WATER-SOLUBLE NANO NITROGEN FOLIAR SPRAY

INTRODUCTION

The Importance of Nitrogen in Crop Growth

Fertilizers are added to crops to ensure sufficient food production for growing human populations. They supply essential nutrients—primarily nitrogen, phosphorus, and potassium—that enable crops to grow faster, larger, and more productively.

Among these macronutrients, **nitrogen is the most crucial for plant growth**. It plays a vital role in several biological processes. Nitrogen is a key component of *chlorophyll*, the pigment that enables plants to harness sunlight for photosynthesis—converting carbon dioxide and water into sugars, their primary source of energy. Nitrogen is also a fundamental building block of *amino acids*, which form the proteins required for plant

structure and function. Without adequate protein synthesis, plants cannot grow and eventually wither.

Additionally, nitrogen is essential for the formation of *nucleic acids* such as DNA and RNA, the molecules that carry genetic information and regulate cell division and reproduction. Thus, nitrogen is indispensable to the growth, development, and reproduction of plants.

Although nitrogen makes up approximately 78% of the atmosphere, plants cannot directly absorb atmospheric nitrogen (N_2). Instead, they rely on nitrogen compounds—such as nitrates and ammonium—in the soil. These compounds can be formed naturally through biological nitrogen fixation and decomposition or supplemented through the application of fertilizers.

Plants absorb nitrogen continuously throughout their life cycle, with their nitrogen requirement increasing as they grow. When adequately supplied, plants exhibit vigorous growth and lush, green foliage. In annual crops like maize (corn), sufficient nitrogen allows the plant to reach full maturity without developmental delays.

Conversely, **nitrogen deficiency** leads to poor plant performance. A nitrogen-starved plant is typically small and slow-growing, with pale green or yellowish leaves due to reduced chlorophyll content. In such cases, older leaves often become necrotic and die, as the plant reallocates its limited nitrogen reserves to support newer growth

UREA AS A NITROGEN SUPPLEMENT IN AGRICULTURE: BENEFITS AND LIMITATIONS

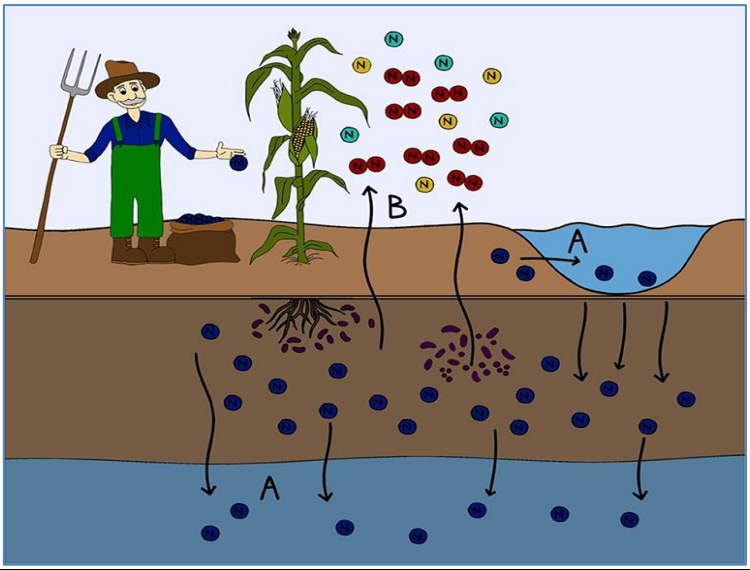
To address the deficit in nitrogen availability in agricultural soils, farmers commonly apply nitrogen-rich supplements. The most widely used nitrogen fertilizer across the world is **urea**, owing to its high nitrogen content (46%) and natural origin—it is a compound naturally found in the urine of animals. Urea's high solubility in water makes it easy to handle, transport, and apply in agricultural fields.

However, while urea is effective in promoting plant growth, significant nitrogen losses occur during and after its application—reducing its overall efficiency and contributing to environmental harm.

Once applied to the soil, urea begins to break down rapidly in the presence of moisture and the enzyme **urease**, which is naturally present in most soils. The breakdown reaction is as follows:

$$\mathbf{CO(NH_2)_2 + H_2O + urease \rightarrow 2NH_3 + CO_2}$$

In this process, urea hydrolyzes into ammonia (NH_3) and carbon dioxide (CO_2). This reaction typically occurs within 2 to 4 days, and the rate is accelerated in warm conditions and alkaline (high pH) soils.



Nitrogen from fertilizers that is not taken up by plants can be lost from the soil. ***(A)*** *Nitrogen leaches from the soil and enters into waterways either above ground (lakes, streams, rivers, or oceans) or into ground water. Nitrogen leaching into aquatic ecosystems can lead to harmful algal blooms and the eutrophication of waterways.* ***(B)*** *Some microbes transform the nitrogen in fertilizer into nitrogenous gases. These can then be lost to the atmosphere in the form of greenhouses gases.*

The key issue is that **ammonia is a gas** and easily volatilizes into the atmosphere if the urea remains on the soil surface and is not incorporated quickly. If soils are dry, the reaction is stalled, but once moisture is present, losses can be substantial unless immediate incorporation methods are adopted.

In addition to volatilization, **unutilized nitrogen from urea can leach into the soil** and eventually be carried away by irrigation or rainwater into nearby water bodies—such as streams, lakes, rivers, and groundwater reservoirs. This **runoff contributes to nitrogen pollution**, leading to environmental concerns such as **eutrophication**, algal blooms, and degradation of aquatic ecosystems.

Studies show that, in a typical agricultural field, **less than 40% of the nitrogen from urea is actually absorbed by crops**. The remaining nitrogen [more than 60%] is either lost to the atmosphere as gaseous ammonia **[a greenhouse gas]** or leached away into water systems. Thus, although urea is effective in stimulating crop growth, more than half of the applied nitrogen goes unused—representing both an economic inefficiency and an environmental hazard.

DRAIN ON NATIONAL RESOURCES

Since Urea, despite its adverse impact on ecology, is considered an absolute necessity for farmers, the Government of India [as do several other countries as well] offers Urea to farmers at highly subsidised rates. Urea, which costs Rs 2600 per bag [45 kgs] in the open market, is made available to farmers at Rs 242. In other words, the Government loses Rs 2358 on every bag of Urea sold to farmers. According to the *Annual Review of Fertilizer Production and Consumption 2023–24*, the budget estimate (BE) for annual urea subsidy in 2024–25 is:

- **₹1,19,000 crore** (≈ USD 15 billion)

This breaks down as:

- **₹1,00,340** crore for subsidy on **indigenous urea production**
- **₹22,634** crore for **imported urea subsidy**

Indian farmers require about 35 million tons of Urea each year. Indian fertilizer manufacturers produce about 31 million tons. Which means, about 4 million tons of Urea is being imported into India every year at high prices and then sold to farmers at subsidised rates.

THE NEED FOR AN ALTERNATIVE

While we need nitrogen from fertilizers for our agriculture, we do not need or want additional nitrogen in our soil, atmosphere or waterways. This means we need to balance the positive benefits of nitrogen fertilization (more food) with the negative consequences of excess fertilizer (environmental hazards) and financial drain on the national exchequer.

The scientists of **EcoHealth Products Pvt Ltd**, India have, after intense researches, developed **N-RICH NANO**, a nano-nitrogen concentrate in liquid form, which has all the benefits of Urea, with none of its deleterious side-effects.

To overcome the limitations associated with urea-based nitrogen application, **nano nitrogen foliar sprays** have emerged as a modern, efficient alternative. These sprays contain nitrogen in ultra-small particle form (typically <100 nm), which enhances its absorption and utilization by plants through leaf surface pores rather than relying on soil uptake.

Below is a comparison of the two approaches:

Parameter	Conventional Urea Application	Nano Nitrogen Foliar Spray
Nitrogen Content	~46% by weight	Typically 4–10% (depending on formulation)
Mode of Application	Soil-based, usually broadcast and mixed with irrigation	Directly sprayed on leaves
Nitrogen Uptake Efficiency	30–40% (rest lost to air, leaching, runoff)	>80% (rapid uptake through stomata and cuticle)
Time to Effect	3–5 days (depends on soil conditions)	Within 24–48 hours (visible response often faster)
Loss Pathways	Volatilization (NH_3), leaching, denitrification	Minimal; bypasses soil, reducing losses
Environmental Impact	High—causes air/water pollution leading to eutrophication and greenhouse effect	Very low—minimal runoff or emissions

Application Frequency	Fewer, larger doses; risk of overuse	Smaller, more precise doses; easily scheduled
Energy/Water Requirement	Needs soil moisture or irrigation for activation	Can be applied in low water volumes
Cost per kg Nitrogen	Low	Higher per kg, but offset by higher efficiency
Overall Agronomic Efficiency	Moderate; economic loss due to wastage	High; improved crop response with reduced total nitrogen

Key Advantages of Nano Nitrogen Foliar Spray:

- **Precision Delivery**: Nitrogen is delivered directly to where it's needed—inside plant tissues—without dependency on soil conditions.
- **Reduced Environmental Burden**: Virtually eliminates volatilization and nitrate runoff, thereby protecting air and water quality.
- **Higher Efficiency per Dose**: Even with lower nitrogen content per kg, nano nitrogen achieves superior performance due to high uptake efficiency.
- **Complement to Soil Fertility Practices**: Ideal for use in combination with organic or bio-based soil conditioners for balanced nutrition.

In essence, **nano nitrogen is not just a substitute, but a next-generation improvement**—particularly suited for sustainable, low-input farming systems where nutrient use efficiency and environmental stewardship are paramount.

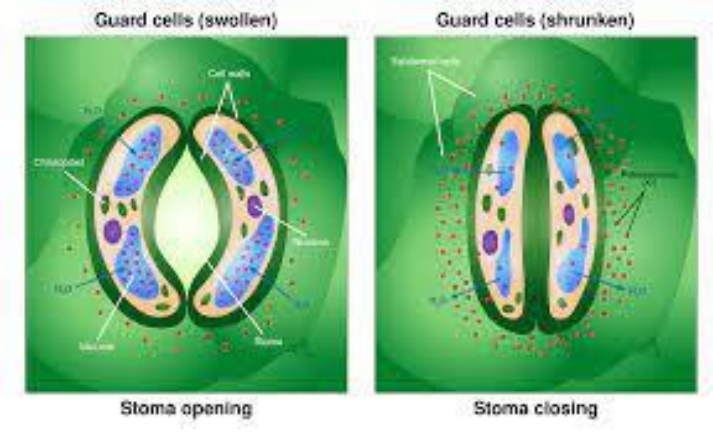
WHAT ARE NANO FERTILIZERS?

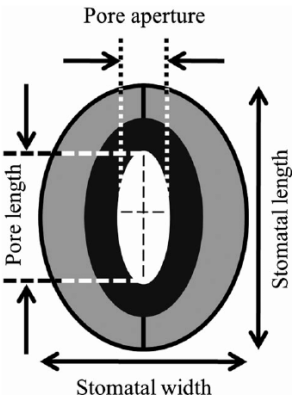
Nano-fertilizers are the latest cutting-edge technology for optimising nutrient absorption by crops with minimal wastage. Nano-scale fertilizers correspond to the conventional fertilizer, but have greatly reduced particle size, typically in the form of nano-particles. Nano-fertilizers offer benefits in nutrition management through their strong potential to increase Nutrient Use Efficiency (NUE). Nano-fertilizers are a crucial development in the protection of the

environment because they can be applied in smaller quantities compared to traditional fertilizers, hence reducing leaching, runoff, and gas emissions to the atmosphere.

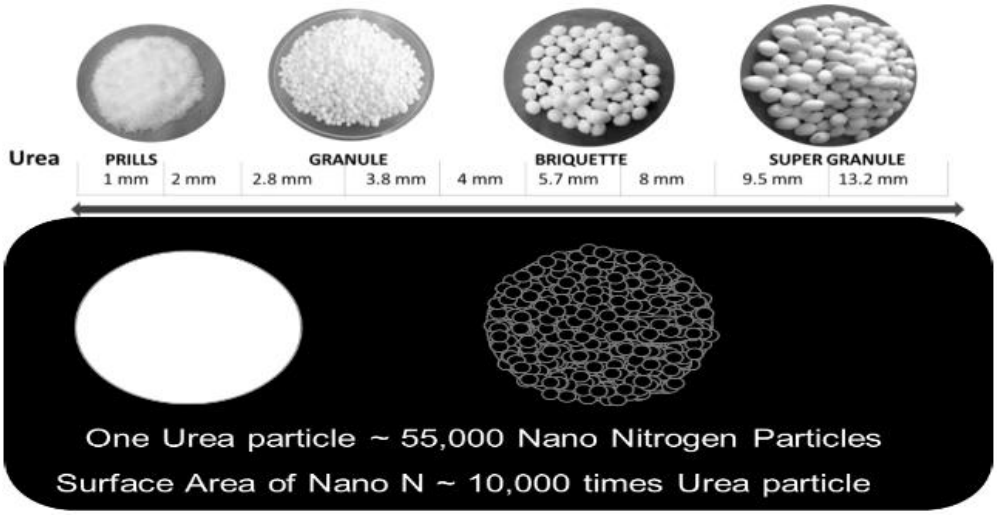
Nanotechnology in agriculture facilitates foliar application as absorption of the nutrients through the stomatal pores is more effective when the nutrients are dosed in nano-particulate form. The size of the stomatal pores vary according to the nature of the crop. Butthe average the stomatal guard cell is estimated to range from 19 to 71 microns. Which means that the size of the pore is even smaller. In other words, when nutrients are applied as nano particles of smaller diameter, they can be easily absorbed through the stomatal pores.

Scale	Size Classification	Example
Macro	≥100 micrometers (microns)	Can see with the unaided eye
Micro – a millionth of a meter	100 microns to 100 nanometers	A human hair is about 80 microns thick
Nano – a billionth of a meter	1 to 100 nanometers	The width of DNA Helix is 2 nm





The particle size of urea ranges from 1 mm to 13 mm. Even when dissolved in water, the particle size is several microns and not congenial for direct absorption through the pores.



Nano-fertilizers have been projected as a tool to meet sustainable intensification criteria in agricultural activities in the next 30 years due to the feasibility of synchronizing the release mechanism of nutrients (N and phosphorus, P) with an increment in crop yields and forage production while reducing the fertilization inputs (Kalia et al., 2019). Nano-fertilizers can boost NUE by enabling a slow and constant release of nutrients thus assisting nutrient plant uptake (Jyothi and Hebsur, 2017; Kalia and Sharma, 2019). It has been reported that the use of nano-fertilizers can improve crop production by up to 30% compared with traditional chemical fertilizers (Kah et al., 2018); however, there are also studies showing no advantage to using nano-fertilizers over conventional fertilizers (Kopittke et al., 2019).

N-RICH NANO

N-RICH NANO, developed by EcoHealth Products Pvt Ltd, Chennai, is nano-particulate Nitrogen concentrate **extracted from Neem cake**. With a particle size of <40 nm, about 4 litres of **N-Rich Nano** packs the Nitrogen equivalent of 1 ton of Urea. The nano-particulation facilitates easy absorption through the foliar pores. **Since the dosing concentration is vastly reduced, there is very little Nitrogen loss both into the atmosphere and the soil, thereby greatly reducing the formation of greenhouse gases and eutrophication of water bodies.**

N-RICH NANO is an organic product available as a water-soluble liquid. Unlike other liquid nano-fertilizers, which tend to slowly transform into larger micro/macro-particles over time, N-RICH NANO obtains its nano-particulate structure only when diluted in water at the time of dosing.

	
Paddy crop at 30 days stage -- Urea and normal fertilizers	***Paddy crop at 30 days stage -- Dosed with only N-Rich Nano***

Field trials on paddy conducted in Rajamundry belt in Andhra Pradesh showed substantial increase in yield in fields treated with **N-Rich Nano** as compared to Urea.

	
Paddy crop at harvest stage -- Urea and normal fertilizers	***Paddy crop at harvest stage -- Dosed with only N-Rich Nano***

For crops like paddy, 200 ml of N-RICH NANO can be mixed into 400 litres of water and sprayed over 1 acre of crop per application. Two to three applications with 20 to 25 days interval is recommended.

	
Cabbage - 25 days	***Cabbage - 25 days after 5 days of N-Rich Nano dosing***

	
Gonghura cultivation - Normal	***Gonghura treated with N-Rich Nano***

ADVANTAGES OF N-RICH NANO

- ✓ Easy to use. Just mix in water and spray. Spraying can be done using conventional back-pack sprayers or modern drones.

- ✓ 200 ml of N-RICH NANO can replace 50 kgs (1 bag) of Urea.

- ✓ Being a foliar spray, it is easily absorbed through the stomatal pores and transported to all parts of the plant.
- ✓ Since dosing is in miniscule quantities, there is no danger of over-fertilization or under-utilization.
- ✓ Since there is no unutilised Nitrogen in the soil, there is no likelihood of nutrient run-offs into waterways and consequent eutrophication.
- ✓ There is also no conversion of unutilised Nitrogen compounds into the air as greenhouse gases.
- ✓ Extremely cost-effective, saving millions to governments in the form of subsidies.
- ✓ Huge saving of foreign exchange as several million tons of Urea is imported by India.
- ✓ Huge savings on transportation costs.

Tests conducted at the Central Laboratory for Soil and Plant Analysis of the Indian Council for Agricultural Research [ICAR] have shown that N-RICH NANO has high Nitrogen content making it one of the richest source of nano nitrogen available for agriculture.

केन्द्रीय मृदा एवं पादप परीक्षण प्रयोगशाला
CENTRAL LABORATORY FOR SOIL AND PLANT ANALYSIS
मृदा विज्ञान एवं कृषि रसायन विज्ञान संभाग
Division of Soil Science and Agricultural Chemistry
भाकृअनुप–भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली–110012
ICAR-INDIAN AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI -110012
(Phone: 011-25841494, Email: soilhealth.ssac04@gmail.com)

खाद परीक्षण रिपोर्ट / MANURE TEST REPORT

(Receipt No. 301633, Dated 08-09-2022, Rs.5000/-)

नाम व पता / **Name & Address:** Enviro Eco System LLP, 23/1 Thangam Colony, Second Street Anna Nagar, Wes Chennai, Pin – 600040

क.सं. S. No.	नमूना पहचान चिह्न Sample mark	प्रयोगशाला संख्या Lab. No.	अभिक्रिया pH (1:5)	विद्युत चालकता EC (dS/m) (1:5)	Total Elements			
					P_2O_5	K_2O	C	N
					(%)			
1.	Manure	C-717/22	3.58	1.43	0.008	0.014	23.5	40.1

सिफारिशें : खाद का नमूना सामान्य है।
Recommendations: Manure sample is normal.

नोट : यह रिपोर्ट वैधानिक उद्देश्यों के लिए प्रमाण–पत्र के रूप में प्रयोग नहीं की जा सकती।
Note: This report can not be used as a certificate for legal purpose.

प्रभारी वैज्ञानिक / Scientist Incharge
डा. महेश चंद मीना
Dr. Mahesh C. Meena
वरिष्ठ वैज्ञानिक / Senior Scientist
मृदा विज्ञान एवं कृषि रसायन संभाग
Div. of Soil Science & Agricultural Chemistry
भा.कृ.अनु.सं., नई दिल्ली/I.A.R.I., New Delhi

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TEST REPORTS ON NANO PARTICLE SIZE OF NITROGEN IN N-RICH NAN0

Particulate Systems

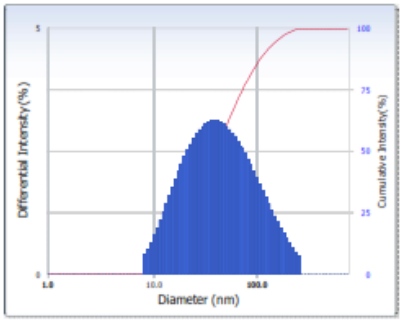
NanoPlus
Common

Intensity Distribution S/N : 411615

User	: Common	Group	:	Repetition	: 1/1
Date	: 29-Jul-22	File Name	: Nano-20		
Time	: 09:57:18	Sample Information	:		
SOP Name	: SJC Size Method			Security	: No Security

Version 5.22 / 3.00

Intensity Distribution



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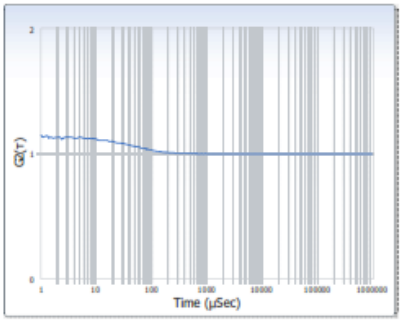

Distribution Results (Contin)

Peak	Diameter (nm)	Std. Dev.
1	60.6	50.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
Average	60.6	50.0

Residual : 2.676e-003 (O.K)

Cumulants Results

Diameter	(d)	: 36.5	(nm)
Polydispersity Index	(P.I.)	: 0.311	
Diffusion Const.	(D)	: 1.355e-007	(cm²/sec)

Measurement Condition

Temperature	: 25.2	(°C)
Diluent Name	: WATER	
Refractive Index	: 1.3328	
Viscosity	: 0.8838	(cP)
Scattering Intensity	: 30023	(cps)
Attenuator 1	: 2.42	(%)

Intensity Distribution Table

d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)
1.0	0.0	0.0	5.4	0.0	0.0	29.3	2.9	32.8	158.2	1.2	94.5
1.1	0.0	0.0	5.8	0.0	0.0	31.3	3.0	35.8	169.3	1.1	95.5
1.1	0.0	0.0	6.2	0.0	0.0	33.5	3.1	38.9	181.1	0.9	96.5
1.2	0.0	0.0	6.6	0.0	0.0	35.8	3.1	42.0	193.8	0.8	97.3
1.3	0.0	0.0	7.1	0.0	0.0	38.3	3.1	45.1	207.3	0.7	98.0
1.4	0.0	0.0	7.6	0.0	0.0	41.0	3.1	48.3	221.8	0.6	98.7
1.5	0.0	0.0	8.1	0.0	0.0	43.9	3.1	51.4	237.3	0.5	99.2
1.6	0.0	0.0	8.7	0.4	0.4	46.9	3.1	54.5	253.9	0.4	99.6
1.7	0.0	0.0	9.3	0.5	0.9	50.2	3.1	57.5	271.6	0.4	100.0
1.8	0.0	0.0	9.9	0.6	1.6	53.7	3.0	60.6	290.6	0.0	100.0
2.0	0.0	0.0	10.6	0.8	2.3	57.5	2.9	63.5	310.9	0.0	100.0
2.1	0.0	0.0	11.4	0.9	3.3	61.5	2.9	66.4	332.6	0.0	100.0
2.2	0.0	0.0	12.2	1.1	4.4	65.8	2.8	69.1	355.8	0.0	100.0
2.4	0.0	0.0	13.0	1.3	5.6	70.4	2.7	71.8	380.6	0.0	100.0
2.6	0.0	0.0	13.9	1.4	7.1	75.3	2.6	74.4	407.2	0.0	100.0
2.8	0.0	0.0	14.9	1.6	8.6	80.6	2.5	76.9	435.7	0.0	100.0
2.9	0.0	0.0	15.9	1.8	10.4	86.2	2.3	79.2	466.1	0.0	100.0
3.2	0.0	0.0	17.0	1.9	12.3	92.2	2.2	81.4	498.7	0.0	100.0
3.4	0.0	0.0	18.2	2.1	14.4	98.6	2.1	83.5	533.5	0.0	100.0
3.6	0.0	0.0	19.5	2.2	16.7	105.5	2.0	85.5	570.8	0.0	100.0
3.9	0.0	0.0	20.9	2.4	19.1	112.9	1.8	87.3	610.7	0.0	100.0
4.1	0.0	0.0	22.3	2.5	21.6	120.8	1.7	89.0	653.3	0.0	100.0
4.4	0.0	0.0	23.9	2.7	24.3	129.2	1.6	90.6	698.9	0.0	100.0
4.7	0.0	0.0	25.6	2.8	27.0	138.2	1.4	92.0	747.8	0.0	100.0

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Particulate Systems

NanoPlus
Common

Intensity Distribution S/N : 411615

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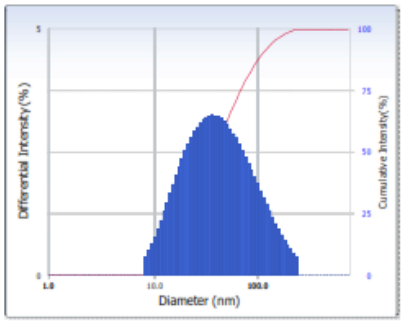
Time	: 08:44:46	Sample Information	:		
SOP Name	: SJC Size Method			Security	: No Security

Version 5.22 / 3.00

Intensity Distribution



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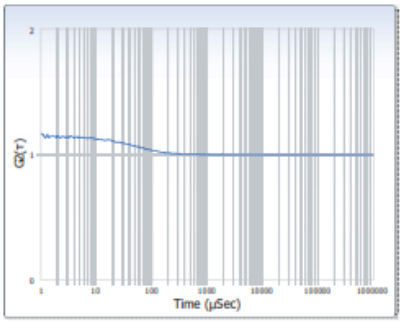

Distribution Results (Contin)

Peak	Diameter (nm)	Std. Dev.
1	57.4	46.2
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
Average	57.4	46.2

Residual : 4.138e-003 (O.K)

Cumulants Results

Diameter	(d)	: 39.0	(nm)
Polydispersity Index	(P.I.)	: 0.319	
Diffusion Const.	(D)	: 1.265e-007	(cm²/sec)

Measurement Condition

Temperature	: 25.1	(°C)
Diluent Name	: WATER	
Refractive Index	: 1.3328	
Viscosity	: 0.8858	(cP)
Scattering Intensity	: 29087	(cps)
Attenuator 1	: 3.02	(%)

Intensity Distribution Table

d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)
1.0	0.0	0.0	5.4	0.0	0.0	29.3	3.1	34.2	158.2	1.0	95.6
1.1	0.0	0.0	5.8	0.0	0.0	31.3	3.2	37.3	169.3	0.9	96.5
1.1	0.0	0.0	6.2	0.0	0.0	33.5	3.2	40.5	181.1	0.8	97.4
1.2	0.0	0.0	6.6	0.0	0.0	35.8	3.2	43.8	193.8	0.7	98.1
1.3	0.0	0.0	7.1	0.0	0.0	38.3	3.2	47.0	207.3	0.6	98.7
1.4	0.0	0.0	7.6	0.0	0.0	41.0	3.2	50.3	221.8	0.5	99.2
1.5	0.0	0.0	8.1	0.0	0.0	43.9	3.2	53.5	237.3	0.4	99.6
1.6	0.0	0.0	8.7	0.4	0.4	46.9	3.2	56.7	253.9	0.4	100.0
1.7	0.0	0.0	9.3	0.5	0.9	50.2	3.1	59.8	271.6	0.0	100.0
1.8	0.0	0.0	9.9	0.6	1.5	53.7	3.1	62.8	290.6	0.0	100.0
2.0	0.0	0.0	10.6	0.8	2.3	57.5	3.0	65.8	310.9	0.0	100.0
2.1	0.0	0.0	11.4	0.9	3.2	61.5	2.9	68.7	332.6	0.0	100.0
2.2	0.0	0.0	12.2	1.1	4.3	65.8	2.8	71.5	355.8	0.0	100.0
2.4	0.0	0.0	13.0	1.3	5.6	70.4	2.7	74.1	380.6	0.0	100.0
2.6	0.0	0.0	13.9	1.5	7.1	75.3	2.5	76.7	407.2	0.0	100.0
2.8	0.0	0.0	14.9	1.7	8.8	80.6	2.4	79.1	435.7	0.0	100.0
2.9	0.0	0.0	15.9	1.8	10.6	86.2	2.3	81.4	466.1	0.0	100.0
3.2	0.0	0.0	17.0	2.0	12.6	92.2	2.1	83.5	498.7	0.0	100.0
3.4	0.0	0.0	18.2	2.2	14.8	98.6	2.0	85.5	533.5	0.0	100.0
3.6	0.0	0.0	19.5	2.4	17.2	105.5	1.9	87.4	570.8	0.0	100.0
3.9	0.0	0.0	20.9	2.5	19.7	112.9	1.7	89.1	610.7	0.0	100.0
4.1	0.0	0.0	22.3	2.7	22.4	120.8	1.6	90.6	653.3	0.0	100.0
4.4	0.0	0.0	23.9	2.8	25.2	129.2	1.4	92.1	698.9	0.0	100.0
4.7	0.0	0.0	25.6	2.9	28.1	138.2	1.3	93.4	747.8	0.0	100.0

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CERTIFICATE OF ANALYSIS SHOWING PERCENTAGE OF NANO NITROGEN IN N-RICH NANO

ABC Techno Labs™
India Private Limited
Quality Uncompromised

ABC Techno Labs India Private Limited

(An ISO : 9001, ISO : 14001, ISO : 45001 & ISO : 22000 Certified Company)
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Email: lab@abctechnolab.com / Web: www.abctechnolab.com

TEST REPORT

Eco Health Products Pvt Ltd
No:23,2nd Street ,Thangam Colony
Anna Nagar West,Chennai-600040
Tamil Nadu

Customer Provided Details			
Sample Name	NANO RICH	Customer Ref	TRF Dated 23-06-2025
Seal if Any	-	Marks on Sample	Batch No:EH 33/64052

Lab Provided Details					
Report Number	2506/0290/001	Date of Receipt	23-06-2025	Analysis Commenced	24-06-2025
Analysis	30-06-2025	Sample	Good	Sample Qty.	250ml
Report Date	01-07-2025	Sample Drawn by	Customer	Date of Sampling	NA

Sl. No.	Test Parameters	Test Method	Unit	Results
1	Organic carbon as C	IS 2720 :Part 22	%	3.64
2	Nitrogen as N	IS 14684:1999	%	8.79
3	C:N ratio	By Calculation	-	0.414
4	Phosphorous as P	IS 3025 :Part 31	mg/L	35.6
5	Potassium as K	ISO 5317	mg/L	410
6	Cadmium as Cd	APHA 24TH Edn.3111B	mg/L	BDL (DL:0.01)
7	Arsenic as As	APHA 24TH Edn.3113 B	mg/L	BDL (DL:0.01)
8	Mercury as Hg	APHA 24TH Edn.3112 B	mg/L	BDL (DL:0.001)
9	Copper as Cu	APHA 24TH Edn.3111 B	mg/L	0.35
10	Boron as B	APHA 24TH Edn.3111 B	mg/L	BDL (DL:0.001)
11	Iron as Fe	APHA 24TH Edn.3111 B	mg/L	BDL (DL:0.05)
12	Manganese as Mn	APHA 24TH Edn.3111 B	mg/L	1.36
13	Zinc as Zn	APHA 24TH Edn.3111 B	mg/L	0.38
14	Molybdenum as Mo	APHA 24TH Edn.3111D	mg/L	0.18

BDL - Below Detection Limit, DL - Detection Limit.

.....End of Report.....

ABC

R.Sivakumar
Asst.Manager

ABC TECHNO LABS INDIA PVT. LTD. CHENNAI 600 098

A.Robson Chinnadurai
Technical Manager

Verified by

Authorised Signatory

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A nano nitrogen concentration of 8.79% is very good and quite effective for foliar spraying, especially when the formulation is properly stabilized and designed for nano delivery.

✅ Why 8.79% is Considered Good

Parameter	Value / Benchmark	Remarks
Nitrogen concentration	**8.79% (w/w or w/v assumed)**	**Higher than many nano N products (which are 3–5%)**
Form type	**Nano nitrogen (likely colloidal or chelated)**	**Enables better leaf absorption**
Typical foliar dose	**20–40 ml per acre**	**Sufficient to meet part of crop N demand**
Absorption efficiency	**~80–90%**	**Far higher than soil urea (~30–40%)**

💉 Comparison with IFFCO Nano Urea

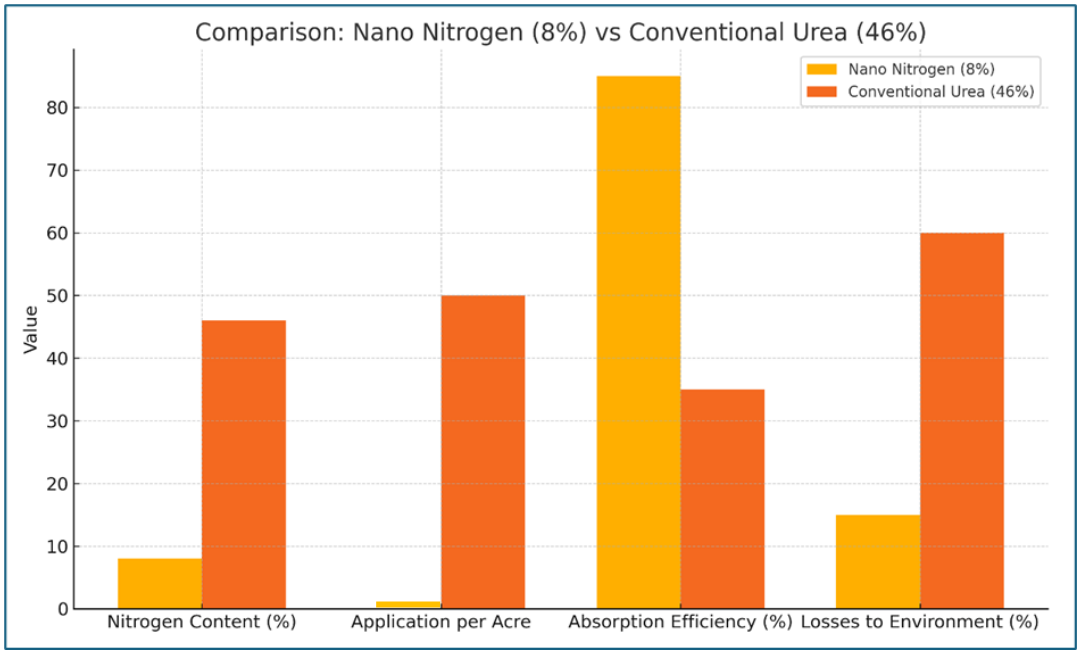
Parameter	IFFCO Nano Urea	N-Rich Nano
N Concentration	**4%**	**8.79%** ✅
Application dose	**30–40 ml/acre**	**Similar**
Equivalence	**1 L = 45–50 kg urea**	**Similar or better**

N-Rich offers more than double the nitrogen concentration of IFFCO Nano Urea — which can be a significant technical and commercial advantage.

🌿 Key Considerations for Foliar Nano Nitrogen (8.79%)

Factor	Ideal Conditions
Particle size	**<100 nm (nano range)**

Stability	**No clumping/sedimentation**
Spray pH	**Neutral to slightly acidic (6–7)**
Surfactants/wetting agents	**May improve uptake**
Shelf life	**Should remain effective ≥12 months**
Phytotoxicity	**Field-tested, non-burning at recommended dose**



The comparison between **8% nano nitrogen** and **46% conventional urea nitrogen** (by weight) goes beyond just percentage — it hinges on formulation efficiency, absorption, losses, and mode of application.

Factor	Nano Nitrogen	Conventional Urea
Absorption efficiency	~80–90% (foliar uptake)	~30–40% (soil, heavy losses)
Losses (leaching, volatilization, denitrification)	Minimal (~10–20%)	High (~50–70%)
Mode of application	Foliar spray	Soil application
Speed of action	Fast (direct absorption)	Slow (requires conversion in soil)
Environmental impact	Low	High (GHG emissions, leaching)

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