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Influence of nano urea and sulphur on growth and yield of sunflower (*Helianthus annuus* L)

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Abstract
At the Central Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj (U.P), a field experiment was undertaken in the month of Zaid in 2022. The experiment was set up using a Randomized Block Design, with each of the 10 treatments being reproduced three times. The result showed that growth parameters *viz.* Dry weight per plant (70.08 g), straw yield (3.36 t/ha) were recorded significantly higher with applying 40 kg/ha of sulfur and 4 ml/l of nano-urea and higher oil content (37.73%) with application of S40 kg/ha+ nano urea 3 ml/l. Between 60-80 DAS, Highest CGR (4.98 g/m^2/day) and RGR (0.0147 g/g/day) were reported with the use of 40 kg/ha of sulfur and 4 ml/lt of nanourea.

Keywords: Sunflower, zinc, nano urea, growth, yield

Introduction

Sunflower (*Helianthus annuus* L.), is a member of the Compositae family. It was first domesticated in Mexico and Peru and brought to India in the sixteenth century. As one of the most significant and premium oilseeds, sunflower has a high concentration of polyunsaturated fatty acids (PUFAs), which have a Lack of linolenic acid and a high quantity of linoleic acid (64%) aid in washing away cholesterol buildup in the heart's coronary arteries, which is advantageous for heart patients. But its role to the "Yellow Revolution" and achieving self-sufficiency in edible oil and noteworthy in the country (Rai, 2002) [13]. Nowadays, the consumption of edible oil is increasing, whereas production is declining due to the imbalanced application of nutrients in India. The increased demand for food grain production has led to intensive cultivation, which paves continuous depletion of soil micronutrient fertility. It holds great promise because of its short duration (90-100 days), high seed multiplication ratio, wide adaptability, photo-insensitivity, higher water use efficiency and drought tolerance. The main cause of insufficient carrying capacity is low productivity and stock stills or a loss in the area of production of these oil crops, such as peanut, rapeseed, and mustard.

In India, Sin sufficiency is a common problem. It is the fourth most essential nutrient after nitrogen, phosphorus, and potassium. (Sakal *et al.* 2001) [11]. It significantly contributes to increasing the sunflower crop's seed quality and the effectiveness with which nitrogen and phosphorus are used. Sis essential for the growth of seeds and enhancing quality in oilseeds. (Naser *et al.*, 2012) [12].

The major consequences of urea fertilizer include harmful environmental effects, early soil growth, and seedling development. Urea is a more economically advantageous form of traditional fertilizer when applied at key crop growth phases. The yield and oil content of the seeds are increased by the plants when they receive enough sulphur. The main indicator of a nutrient deficiency in sulfur is the yellowing of younger leaves, which may be brought on by inadequate chlorophyll synthesis. Eventually, a plant's growth will slow.

Nutrient loss occurs when fertilisers are applied directly to the soil due to a variety of processes, including photolysis, hydrolysis, leaching, and degradation. This makes it likely that the applied fertilizer won't be able to reach the exact locations in the plant's system where it would be most beneficial for promoting crop development and output. In order to increase the fertilizer's effectiveness, a crop was treated with a foliar spray application of nano fertilizer. (Ajith Kumar *et al.* 2021) [10].

Nanomaterials, which are substances with a minimum one-dimensional size of 1 nm and a maximum size of 100 nm, are used to create nano fertiliser. Nano urea (liquid) contains nitrogen, a crucial element for healthy plant development and growth.

A healthy plant typically has nitrogen levels between 1.5 and 4%. The plant's nitrogen requirements are successfully met by nano urea (liquid) when administered as a foliar spray during critical periods of crop growth. While increasing crop production and quality. When compared to other treatments, using 100% Nano fertiliser has resulted in the highest growth performance.

Researchers have thought of using novel fertilising techniques, one of which is the use of nano-fertilizers to feed plants and the soil. In reality, potential for improving nutrient utilization and lowering environmental protection expenditures have been provided by nanotechnology. (Naderi and Abedi, 2012) [9].

The present investigation entitled "Influence of Nano Urea and Son growth and yield of sunflower (*Helianthus annuus* L)" was undertaken with the following objectives.

Material and Methods

At the Central Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj (U.P), a field experiment was undertaken in the month of Zaid in 2022. To evaluate the impact of Sand nano urea on sunflower growth and yield. A Randomized Block Design with ten treatments and three replications was used to set up the experiment. Two different levels of Sand nano-urea were combined in the treatment.

The nutrient sources are urea, DAP, MOP and elemental S fulfil the requirement of Nitrogen, Phosphorus, Potassium and Sulphur. Following the region's advice, plant protection measures were taken. Three plants at random were chosen from each plot's border rows to weigh the plants for dry weight. After an appropriate drying period, the crop was cut from the net plot area (1 m^2) and manually threshed. The grain was afterwards washed, weighed, winnowed, and expressed as tonnes per hectare. The grain yield per ha was calculated. In Statistical computation and evaluation of the data were performed. Initial soil samples were obtained after full field preparation in order to assay for main nutrients that were readily available. Organic Carbon (OC), pH, soluble salts, phosphorus (P), potassium (K), and nitrogen (N). The type of soil in the experimental field is sandy loam. The pH of the experimental field was 8.0, organic carbon was 0.42%. The N status of the experimental field was 180.58 kg/ha, available P was 15.54 kg/ha, while available K status was 198.67 kg/ha.

Treatment Combinations

Treatment combinations	
Treatment 1	S 20 kg ha^{-1} + Nano urea 2ml l^{-1}
Treatment 2	S 20 kg ha^{-1} + Nano urea 3ml l^{-1}
Treatment 3	S 20 kg ha^{-1} + Nano urea 4ml l^{-1}
Treatment 4	S 30 kg ha^{-1} + Nano urea 2ml l^{-1}
Treatment 5	S 30 kg ha^{-1} + Nano urea 3ml l^{-1}
Treatment 6	S 30 kg ha^{-1} + Nano urea 4ml l^{-1}
Treatment 7	S 40 kg ha^{-1} + Nano urea 2ml l^{-1}
Treatment 8	S 40 kg ha^{-1} + Nano urea 3ml l^{-1}
Treatment 9	S 40 kg ha^{-1} + Nano urea 4ml l^{-1}
Treatment 10	Control (RDF 60-30-30 kg ha^{-1} NPK)

Result and Discussion

Dry weight per plant: The data resulted that there were an increase in dry weight. At 80DAS, significantly higher plant dry weight (70.08 g) was observed in treatment 9. However, Treatment 8 and Treatment 6 were found to be statistically at par with Treatment 9. It might be due to Saids in the production of chlorophyll and promotes vegetative plant development. It also accelerates root development (Yawalkar *et al.*, 2002) [5] and also Sulphur treatment may enhance plant dry matter because of an increase in metabolic activity, as documented by (Jagtap *et al.*, 2003) [6]. Further, increase in dry weight per plant might be due to increased photosynthetic rate and higher leaf area. Similar result were found by Rawate *et al.* (2022) [7].

Crop Growth Rate: At 60-80 DAS, the highest crop growth rate was obtained in Treatment 9 i.e. 4.98 g $m^{-2}day^{-1}$ which was 19.9% higher than the lowest CGR though it was non-significant. At 40-60 DAS, higher CGR (12.17 g $m^{-2}day^{-1}$) was observed in Treatment 9. However, Treatment 8, Treatment 6 and Treatment 5 were found to be statistically at par with Treatment 9. At 20-40 DAS, the highest CGR was obtained in Treatment 5 i.e., 2.66 g $m^{-2}day^{-1}$ which was 28% higher than the lowest CGR though it was non-significant among the treatments.

Relative growth rate: At 60-80 DAS, the highest crop growth rate was obtained in T6 (S30 kg/ha + Nano urea 4 ml/l) i.e., 0.0147 g $m^{-2}day^{-1}$ which was 12.9% higher than the lowest RGR though it was non-significant. At 40-60 DAS, higher RGR (0.0927 g $m^{-2}day^{-1}$) was observed in Treatment 6. However, Treatment 9 and Treatment 1were found to be statistically at par with Treatment 6. At 20-40 DAS, the highest RGR was obtained in Treatment 5 i.e., 0.162 g $m^{-2}day^{-1}$ which was 18.4% higher than the lowest CGR though it was non-significant among the treatments.

Grain Yield: The data revealed that there was an increase in grain yield. Significant and higher grain yield (1.70 t ha^{-1}) was observed in Treatment 8. However, Treatment 9, Treatment 5, Treatment 7 and Treatment 6 was found to be statistically at par with Treatment 9. It might be a result of the strong growth that may have aided in increased dry production and led to more photosynthate accumulation in sink. Similarly reported by Vyas *et al.* (2020) [4], a similar outcome was obtained. Further, foliar spray of nano urea leading to more photosynthate assimilation and translocation of photosynthates from the source to the sink in addition timely supply of nitrogen stimulates the initiation of grain formation which helped to increase the number of grains. Nearly similar results were found by Algym *et al.* (2020) [3].

Straw Yield: The data revealed that there was an increase in grain yield at 80 DAS. Significant and higher straw yield (3.36 t ha^{-1}) was observed in Treatment 9. However, Treatment 8 and Treatment 6 was found to be statistically at par with Treatment 9.

The fast plant uptake of and ease of translocation of nano fertilisers may have contributed to greater rates of photosynthesis and more dry matter buildup, which in turn resulted in increased straw production, when applied as a foliar spray of nano urea fertiliser. Results of Khalil *et al.* (2019) [2] were very comparable.

Oil Content: The data revealed that there was an increase in grain yield at 80 DAS. Significantly higher oil content (37.73%) was observed in Treatment 8. However, Treatment 7 and Treatment 9 were found to be statistically at par with Treatment 9.

Sis a component of acetyl Co-A, is transformed into maloyl Co-A during the production of fatty acids by the enzyme hexokinase. Similarly, reported by Rani *et al.* (2009) [14].

Table 1: Influence of Nano Urea and Sulphur on Crop Growth Rate (g $m^{-2}day^{-1}$) of sunflower.

Treatment Combinations		Crop Growth Rate (g $m^{-2}day^{-1}$)		
		20-40DAS	40-60DAS	60-80DAS
1.	S 20 kg ha^{-1} + Nano urea 2ml l^{-1}	3.33	15.94	5.58
2.	S 20 kg ha^{-1} + Nano urea 3ml l^{-1}	3.68	15.49	6.67
3.	S 20 kg ha^{-1} + Nano urea 4ml l^{-1}	3.79	15.79	6.60
4.	S 30 kg ha^{-1} + Nano urea 2ml l^{-1}	3.72	15.54	5.78
5.	S 30 kg ha^{-1} + Nano urea 3ml l^{-1}	3.99	16.43	6.31
6.	S 30 kg ha^{-1} + Nano urea 4ml l^{-1}	3.20	18.14	6.41
7.	S 40 kg ha^{-1} + Nano urea 2ml l^{-1}	3.45	16.21	6.80
8.	S 40 kg ha^{-1} + Nano urea 3ml l^{-1}	3.86	18.22	6.32
9.	S 40 kg ha^{-1} + Nano urea 4ml l^{-1}	3.32	18.25	7.46
10.	Control (RDF 60-30-30 kg ha^{-1} NPK)	3.25	15.83	5.17
	F test	NS	S	NS
	S.Em(±)		0.63	1.25
	C.D. (P=0.05)	0.59	1.87	3.71

Table 2: Influence of nano urea and sulphur on relative growth rate (g $g^{-1}day^{-1}$) of sunflower.

Treatment Combinations		Relative Growth Rate (g $g^{-1}day^{-1}$)		
		20-40DAS	40-60DAS	60-80DAS
1.	S 20 kg ha^{-1} + Nano urea 2 ml l^{-1}	0.141	0.0867	0.0127
2.	S 20 kg ha^{-1} + Nano urea 3 ml l^{-1}	0.147	0.0803	0.0147
3.	S 20 kg ha^{-1} + Nano urea 4 ml l^{-1}	0.148	0.0800	0.0146
4.	S 30 kg ha^{-1} + Nano urea 2 ml l^{-1}	0.158	0.0800	0.0127
5.	S 30 kg ha^{-1} + Nano urea 3 ml l^{-1}	0.162	0.0800	0.0133
6.	S 30 kg ha^{-1} + Nano urea 4 ml l^{-1}	0.150	0.0927	0.0130
7.	S 40 kg ha^{-1} + Nano urea 2 ml l^{-1}	0.156	0.0853	0.0147
8.	S 40 kg ha^{-1} + Nano urea 3 ml l^{-1}	0.157	0.0857	0.0120
9.	S 40 kg ha^{-1} + Nano urea 4 ml l^{-1}	0.153	0.0917	0.0147
10.	Control (RDF 60-30-30 kg ha^{-1} NPK)	0.153	0.0867	0.0120
	F test	NS	S	NS
	S.Em(±)	0.006	0.0025	0.0026
	C.D. (P=0.05)	-	0.0075	-

Table 3: Influence of nano urea and sulphur on dry weight and yield of sunflower

S. No.	Treatment combinations	Dry weight/plant(g)	Grain yield (t/ha)	Stover yield(t/ha)	Oil content (%)
1.	S (20 kg/ha) + Nano urea (2 ml/l)	59.83	1.34	2.42	34.23
2.	S (20 kg/ha) + Nano urea (3 ml/l)	62.50	1.45	2.63	34.96
3.	S (20 kg/ha) + Nano urea (4 ml/l)	63.33	1.39	2.73	33.67
4.	S (30 kg/ha) + Nano urea (2 ml/l)	60.50	1.50	2.55	35.47
5.	S (30 kg/ha) + Nano urea (3 ml/l)	64.58	1.62	3.03	36.40
6.	S (30 kg/ha) + Nano urea (4 ml/l)	67.00	1.52	3.14	35.58
7.	S (40 kg/ha) + Nano urea (2 ml/l)	63.92	1.53	2.83	37.47
8.	S (40 kg/ha) + Nano urea (3 ml/l)	68.58	1.70	3.23	37.73
9.	S (40 kg/ha) + Nano urea (4 ml/l)	70.08	1.66	3.36	37.25
10.	Control	58.58	1.20	2.35	32.33
	F test	S	S	S	S
	S.Em(±)	2.37	0.059	0.108	0.929
	C.D. (P=0.05)	4.96	0.175	0.319	2.76

Conclusions

It was concluded that with the application of S along with foliar application of nano urea in Treatment 9. It has positively and improves growth and yield parameter.

References

1. Rani UK, Sharma KL, Nagasri K, Srinivas K, Murthy TV, Shankar GR, *et al.* Effect of different levels of phosphorus and Son the growth, yield and oil content of sunflower, (*Helianthus annuus* L.). J Oilseeds Res. 2011;22(2):408-9.
2. Khalil MH, Abou AAF, Abdrabou RTH, Abdalhalim SH, Abdelmaaboud MSH. Response of two maize cultivars (*Zea mays* L.) to organic manur and mineral nano nitrpgen fertilizer under siwa oasis conditions. Aujas, Ain Shams Univ., Cairo, Egypt. 2019;27(1):299-312.
3. Algym AJK, Alasady MHS. Effect of the method and level of adding NPK nanoparticles and mineral fertilizers on the growth and yield of yellow corn and the content of mineral nutrient of some plant parts. 2020;20(1):38-43.
4. Vyas VV, Singh R, Singh E. Effect of different levels of phosphorus and Son Growth and Yield of Linseed

(*Linum usitatissimum* L.). Int J Curr Microbiol App Sci. 2020;9(12):1692-6

5. Yawalkar KS, JP Agarwal, S Bodke. Manure and fertilizer. 9th Revised Ed; c2002. p. 8-13.
6. Jagtap AG. Effect of different sources and levels of son growth and yield of linseed. Unpublished M.Sc. Agri. Thesis, Dr. PDKV, Akola; c2003.
7. Rawate D, Patel JR, Agrawal AP, Agrawal HP, Pandey D, Patel CR, *et al.* Effect of nano urea on productivity of wheat (*Triticum aestivum* L.) under irrigated condition; c2022.
8. Gomez KA, Gomez AA. Statistical procedures for Agricultural Research. 2nd Ed. New York: John Wiley & Sons; c1976. p. 680.
9. Naderi MR, Abedi A. Application of nanotechnology in agriculture and refinement of environmental pollutants. J Nanotechnology. 2012;11(1):18-26.
10. Ajithkumaz K, Kumar Y, Savitha AS, Ajayakumar MY, Narayanaswamy C, Raliya R, Bhat SN. Effect of IFFCO Nano fertilizer on growth, grain yield and managing turcicum leaf blight disease in maize. International Journal of Plant & Soil Science. 2021;33(16):19-28.
11. Sakal R, Singh AP, Choudhary BC, Shahi B. Status of Ustifluvents and response of crops to application. Fertiliser News. 2001;46(10):61-66.
12. Naser A, Sarvajeet A, Gill S, Umar S, Ahmed I, Durate AC, *et al.* Improving growth and productivity of Oliferous brassica under changing environment. Significance of nitrogen and Snutrient and underlying mechanisms. The Scientific World Journal; c2012. p. 21.
13. Rai M. Oilseeds in India. Andhra Pradesh Agric. Reg. Res. J. 2002;20:13-15.
14. Raman R, Rani PK, Rachepalle SR, Gnanamoorthy P, Uthra S, Kumaramanickavel G, *et al.* Prevalence of diabetic retinopathy in India: Sankara Nethralaya diabetic retinopathy epidemiology and molecular genetics study report 2. Ophthalmology. 2009 Feb 1;116(2):311-8.