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EFFECT OF NANO FERTILIZERS OF NITROGEN AND PHOSPHORUS ON GROWTH, YIELD AND QUALITY OF POTATO (*SOLANUM TUBEROSUM* L.)

V.S. Pallavi[1*], E. Padma[1], G. Kranthi Rekha[2] and B. Peda Babu[3]

[1]Department of Vegetable Science, College of Horticulture, Dr. YSR, Horticultural University, Venkataramannagudem-534101, Andhra Pradesh, India

[2]Department of Vegetable Science, HRS, Dr. YSR Horticultural University, Lam Guntur-522034, Andhra Pradesh, India

[3]Department of Soil Science, KVK, Dr. YSR Horticultural University, Venkataramannagudem-534101, Andhra Pradesh, India

[*]Corresponding author E-mail: ps9434207@gmail.com

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ABSTRACT

The present investigation was carried out to evaluate the "Effect of nano fertilizers of Nitrogen and Phosphorus on growth, yield and quality of potato (*Solanum tuberosum* L.)" in Randomized Block Design (RBD) with three replications. Potato is a staple food in many countries and is particularly important in India, which ranks second in global production after China. It is a rich source of carbohydrates, proteins, vitamins and minerals and offers high caloric value per unit area compared to most other crops. Commonly cultivated potato varieties are tetraploid (2n=4x=48) and belongs to the family Solanaceae. The edible part is an underground modified stem or tuber. The study was carried out at college of horticulture, Venkataramannagudem, during *rabi* 2024-25. The variety used in experiment is kufri pukhraj The analysis of variance revealed significant differences ($p < 0.05$) among treatments studied. Among the ten treatments 70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (2 sprays) showed high yield parameters of potato when compared to remaining treatments.

***Key words*:** potato, *rabi*, nano fertilizer and yield

Introduction

Nanotechnology is one of the important technologies of recent times. To meet the needs and demands of increasing population globally, there is a need to increase the production and productivity of vegetable crops by utilizing the limited resources available. Nanotechnology is a new perspective of precision farming which maximizes the output from crops while minimizing the inputs such as fertilizers, pesticides, fungicides and herbicides. Nano encapsulation reduces pollution and protects the environment by reducing leaching and evaporation of harmful substances. In vegetables, nanotechnology has vivid applications in crop growth, plant protection, genetic engineering and post-harvest technology. Hence, the use of nanotechnology can significantly contribute to sustainable intensification of vegetable production. Nano fertilizers have opened up new opportunities to improve input use efficiency, minimize costs and environmental deterioration. Chemical fertilizers may be transformed into nano fertilizers to increase their usage efficiency and thereafter be used in agriculture, according to a recent study by Usman *et al*., (2020). A nano fertilizer is a nutrient or nutrient carrier that is in the form of a nanoparticle. Nano fertilizers are another name for nutrients encapsulated or coated in nanomaterials (DeRosa *et al*., 2010). The nano fertilizers can increase NUE in areas with high surface area and adsorption capacity values, as well as regulated nutrient release to particular locations (Seleiman *et al*., 2020).

Potato cultivation in Andhra Pradesh is limited to around 2500 ha which include subtropical areas of Chittoor district, bordering Karnataka and high altitude hilly areas of Visakhapatnam district with an anuual production merely 49,000 MT as against the national production of 45 million MT. Table potatoes are procured from the wholesale markets of Kolkota, Agra, Jalandhar, Indore

Table 1: Effect of nano fertilizers of N and P on yield attributes in potato (*Solanum tuberosum* L.).

T	Treatment details	Number of tubers per plant	Length of the tuber (cm)	Diameter of the tuber (cm)	Yield per plant (g)	Yield per plot (Kg)
T_1	RDF of N and P through conventional fertilizers.	5.2	6.53	4.47	325.67	6.51
T_2	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (2 sprays).	5.4	6.62	4.54	350.00	6.85
T_3	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (3 sprays).	5.5	6.71	4.63	342.83	7
T_4	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (4 sprays).	5.6	6.86	4.76	363.13	7.26
T_5	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (2 sprays).	5.9	6.88	4.83	372.60	7.45
T_6	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (3 sprays).	6.1	6.92	4.92	375.30	7.5
T_7	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (4 sprays).	6.3	7.12	5.18	382.50	7.65
T_8	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (2 sprays).	7.8	7.34	5.29	405.20	8.07
T_9	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (3 sprays).	6.6	7.23	5.27	384.80	7.69
T_{10}	70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (4 sprays).	6.2	7.02	4.97	379.33	7.58
Mean		**6.06**	**6.923**	**4.886**	**368.14**	**7.36**
SEm±		**0.276**	**0.093**	**0.855**	**0.911**	**0.020**
CD @ 0.05		**0.82**	**0.27**	**2.54**	**2.71**	**0.06**

T: Treatments

etc on daily basis for consumption in the state. In Andra Pradesh the production of potato is very limited but the consumption of potato is on par with other vegetables. Compared to conventional fertilizers, nano fertilizers are having low cost, they are in liquid form, easy to transport and are required in less quantity. Hence the present investigation is aimed to study the influence of foliar applications of nano nitrogen and nano phosphorus on potato with the following objective to study the effect of nano particles of nitrogen and phosphorus on the yield of potato.

Materials and Methods

During *rabi*, 2024-25, potato plants were raised in Randomized block design with three replications and ten treatments *viz.*, RDF of N and P through conventional fertilizers, 70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (2 sprays), 70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (3 sprays), 70% RDF of N and P through conventional fertilizers + 30% nano DAP + nano urea (4 sprays), 60% RDF of N and P through conventional fertilizers + 40% nano DAP + nano urea (2 sprays), 60% RDF of N and P through conventional fertilizers + 40% nano DAP + nano urea (3 sprays), 60% RDF of N and P through conventional fertilizers + 40% nano DAP + nano urea (4 sprays, 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (2 sprays), 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (3 sprays), 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (4 sprays). Recommended dose of potassium will be applied equally to all the treatments, two sprays of nano fertilizers were sprayed at 25 and 50 DAP, three sprays of nano fertilizers were sprayed at 20, 35 and 50 DAP, four sprays of nano fertilizers were sprayed at 20, 30, 40 and 50 DAP. The

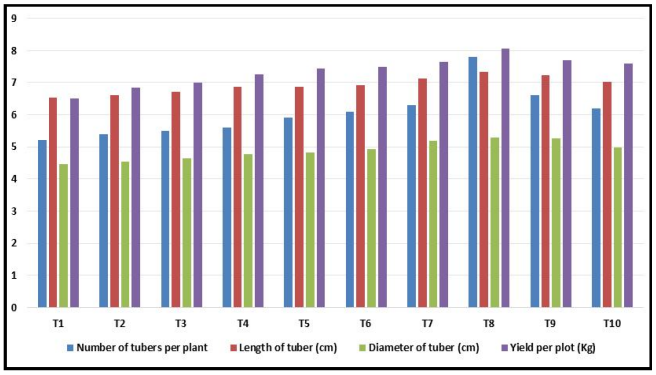

Fig. 1: Effect of nano fertilizers of N and P on Yield attributes in potato (*Solanum tuberosum* L.).

number of tubers, length, diameter of the tuber, yield per plant and yield per plot were measured.

Results and Discussion

The data pertaining to yield attributes as influenced by nano urea and nano DAP in potato are presented in Table 1. It was observed that number of tubers, length, diameter of the tuber, yield per plant and yield per plot were recorded maximum in treatment T_8 where plants applied with 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (2 sprays) found best among all treatments and it was statistically on par with 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (3 sprays) (T_9) and 60% RDF of N and P through conventional fertilizers + 40% nano DAP + nano urea (4 sprays) (T_7). Further, minimum number of tubers, length, diameter of the tuber, yield per plant and yield per plot were recorded with RDF of N and P through conventional fertilizers (T_1).

The increase in yield attributes might be attributed to the application of nano urea and nano DAP as these fertilizers provide crops with the exact amounts of nutrients in the right proportions. The use of these nano-fertilizers enhanced nutrient use efficiency due to their high surface area-to-volume ratio, which improved nutrient solubility, mobility and uptake. As a result, plants exhibited better vegetative growth, increased chlorophyll synthesis and enhanced metabolic functions. The efficient assimilation of nitrogen and phosphorus contributed to improved plant vigour, tuber development and biomass accumulation. This collective improvement across individual plants likely translated into a significant increase in overall yield per plot. The results are in agreement with the findings of Pooja *et al*., (2022) in broccoli, Chauhan *et al*., (2023) in potato, Hoque *et al*., (2024) in potato and Preeti *et al*., (2024) in radish.

Conclusion

Based on results obtained in the present experiment, it can be concluded that potato treated with T_8 *i.e.*, 50% RDF of N and P through conventional fertilizers + 50% nano DAP + nano urea (2 sprays) recorded highest estimated yield attributes. Hence the above foliar spray can be utilized for cultivation of potato.

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