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Effect of foliar application of nano urea on growth, yield and economics of sunflower (*Helianthus annuus* L.) in coastal Odisha

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Abstract

Nano fertilizers play a major role in sustainable agricultural production offering multifaceted benefits for crop cultivation while mitigating the adverse effects of excessive fertilizer usage on the ecosystem. A field experiment was conducted during *summer*, 2023 at the AICRP on sunflower, Odisha University Agriculture and Technology, Bhubaneswar to study the “effect of Foliar application of nano urea on growth, yield and economics of sunflower (*Helianthus annuus* L.) in coastal Odisha”. The experiment was carried out in a randomized block design with a total of ten treatments replicated thrice. The treatments are: 50%RDN through urea + nano urea 2mL⁻¹ at 45DAS, 50%RDN through urea + nano urea 3mL⁻¹ at 45 DAS, 50%RDN through urea + nano urea 4mL⁻¹ at 45DAS, 50%RDN through urea + urea spray 2% at 45DAS, 75% RDN through urea + nano urea 2mL⁻¹ at 45DAS, 75% RDN through urea + nano urea 3mL/L at 45DAS, 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS, 75% RDN through urea + urea spray 2% at 45 DAS, RDN through urea (60Kgha⁻¹), nano urea@2mL⁻¹ at 15,30 and 45 DAS. The results revealed that among all the treatments, RDN through urea(60kgha⁻¹) recorded maximum seed yield (1713 kgha⁻¹) and oil yield (670 kgha⁻¹) which was followed by 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS (seed yield of 1503 kgha⁻¹ and oil yield of 572 kgha⁻¹). The highest yield attributing characters i.e. head diameter (15.3 cm), 100 seed weight (5.7 g) were recorded in RDN through nano urea (60 kgha⁻¹). As compared to other treatments, RDN through urea 60 kgha⁻¹ recorded highest net return (Rs. 50350 ha⁻¹) and B: C ratio (1.77). From the study, it was concluded that conventional use of nitrogen fertilizer with urea 60 kgha⁻¹ can be practiced in sunflower. However, during scarce supply of urea, 75% RDN through urea in conjunction with 4mL⁻¹ nano urea spraying at 45DAS can be practiced with higher productivity and profitability in sunflower.

Keywords: Sunflower, nano urea, nitrogen, nano-fertiliser

Introduction

Sunflower (*Helianthus annuus* L.), an edible oilseed crop belongs to Asteraceae family. It contains oleic acid (42-57%) and linolenic acid (33-48%), which lowers low-density lipoprotein cholesterol, making it a good source of unsaturated fatty acids and lessens the risk of heart disease. However, it is known throughout the nation for its contribution to the "Yellow Revolution" and establishing edible oil self-sufficiency (Rai, 2002)^[6]. However, insufficient soil fertility, improper nutrient management, and subpar agronomic methods are some of the causes attributing to sunflower's continued low production and productivity problems in the coastal regions of Odisha. Nitrogen deficiency is probably the most important nutritional limitation to sunflower production worldwide. It is the most important nutrient, which determines the growth of the oilseed crops and increases the amount of protein and the yield. Conventional fertilizers are claimed to demand more manpower to be applied (especially as top dressing) and to alter the soil chemical properties if used indiscriminately. This indicates the need to explore new means to supply N to the crop with higher nitrogen use efficiency. Nano fertilizers work at nano scale (1-100 nm) dimensions using nutritionally active chemicals. Nitrogen, an essential ingredient for proper plant development and growth, is present in nano urea (liquid). Nitrogen levels in a healthy plant normally range from 1.5 to 4%. When applied as a foliar spray during crucial stages of crop growth, nano urea (liquid) successfully satisfies the plant's nitrogen needs, while

boosting crop quality and productivity. The use of nano fertilizers increases use efficiency through extremely high nutrient absorption, increases photosynthesis due to an increase in leaf surface area, and also minimizes the toxicity produced by excessive fertilizer use in the soil. Foliar application of nano N could efficiently supply required N to the crop during critical growth stages increasing N use efficiency and crop performance (Kumar *et al.*, 2021)^[2].

Materials and Methods

The experiment was carried out in the summer 2023 at the Instructional farm of the Odisha University of Agriculture & Technology in Bhubaneswar. The experimental site is located 64 kilometres from the Bay of Bengal at 20°27' North Latitude and 85°79' East Longitude, at an elevation of 25.9 m above mean sea level (MSL). It belongs to the East and South Eastern Coastal Plain Agroclimatic Zone of Odisha. During experiment total rainfall received (January to April) was 113.10 mm with 6 rainy days. During the crop growth period, the mean maximum and minimum temperatures were 37.2 °C (April) and 16.4 °C (January), respectively. The crop was sown on 27th January, 2022 with the test hybrid DRS-1 and spacing of 60cm x 30cm. The experiment was carried out in RBD with the treatments: T₁- 50%RDN through urea + nano urea 2mL⁻¹ at 45DAS, T₂- 50%RDN through urea + nano urea 3mL⁻¹ at 45 DAS, T₃- 50%RDN through urea + nano urea 4mL⁻¹ at 45DAS, T₄- 50%RDN through urea + urea spray 2% at 45DAS, T₅ - 75% RDN through urea + nano urea 2mL⁻¹ at 45DAS, T₆- 75% RDN through urea + nano urea 3mL/L at 45DAS, T₇- 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS, T₈- 75% RDN through urea + urea spray 2% at 45 DAS, T₉- RDN through urea (60Kgha⁻¹), T₁₀- nano urea@2mL⁻¹ at 15,30 and 45 DAS. The soil of the experimental site was sandy loam in texture. The soil was acidic in reaction with pH of 5.12, low in organic carbon (0.59%), medium in available nitrogen (133.38 kg/ha), low in available phosphorous (7.07 kg/ha) and medium in available potassium (263.16 kg/ha). A fertiliser dose of 60-80-60: N-P₂O₅-K₂O (kg/ha) along with well decomposed FYM@5t/ha was applied in the treatment with normal fertilizer application(T₉). In this treatment 50% N with full P₂O₅ and K₂O was applied as basal. 25%N was top dressed at button stage (30-35 DAS) and rest 25% N was top dressed at flowering stage (50-55 DAS). In treatments T₁ to T₄ 50% of RDN was applied as basal and in treatments T₅ to T₈ 50% N was applied as basal and rest 25% at 30DAS (button stage). In treatment T₄& T₈ 2% urea spraying was done.

Results and Discussion

Growth & Yield

At 60DAS split application of conventional granular urea in T₉

treatment (RDN through urea 60kgha⁻¹) resulted in significantly tallest plant height (166cm) over nano urea applied treatments. So, by this we can notice that application of nano urea at various rates could show its significance only when compared to no basal nitrogen applied treatment.

Highest head diameter (15.3 cm) was recorded with soil applied nitrogenous fertilizer treatment and was due to the release of nutrient at controlled pace and this makes the plant to readily absorb the nutrient and helps in assimilation of more photosynthates resulting in better partitioning of photosynthates from source to sink reflecting in yield attributes (capitulum diameter). Highest seed index (5.7g) was recorded when N was applied through Urea(T₉) followed by the treatment 75% RDN through urea + nano urea 4mL/l at 45 DAS(5.5 g). From the data it was observed that seed yield of sunflower was significantly maximum with application of 100% conventional N fertilizer through urea with the treatment T₉ (1713kgha⁻¹) which was superior over the rest of the treatments. This was followed by 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS (1503kgha⁻¹). The lowest seed yield was obtained in the treatment where no basal nitrogen was applied and nano urea was applied @ 2mL⁻¹ at 15, 30, 45DAS (1064 kg ha⁻¹). According to Sridhar *et al.* (2012)^[5] increased nitrogen availability due to adequacy of soil applied recommended dosage of fertilizers from inorganic source during seedling and grand vegetative stage might have increased drymatter production and its better partitioning resulted in improvement of yield attributing characters, culminating in higher seed yield. Similar results have been observed by Mollashahi *et al.* (2013)^[3] and Munir *et al.* (2007)^[4] also reported that the application of RDF affects the development and growth of both source and sink. It is evident from the data that there was significant variation in oil yield in relation to nitrogen application practice. Significantly highest oil yield (670 kg ha⁻¹) in sunflower has been recorded with conventional N application practice (T₉) followed by 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS (572 kg ha⁻¹). Lowest oil yield (395 kg ha⁻¹) was obtained with T₁₀. There is promising relevance of including foliar application of nano urea (liquid) in N management under low input agriculture Velmurugan *et al.* (2021)^[7] and the areas where adequate quantity of conventional urea could not reach due to various reasons Highest net return (Rs. 50350 ha⁻¹) was recorded with RDN through urea (60 kg ha⁻¹) treatment followed by 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS (Rs. 35371 ha⁻¹). The highest B:C ratio (1.77) was recorded with RDN through urea (60 kg ha⁻¹) treatment followed by 75% RDN through urea + nano urea 4mL⁻¹ at 45DAS (1.53). The present results were in accordance with the findings of Dambale *et al.* (2018)^[1].

Table 1: Effect of nano urea on growth, yield attributes, Yield and economics of Sunflower

Treatments	Plant height (cm.)	Head dia (cm)	100 seed Wt. (g)	Seed yield (kg/ha)	Oil yield (kg/ha)	Net return (Rs.)	BCR
T ₁ 50% RDN through urea + nano urea 2ml/l at 45 DAS	126	11.4	4.1	1082	416	7559	1.12
T ₂ 50% RDN through urea + nano urea 3ml/l at 45 DAS	129	11.5	4.1	1176	448	13682	1.21
T ₃ 50% RDN through urea + nano urea 4ml/l at 45 DAS	139	12.6	4.8	1287	503	20967	1.32
T ₄ 50% RDN through urea + urea spray 2% at 45 DAS	122	10.2	3.6	1079	412	7746	1.12
T ₅ 75% RDN through urea + nano urea 2ml/l at 45 DAS	137	12.5	4.7	1225	461	17028	1.26
T ₆ 75% RDN through urea + nano urea 3ml/l at 45 DAS	140	13.3	5.2	1400	525	28633	1.43
T ₇ 75% RDN through urea + nano urea 4ml/l at 45 DAS	142	13.3	5.5	1503	572	35371	1.53
T ₈ 75% RDN through urea + urea spray 2% at 45 DAS	134	11.7	4.4	1208	462	16269	1.25
T ₉ RDN through urea	166	15.3	5.7	1713	670	50350	1.77
T ₁₀ Nano urea @2ml/l at 15,30 and 45 DAS	122	8.9	4.5	1064	395	5832	1.09
S.Em(±)	5.9	0.6	0.4	85.6	32.9	-	-
CD (p=0.05)	18.0	1.8	1.1	254	98.0	-	-

Conclusion

Considering the overall growth, productivity (1713 kg ha^{-1}), and profitability (Rs. 50350 ha^{-1}) conventional use of nitrogen fertilizer with urea 60 kg ha^{-1} can be practiced in sunflower. However, during scarce supply of urea, 75% RDN through urea in conjunction with 4 mL^{-1} nano urea spraying at 45DAS can be practiced with higher productivity and profitability in sunflower.

References:

1. Dambale AS, Ghotmukale AK, Khandekar SD, Suryawanshi SB, Suryararshi VP, Shinde RS. Influence of integrated nutrient management on growth, yield, quality and economics of sunflower (*Helianthus annuus* L.). Int J Curr Microbiol Appl Sci. 2018;6:1226-1233.
2. Kumar Y, Tiwari KN, Singh T, Raliya R. Nanofertilizers and their role in sustainable agriculture. Ann Plant Soil Res. 2021;23(3):238-255.
3. Mollashahi M, Ganjali H, Fanaei H. Effect of different levels of nitrogen and potassium on yield, yield components and oil content of sunflower. Int J Farming Allied Sci. 2013;2:1237-1240.
4. Munir MA, Malik MA, Yaseen M. Performance of sunflower in response to nitrogen management at different stages. Pak J Agric Sci. 2007;44:12-15.
5. Sridhar K, Yakadri M, Prasad JVNS, Ramesh T, Sarawad IM, Angadi VV, et al. Nitrogen management in Rabi sunflower (*Helianthus annuus* L.) in relation to different tillage practices imposed during Kharif. Indian J Dryland Agric Res Dev. 2012;27(2):69-72.
6. Rai M. Oilseeds in India. Andhra Pradesh Agric Res J. 2002;20:13-15.
7. Velmurugan A, Subramani T, Bommayasamy S, Ramakrishna MK, Swarnam TP. The effect of foliar application of nano urea (liquid) on rice (*Oryza sativa* L.). J Andaman Sci Assoc. 2021;26(2):76-81