

Nano Urea Liquid: A Step towards Sustainability and Enhancing Farmers' Income

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ARTICLE ID: 57

Introduction

The world's first Nano urea liquid for farmers across the world was introduced by Indian Farmers Fertilizer Cooperative Limited (IFFCO) on 31 May 2021 at Nano Biotechnology Research Center Kalol Gujarat with Atmanirbhar Bharat and Atmanirbhar Krishi. Nano urea liquid is a Nano fertilizer that is being used to replace the conventional urea packet. IFFCO Nano Urea is a 21st century product that is urgently needed to maintain the environment, soil, air and water for future generations while ensuring food security for all. It is a nanotechnology based revolutionary agri-input which provides nitrogen to plants. Nano urea release nitrogen in controlled manner and thus, enhances nitrogen use efficiency of plant.

Nano urea liquid fertilizer is tested on 94 crops at 11,000 locations and the field trials were also undertaken by collaboration with 20 ICAR Research Institute, State Agriculture University, KVK'S and progressive farmers. A successful field trial of drone spraying of Nano urea liquid was done in October 2021 in Bhavnagar, Gujarat by IFFCO.

Nano urea is 80 percent effective in delivering nitrogen to plant which is more than 2 times conventional urea. It is 10 percent cheaper than traditional urea. Its use will boost balanced nutrition programme by reducing the excess use of urea application in the soil and will make the crops stronger, healthier and protect them from lodging effect. Nano urea is applied through foliar spray on leaves and the Nano particles (10^{-9}) enter through stomata and via phloem, it is circulated in all the



parts of plant body. Excess Nano urea is stored in plant vacuole.

Nano urea trials shows increase in crop yields and save nitrogen to the extent of 50 percent. A single urea particle is comparable to 55,000 small Nano urea particles (more surface area), which are delivered directly to the plant cell after foliar spray, releasing nitrogen inside the plant cells. The eco-friendly process improves nitrogen use efficiency. Application of 1 bottle of 500 ml Nano Urea can effectively replace at least 1 bag of 45 kg of conventional urea. It contains 4.0 % total nitrogen (w/v) evenly dispersed in water.

Conventional granular urea is one of the most important nitrogenous fertilizers in the country with a nitrogen concentration of 46 percent. Urea represents for 82 percent of India's total nitrogenous fertilizer consumption, with an annual use of 33.6 million tonnes in 2019-20 but only 30-40 percent of the urea granules is used by plant and remaining amount of nitrogen is not available for plant due to losses of nitrogen by run off, leaching, volatilization and denitrification. Such losses of nitrogen cause water pollution, soil pollution and air pollution. So to overcome these types of pollution, Nano urea liquid fertilizer is a golden opportunity in the 21st century for the welfare of the nation.

Benefits of Nano Liquid Urea:

- ❖ **Higher Crop Yields:** Nano liquid urea enhance crop yields because Nano Urea particles are easily available to crops due to their small size. Nano urea particles Increased chlorophyll and photosynthesis in leaves, as well as rise in root biomass and the number of active tillers/branches, resulting increase average yield up to 8%.
- ❖ **Increased income for farmers:** farmer can earn more money by using Nano urea in the crop because it gives more profit at lower cost, higher crop yield and better quality produce. The on-ground experience of Nano urea (liquid) has proved that average increase in income of Rs 5000 per hectare have been registered as per Farmer Field trials.
- ❖ **Improved food quality:** Improving the quality of farm produce by providing better nutrition to crops. Crops grown with IFFCO Nano Urea are completely safe to eat. In terms of protein, oil content, sugar content and nutrient content, the nutritional quality of harvested produce is superior.
- ❖ **Easy to keep and transport:** Nano liquid urea is simple to store and transport because in comparison to bulky nitrogenous fertilizers like urea, IFFCO Nano Urea is



only needed in small quantities (500ml). In terms of relative logistics and warehousing costs, this has a considerable impact. Farmers can simply transport Nano Urea bottles rather than large Urea bags (45kg).

- ❖ **Eco- Friendly:** Agriculture sustainability and environmental safety can be ensured by using IFFCO Nano Urea. Production of Nano urea is energy and resource efficient. It's reducing extra bulk urea application and associated volatilization, as well as leaching and runoff losses.

Rate, Time and Application Method of Nano Urea:

A Spray of mixture of 2 to 4 ml Nano urea in one Liter of water on crop plants during active growth periods.

Apply 2 foliar sprays for optimal results –

1. The first spray should be applied during the active tillering / branching stage (30-35 Days after Germination or 20-25 Days after Transplanting)
2. Apply second spray 20-25 days after the first spray, or before the crop flowers.

Application Instruction of Nano Urea:

1. Well shake the bottle before use.
2. For spraying on the leaves, use a flat fan or cut nozzles.
3. Spray early in the morning or late in the evening to avoid dew.
4. If rain falls within 12 hours of the Nano urea spray, it is recommended that the spray be repeated.
5. Nano Urea can easily be mixed with bio stimulants, 100 percent water-soluble fertilizers and agrochemicals. It is always advised to go for a jar test before mixing and spraying for compatibility.
6. Nano urea should be utilised within two years of its manufacturing date for the best results.

Safety & Precautions:

1. The Department of Biotechnology (DBT) of the Government of India and the Organisation for Economic Co-operation and Development (OECD) international criteria were used to evaluate Nano-Urea for bio safety and toxicity.
2. Although Nano urea is non-toxic and safe for users, flora and fauna, but it is recommended that users use a face mask and gloves when spraying on crops.

3. Keep out of the reach of children and pets and store in a dry area away from extreme temperatures.

Achievements:

Nanourea fertilizer has proved to provide significant contribution in the agriculture sector and thus leads to eminent spread throughout the world. IFFCO produced 3 crore bottles of Nano urea till 8 April 2022. Bottles are packed in 500ml quantity and price of one bottle is merely Rs.240. Nano urea promotes sustainable and precision farming. Harvested grains of Nano urea treated crop plots recorded increase in nutritional content and mineral content like (carbohydrate, protein, oil and fiber) and (N, P, K, S, Zn, Cu, Fe etc.).

