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Effect of nano and ordinary urea on growth, yield and economics of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

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Abstract

An experiment to replace 50% of nitrogen by two foliar applications of nano urea (4% N) or by two foliar applications of 2% ordinary urea and as an extra dose of nitrogen by two foliar applications of nano urea or 2% ordinary urea in addition to the recommended dose of nitrogen was conducted to see the effect of foliar application of nano urea or 2% ordinary urea on growth, yield and economics of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson] during the period 2024-25 and 2025-26 on sandy loam soil in randomized block design at Agricultural Research Farm, Dholi of Tirhut College of Agriculture under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar). It was found that pseudo-stem height, pseudostem girth, canopy spread, corm yield, net return and B:C ratio were significantly higher under T₄ treatment where two extra sprays of nano urea in addition to package of practices of manures and fertilizers of the state was given at one and two month after planting than T₂ where only two foliar sprays of nano urea was applied in place of 50% nitrogen application by ordinary urea in soil as top dressing in two equal splits. Reductions in the pseudo-stem height, pseudostem girth, canopy spread, corm yield, net return and B:C ratio were to the tune of 2.25 to 11.36, 2.19 to 9.66, 1.13 to 10.80, 3.46 to 8.39, 6.42 to 14.38 and 3.93 to 8.39 per cent with respect of other treatments, respectively may be due to lesser quantity of nitrogen available to plants and overall lesser quantity of nitrogen absorbed by the plants under T₂ than the plants under other treatments.

Keywords: Elephant foot yam, nano urea, ordinary urea, growth and corm yield, net return

Introduction

Elephant Foot Yam [*Amorphophallus paeoniifolios* (Dennst.) Nicolson]) is an important tuber crop grown in Bihar particularly in the districts of northern Bihar. It is also one of the most important tuber crops of India as well as other parts of the tropical and subtropical world. In the present situation of changing climate scenario, it has assumed more importance than before due to some unparalleled edges over other crops like- its capacity to produce even in adverse climatic conditions without affecting much on its productivity and its high yield potential (George James and Sunitha, S., 2018) [3]. Its farming is also eco-friendly because of less use of agro-chemicals (Singh *et al.*, 2020) [9]. It has both nutritional and medicinal value and is usually consumed as cooked vegetable. Elephant foot yam is rich in minerals, protein, vitamins-A. (Mukherjee *et al.*, 2020) [6]. It has high dry matter production capability per unit area than most of the other vegetables. Elephant foot yam is a remunerative and profitable tuber crop. The crop is gaining popularity due to easiness in cultivation, high productivity, less incidence of pests and diseases, steady demand and reasonably good price. Tubers are mainly used as vegetable after thorough cooking.

There are several factors responsible for increase in cost of production of crops especially elephant foot yam and among them are- chemical fertilizers particularly most commonly used nitrogenous fertilizer like-urea. Use of urea as nitrogenous fertilizer becomes even costlier due to its low nitrogen use efficiency, less net assimilation rate, its potential losses like leaching, volatilization along with air, water and environmental hazards. Keeping these views, it was thought to go for other nitrogenous fertilizer like nano urea which have an edge over ordinary urea with the objectives- to reduce the cost of production by reducing the doses of ordinary urea and address

the concerns with ordinary urea and most importantly, the effect of nano urea on growth, yield and economics on cultivation of elephant foot yam.

Materials and Methods

The experiment was conducted at Agricultural Research Farm, Dholi of Tirhut College of Agriculture under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) during the period of 2024-25 to 2025-26. The soil of the experimental plot was sandy loam with pH value of 8.2. Initial soil analysis value of experimental field was: available nitrogen (201.6 kg/ha), phosphorus (16.1 kg/ha), and potassium (128.4 kg/ha). There were five treatments i.e., T₁: As per package of practices of the state (15 t FYM/ha and 80:60:80 Kg N:P₂O₅:K₂O/ha); T₂: IFFCO nano urea (4% N) as foliar spray [similar operation as in T₁ except two sprays of nano urea as foliar in place of 50% nitrogen through ordinary urea in soil at one & two month after planting]; T₃: [similar operation as in T₁ except two sprays of 2% ordinary urea as foliar in place of 50% nitrogen through ordinary urea in soil at one & two month after planting]; T₄: T₁ + two sprays of nano urea as foliar spray at one and two month after planting and T₅: T₁ + 2% ordinary urea in two foliar sprays at one and two month after planting. In T₁, 50% of nitrogen and potassium along with 100% phosphorus was applied as basal dose and 50% of remaining nitrogen and potassium was applied in two equal split of top dressing at one and two month after planting. Basal application of nitrogen, phosphorus, potassium and top dressing of 50% of potassium was kept same for all treatments. There were only variations in doses, application methods and source of nitrogen for remaining 50% nitrogen in different treatments. ‘Gajendra’ was taken as test variety. Pseudostem height, pseudo stem girth, canopy spread of five tagged plants were recorded treatment and replication wise at three and five months after planting and were averaged. Similarly, corm weight of five plants was taken after harvesting and cleaning of corms and then were calculated on hectare basis (t/ha). All other standard package of practices were followed and analysis was done following standard statistical procedures.

Results and Discussion

Different treatments of nitrogen application either in the form of ordinary urea or nano urea produced significant effect on pseudo-stem height, pseudo-stem girth and canopy spread. It was found that pseudo-stem height under T₄ treatment where two extra sprays of nano urea in addition to package of practices of manures and fertilizers of the state was given at one and two months after planting was significantly superior over T₂ and T₁ and was found at par with T₃ where 2% ordinary urea as foliar spray was given in place of nano urea foliar application and T₅-where 2% ordinary urea was foliar applied in addition to package of practices of manures and fertilizers of the state. Reduction in the pseudo-stem height was to the tune of 2.91 to 11.29 and 2.25 to 11.36 per cent as compared to other treatments at 3 and 5 months after planting. Similarly, reductions in pseudo stem girth at 3 and 5 months after planting were to the tune of 1.22 to 8.88 and 2.19 to 9.66 per cent and for canopy spread it ranged from 2.74 to 11.84 and 1.13 to 10.80 per cent, respectively. Pseudo-stem height after five months of planting followed similar trend where only T₅ showed comparable result on pseudo-stem height to that of T₄. Significantly lower pseudo-stem height was recorded under T₂ treatment where only two foliar sprays of nano urea was applied for 50% nitrogen application as top dressing in two splits may be due to lesser amount of nitrogen available for plants as compared to other treatments; although the nitrogen use efficiency of nano

urea is very high as compared to ordinary urea. Nitrogen is a vital macronutrient required for the synthesis of amino acids, proteins, chlorophyll and cell membranes. Adequate nitrogen availability enhances photosynthetic activity, promotes vigorous vegetative growth and supports overall plant development (Krishnaveni and Ramaswamy, 1985) [5]. Pseudo-stem girth and canopy spread recorded after three and five months after planting produced similar patterns of results to that of pseudo-stem height may be due to lesser quantity of nitrogen available to plants and overall lesser quantity of nitrogen absorbed by the plants under T₂ (Table-1. & Fig.-1). Similar findings were also reported by Neogi S. and Das S.K. (2022) [7], Dutta *et al.* (2023) [1] and Hoque and Khan in potato (2024) [2].

Table 1: Effect of nano urea on pseudostem height, pseudostem girth and canopy spread at 3 and

Treatments	Pseudostem height (cm)		Pseudostem girth (cm)		Canopy spread (cm)	
	3 MAP*	5 MAP	3 MAP	5 MAP	3 MAP	5 MAP
T ₁	56.79	78.39	17.39	21.58	83.32	104.15
T ₂	55.13	76.62	17.18	21.11	81.04	102.97
T ₃	59.24	80.68	18.19	22.71	87.05	107.61
T ₄	62.15	86.44	18.85	23.37	91.92	115.44
T ₅	60.51	83.41	18.45	22.94	89.44	111.86
Sem (±)	0.95	1.34	0.30	0.36	1.32	2.03
CD (p=0.05)	2.94	4.17	0.92	1.12	4.10	6.33
CV (%)	3.22	3.30	3.28	3.23	3.04	3.75

5 months after planting of elephant foot yam.

* MAP – Months after planting

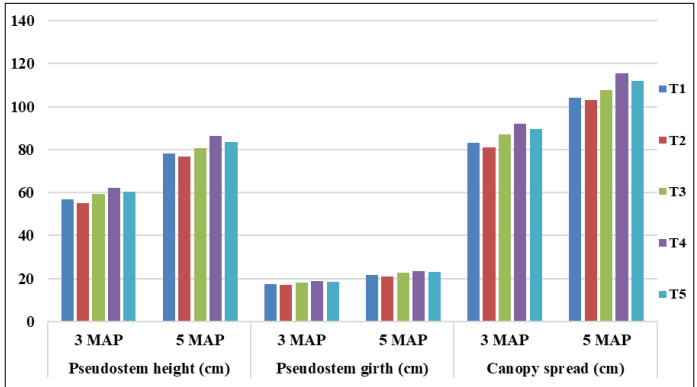


Fig 1: Effect of nano urea on growth, yield and economics of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

Net return and B:C ratio were also significantly influenced by different treatments of nitrogen application either in the form of soil application or foliar application through the different sources of nitrogen (ordinary urea and nano urea). Corm yield/plant (kg), corm yield (t/ha), net return and B:C ratio were also significantly influenced by the application of nitrogen either in the form of nano urea or ordinary urea applied in the soil or as foliar application. It was found that corm yield per plant and on hectare basis in T₄ was significantly higher than T₂ and T₁ and was found at par with T₅ and T₃. The reduction in T₂ was to the tune of 2.93 to 10.18 and 3.46 to 8.39 per cent for corm yield per plant and corm yield on hectare basis, respectively may be due to the cumulative effect of growth conditions of the plant in different treatments and availability and absorption of nitrogen due to different methods of application of nitrogen in the soil or in the form of foliar application of nano urea or ordinary urea (Table-2. & Fig.-2). These results conform the findings of Shivam Kumar *et al* (2025) [8] on tomato where maximum fruit yield per plant

(1.90 kg), per plot (56.84 kg) and per hectare (438.66 q) were recorded in 100% RDN + two sprays of nano urea @ 4 ml/litre at 30 and 50 DAT and also similar results were reported by Sneha *et al.* (2026) and Karubakee in potato (2024) ^[4]. It was found that net return under T₄ treatment where two extra sprays of nano urea in addition to package of practices of manures and fertilizers of the state (was given at one and two months after planting) was significantly superior over T₂ and was found at par with rest of the treatments. Effects due to different treatments of nitrogen in the form of nano urea or ordinary urea also influenced B:C ratio in the same pattern to that of net return. Reduction in the net return under treatment T₂ was to the tune of 6.42 to 14.38 as compared to other treatments. Similarly, reductions in B:C ratio was to the tune of 3.93 to 8.39. treatments. Similar findings were also reported by Neogi and Das (2022) ^[7] in potato.

Table 2: Effect of nano and ordinary urea on corm yield/plant (kg), corm yield (t/ha), Net return (Rs./ha) and B:C ratio of elephant foot yam

Treatments	Corm yield/ plant (kg)	Corm yield (t/ha)	Net return (Rs./ha)	B:C ratio
T ₁	3.14	38.92	747533	2.22
T ₂	3.04	37.58	699579	2.13
T ₃	3.20	39.33	759414	2.23
T ₄	3.39	41.02	817043	2.32
T ₅	3.28	40.55	801458	2.30
SEm (±)	0.07	0.65	22828	0.04
CD (p=0.05)	0.22	2.03	71120	0.12
CV (%)	4.38	3.30	5.97	3.34

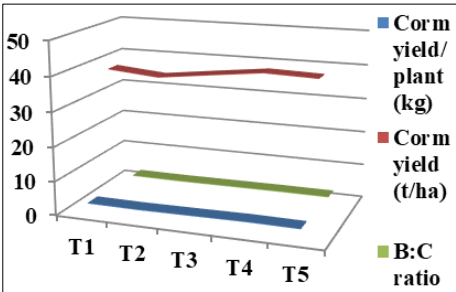


Fig 2: Effect of nano urea on corm yield/plant (kg), corm yield (t/ha) and B:C ratio of elephant foot yam.

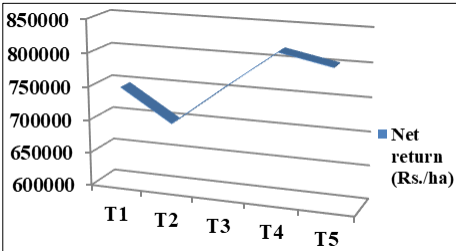


Fig 3: Effect of nano urea on net return (Rs./hq) of elephant foot yam.

Conclusion

Based on the findings of this experiment it can be concluded that the treatment of two foliar applications of nano urea (4% N) to replace 50% nitrogen dose (T₂) which is used as top dressing at one and two months after planting of elephant foot yam in the soil resulted in reduction of pseudo-stem height, pseudo-stem girth, canopy spread, corm yield/plant (kg), corm yield (t/ha), net return (Rs./ha) and B:C ratio of elephant foot yam as compared to the treatment of package of practices of manures and fertilizers of the state (T₁) but all these growth, yield and economic parameters mentioned above under T₄ treatment where two extra sprays of

nano urea in addition to package of practices of manures and fertilizers of the state was given at one and two month after planting was significantly superior over T₂ with respect to all these growth, yield and economic parameters mentioned above.

References

1. Dutta D, Bhattachrya P, Sengupta K, Das D. Effect of nano urea on growth and yield of potato in lower Gangetic plains of West Bengal. *Journal of Eco-friendly Agriculture*. 2023;18(2):266-268.
2. Hoque MR, Khan MSH. Greater growth and yield response of nano urea with conventional urea for potato (*Solanum tuberosum*) cultivation. *International Journal of Biological Engineering and Agriculture*. 2024;3(3):378-385.
3. George J, Sunitha S. Tropical tuber crops: potential and prospects. New Delhi: Westvill Publishing House; 2018. p. 1-11.
4. Karubakee S. Effect on yield, nutrient uptake and quality of potato (*Solanum tuberosum* L.) under integrated nutrient management. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*. 2024;52(1):13288.
5. Krishnaveni K, Ramaswamy KR. Influence of N, P and K on the yield and yield attributes of CH-1 hybrid. *Madras Agricultural Journal*. 1985;72(7):382-387.
6. Mukherjee A, Sheela I, Prakash P, Jaganathan D, Sivakumar PS. Root and tuber crops: life saving future crops. *Kerala Karshakan e-Journal*. 2020 Jun:27-33.
7. Neogi S, Das SK. Effect of nitrogen and zinc in nano forms on growth and productivity of potato (*Solanum tuberosum* L.) in Inceptisols. *Journal of Crop and Weed*. 2022;18(1):32-38.
8. Kumar S, Rajiv, Tripathi VK, Kushwaha V, Kumar D. Effect of nano urea on growth, yield and quality of tomato (*Solanum lycopersicum* L.) cv. Azad T-6. *International Journal of Research in Agronomy*. 2025;8(8):667-670.
9. Singh RS, Narayan A, Kumar A, Chaudhary CS, Pandey IB. Effect of integrated weed management practices on weed dynamics, growth, yield and economics of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]. *Plant Archives*. 2020;20(Suppl 2):1242-1245.
10. Math SP, Hiremath SM, Shashidhar TR, Rajkumara S. Effect of nano urea on growth, yield and economics of potato (*Solanum tuberosum* L.). *Plant Archives*. 2026;26(Suppl 1):2296-2300.