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Tosan Kumar Sahu
Ph.D. Scholar, Department of
Agronomy, College of Agriculture,
IGKV, Raipur, Chhattisgarh, India

Dr. Deepak Kumar Chandrakar
Principal Scientist, Department of
Agronomy, College of Agriculture,
IGKV, Raipur, Chhattisgarh,
India

Growth parameters, yield and economics of rice as influenced by application of different doses of nano urea

Tosan Kumar Sahu and Deepak Kumar Chandrakar

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Abstract

A field experiment was conducted to find efficacy of nano urea on rice crop at Research Farm SG CARS, Jagdalpur. The higher growth parameter (plant height, dry matter accumulation, crop growth rate, relative growth rate, leaf area index, number of tillers), yield and economic of rice were observed under treatment T₅ 75% of RDN+ Two foliar sprays of nano urea (AT and PI) which was at par with treatment T₄ 50% of RDN + Two foliar sprays of nano urea (AT and PI) and T₆ 100% of RDN+ Two foliar sprays of nano urea (AT and PI).

Keywords: Rice, nano urea, growth parameters, yield, economics

Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crops. It is a rich source of carbohydrate as it contains a moderate amount of fat and protein and is also a source of vitamin B complex such as thiamine, riboflavin, and niacin. Rice protein, though small in amount, is of high nutritional value and bran is used as cattle and poultry feed. Rice plays a major role in global food security, as it is the staple food for over the half of the world's population. About 90% of rice grown in the world is produced and consumed in Asia. Rice is produced under both upland and lowland ecosystems with about 76% of the global rice produced from irrigated-lowland rice systems (Fageria *et al.*, 2003) [4].

Nitrogen is one of most important nutrient required for growth and development of rice. It is a constituent of compounds such as amino acids, proteins, RNA, DNA and several phytohormones and is thereby an essential macro element for plants. During vegetative stage rice plants require nitrogen to promote growth and tillering, which in turn determines potential number of panicles. It is essential for the synthesis of protein, which is the constituent of protoplasm and chloroplast. Nano urea is suitable source of application for nitrogen for most of the crops and has better use efficiency than conventional urea and because of the ultra-small size and surface properties, the liquid nano urea gets absorbed by plants more effectively when sprayed on their leaves. Upon penetration, these nano particles reach plant parts where nitrogen is required and release nutrients in a controlled manner, thereby reducing usage while also reducing wastage into the environment.

Materials and Methods

The experiment was conducted at Research Farm S.G. CARS Jagdalpur, Chhattisgarh in Randomized Block Design using ten treatments which were replicated three times. The experimental plot soil was low in available N and P, high in available K, medium in organic carbon with acidic in reaction. The total rainfall received during crop season 867.10 mm. The variety Samleswari 20 days seedling was transplanted on dated 3rd August 2021 and harvested on dated 20th November 2021. Healthy seedling was transplanted at the planting distance of 20 cm x 15 cm in all the plots and recommended fertilizer dose of 100:50:30 N:P:K (kg ha⁻¹).

Results and Discussion

Growth parameter and yield

The significantly taller plant (104.73 cm.) was recorded under treatment T₅ which was at par with treatment T₄ and T₆. Under nano urea cells growth increase which might be a reason for

Corresponding Author:
Tosan Kumar Sahu
Ph.D. Scholar, Department of
Agronomy, College of Agriculture,
IGKV, Raipur, Chhattisgarh, India

increase in the plant. These result findings were in close agreement with the findings of Benzon *et al.* (2015) [3]. The higher dry matter accumulation (59.30 g hill⁻¹) was recorded under treatment T₅ which was at par with treatments T₄ and T₆. The dry matter accumulation is increased by the release of nutrient while application and its absorption translocation and conversion of energy for growing parts. Nearly similar results were found by Aziz *et al.* (2021) [2]. The significantly higher crop growth rate (0.94 g hill⁻¹ day⁻¹) was noticed under treatment T₅ which was at par with treatment T₄ and T₆. Similar results were found by Gewaily *et al.* (2019) [5]. The higher relative growth rate (0.025 g g⁻¹ hill⁻¹ day⁻¹) was noticed under treatment T₅ which was at par with treatment T₄ and T₆. The higher plant height, and the leaf area index with more number of tillers directly contributes the growth parameters of rice which results in higher relative growth rate. These findings are in agreement with those reported by Rahman *et al.* (2020) [8]. The higher Leaf area index (4.29) was noticed under treatment T₅ which was at par with treatment T₄ and T₆. Nano urea enhances the number of leaves by the foliar application and as number of leaves increases the related factors such as leaf area index also increase. Similar findings were reported by Hussain *et al.* (2021) [6]. The

higher number of tillers (356.67 m⁻²) recorded under treatment T₅ which was at par with treatment T₄ and T₆. This is due to increased photosynthetic rate, better accumulation of sucrose, glucose as well as fructose in leaves, which might have increased the physiological parameters of the plant which resulted in higher number of tillers. Nearly similar results were found by Rathnayaka *et al.* (2018) [9]. The highest grain yield was observed under treatment T₅ which was at par T₄ and T₆. Application of nano urea increases grain yield it is mainly because of increasing growth of plant parts and metabolic process such as photosynthesis results in higher photosynthates accumulation and translocation to the economic parts of the plant. Similar findings were reported by Kumar *et al.* (2020) [7].

Economics

The significantly highest gross return, net return and B:C ratio was observed under treatment T₅ which was at par T₄ and T₆. Foliar application of nano urea results in the highest gross return, net return and B:C ratio which might be due to the higher grain and straw yields. These results are in consonance with Kumar *et al.* (2021) [1].

Table 1: Growth parameter and yield of rice as influenced by application of different levels nano urea

	Treatments	Plant height (cm) at harvest	Dry matter accumulation (g hill ⁻¹) at harvest	Crop growth rate (g hill ⁻¹ day ⁻¹) (60-90 DAT)	Relative growth rate (g g ⁻¹ hill ⁻¹ day ⁻¹) (60-90 DAT)	Leaf area index (at harvest)	Number of tillers m ⁻² (at harvest)	Grain yield (kg ha ⁻¹)
T ₁	RDF (N ₁₀₀ :P ₅₀ :K ₃₀ kg ha ⁻¹)	93.73	41.03	0.55	0.022	3.57	301.50	3947.92
T ₂	150% of RDF (N ₁₅₀ :P ₇₅ :K ₄₅ kg ha ⁻¹)	92.93	39.33	0.52	0.022	3.49	296.17	3812.5
T ₃	125% of RDF (N ₁₂₅ :P _{62.5} :K _{37.5} kg ha ⁻¹)	93.33	40.33	0.50	0.021	3.54	300.67	3908.33
T ₄	50% of RDN + Two foliar sprays of nano urea (AT and PI)	103.03	55.00	0.87	0.024	4.25	351.67	5077.08
T ₅	75% of RDN + Two foliar sprays of nano urea (AT and PI)	104.73	59.30	0.94	0.025	4.29	356.67	5195.83
T ₆	100% of RDN + Two foliar sprays of nano urea (AT and PI)	102.23	54.67	0.86	0.024	4.20	349.07	5020.83
T ₇	125% of RDN + Two foliar sprays of nano urea (AT and PI)	96.20	44.67	0.58	0.022	3.70	324.50	4491.66
T ₈	150% of RDN + Two foliar sprays of nano urea (AT and PI)	95.73	42.53	0.54	0.022	3.68	323.33	4402.08
T ₉	50% of RDN (Basal as well as two split doses after 25 days)	94.07	37.33	0.46	0.021	3.46	294.50	3781.25
T ₁₀	Control	71.63	28.03	0.35	0.020	3.19	252.03	2558.33
	SEm±	2.79	1.82	0.03	0.001	0.19	10.32	183.08
	CD (P = 0.05)	8.35	5.47	0.08	0.002	0.56	30.91	548.19

Table 2: Effect of nano urea application on economics of rice

Treatment	Gross return (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)	B:C Ratio
T ₁	77379.17	31171.46	1.67
T ₂	74725.00	27934.65	1.60
T ₃	76603.33	30104.3	1.65
T ₄	99510.83	53285.77	2.15
T ₅	101838.3	55321.95	2.19
T ₆	98408.33	51600.62	2.10
T ₇	88036.67	40937.64	1.87
T ₈	86280.83	38890.48	1.82
T ₉	74112.5	28487.33	1.62
T ₁₀	50143.33	11072.33	1.28
SEm±	3588.50	1529.73	0.07
CD (P = 0.05)	10744.60	4580.27	0.23

Conclusion

75% of RDN + Two foliar sprays of nano urea (AT and PI) was found higher than the other combinations of nano urea followed by 50% of RDN + Two foliar sprays of nano urea (AT and PI) and 100% of RDN + Two foliar sprays of nano urea (AT and PI) regarding the growth attributes, yield and economics of rice. Nano urea due to smaller particle diameters which penetrates more into the roots and leaves of plants improves the physiological traits and yield of crops and simultaneously reduces pollution of groundwater and diseases which is caused

by overusing of conventional urea prills/granular.

References

- Kumar AK, Kumar Y, Savitha AS, Kumar AMY. Effect of IFFCO nano fertilizer on growth, grain and managing turicum leaf blight disease in maize. International Journal of Plant & Soil Science. 2021;33:1-???. doi:10.9734/ijpss/2021/v33i1630519.
- Aziz BR, Zrar DB. Effect of foliar application of nano NPK fertilizer on growth and yield of broad bean (*Vicia faba* L.).

- Agricultural and Environmental Researches. 2021;33(4):??-??.
3. Benzon H, Rosnah U, Venecio U, Lee SC. Nano fertilizer affects the growth, development and chemical properties of rice. *International Journal of Agronomy and Agricultural Research*. 2015;7(1):105-117.
 4. Fageria NK, Slaton NA, Baligar VC. Nutrient management for improving lowland rice productivity and sustainability. *Advances in Agronomy*. 2003;80:63-152.
 5. Gewaily EE, Ghoneim AM, Khattab EA. Nano silicon and nitrogen foliar spray affects the growth, yield and nutrients content of rice. *World Journal of Agricultural Sciences*. 2019;15(6):367-375.
 6. Hussain MA, Omer ON, Mohammed HS. Response yield and some growth parameters of bread wheat to nano and nitrogen fertilizers. *Journal of University of Duhok*. 2021;24(1):73-81.
 7. Kumar Y, Tiwari KN, Singh T, Sain NK, Laxmi S, Verma R, *et al.* Nano fertilizers for enhancing nutrient use efficiency, crop productivity and economic returns in winter season crops of Rajasthan. *Annals of Plant and Soil Research*. 2020;22(4):324-335.
 8. Rahman A, Salam MA, Kader MA, Islam MS, Perveen S. Growth and yield of boro rice (*Oryza sativa* L.) in response to crop establishment methods and varieties. *Archives of Agriculture and Environmental Science*. 2020;5(2):137-143.
 9. Rathnayaka RMNN, Mahendran S, Iqbal YB, Rifnas LM. Influence of urea and nano nitrogen fertilizers on the growth and yield of rice (*Oryza sativa* L.) cultivar 'Bg 250'. *International Journal of Research Publications*. 2018;5(2):1-7.