4)**, 305-307.

Everest, L., Shyamal K., Haider D., Barman S.K., Kausik M. and Panda P. (2022). Effect of phosphorus on yield, nutrient acquisition and use efficiency of groundnut in West Bengal, India. *Legume Research*., **45(9)**, 1149-1154.

Kabir, R., Yeasmin S., Islam A.K.M.M. and Sarkar M.R. (2013). Effect of phosphorus, calcium and boron on the growth and yield of groundnut (*Arachis hypogaea* L.). *International Journal of Bio-Science and Bio. Technology*., **5(3)**, 51-60.

Kumari, M.S., Rao P.C., Padmaja G., Ramulu V., Saritha J.D. and Ramakrishna K. (2017). Effect of bio and nano phosphorus on yield, yield attributes and oil content of groundnut (*Arachis hypogaea* L.). *Environment Conservation Journal*., **18(3)**, 21-26.

Kumar, Y., Tiwari K.N., Singh T. and Raliya R. (2021). Nano fertilizers and their role in sustainable agriculture. *Annals of Plant and Soil Research*., **23(3)**, 238-255.

Mallikarjuna, P.R. (2021). Effect of nano nitrogen and nano zinc nutrition on nutrient uptake, growth and yield of irrigated maize during summer in the Southern Transition Zone of Karnataka. Shivmogga: University of Agricultural Sciences.

Rajesh, H., Yadahalli G.S., Chittapur B.M., Halepyati A.S. and Hiregoudar S. (2021). Growth, yield and economics of sweet corn (*Zea mays* L. Saccharata) as influenced by foliar spray of nano fertilizers. *Journal of Farm Sciences*., **34(4)**, 381-385.

Rajput, J.S., Thakur A.K., Nag N.K., Chandrakar T. and Singh D.P. (2022). Effect of nano fertilizer in relation to growth, yield and economics of little millet (*Panicum sumatrense*) under rainfed conditions. *Pharma Innov J*., **11(7)**, 153-156.

Sahu, D. (2023). Performance of nano DAP under rice-wheat cropping system in vertisol of Chhattisgarh. *Pharma Innov J*., **12(7)**, 1565-1569.

Sounda, G., Mandal A., Moinuddin G. and Mondal K. (2006). Effect of irrigation and mulch on yield, consumptive use of water and water use efficiency of summer groundnut. *Journal of Crop Weed*., **2(1)**, 29-32.

Sunil, C., Kadam P.V., Kanavi G.B., Onte S., Salimath S. Mallikarjuna B., H. Jeevan B., H R., Sharath Chandra M. and Umme S.N. (2024). Comparative assessment of nano nitrogen and nano zinc nutrition on growth, yield, and profitability of chili (*Capsicum annuum* L.). *Journal of Plant Nutrition*, **1**, 15.