



Nano Urea the Philosophy of Future

(*Shailesh Maruti Acharya¹ and Dr. B.D. Bhakare²)

¹PhD Scholar and ²Ex. Dean, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra

*Corresponding Author's email: smacharya.baif@gmail.com

Abstract

Granular urea or pills can be hazardous to people and the environment in addition to being expensive for the manufacturer. Furthermore, improving resistance to abiotic stress can be achieved by nano urea. When wheat is produced under drought stress, nano-urea improves its physiological characteristics and reduces pollution to the environment. Because the nanoparticles in the urea are smaller and more soluble in water, they have a bigger surface area. Nano urea is a valuable tool in agriculture that can boost nitrogen utilization efficiency, decrease fertilizer waste, and lower cultivation costs while also improving crop efficiency, yield, and quality metrics. When it comes to matching the crop growth stage for nutrients and perhaps providing nutrients for the duration of crop growth, nano-urea is incredibly effective at accurate nutrient management in precision agriculture.

Keywords: Nano, Urea, efficiency, nano-nitrogen, environmental pollution; drought stress; physiological traits; conventional urea.

Introduction

Nano sized fertilizers are the new frontier of nanotechnology towards a sustainable agriculture. Nano Urea manufacturing method provide a simplistic way to develop nano scale material for better crop production while significantly minimizing the agro chemical leaching to the soil. Nano Urea (Liquid) contains nano scale nitrogen particles which have more surface area (10,000 times over 1 mm Urea prill) and number of particles (55,000 nitrogen particles over 1 mm Urea prill). ... Further, application of nano urea (liquid) improves yield, biomass, soil health and nutritional quality of the produce.

Technical specifications

Major characteristic features of the Nano Urea are as follows -

Nano urea prepared by nanotechnology contains nano scale particles of Nano Urea. Average physical size of Nano Urea particles is in the range of 20 -50 nm. Nano Urea contains 4 % nitrogen by weight in its nano form. Nitrogen present in Nano Urea effectively meets the crop nitrogen requirement. It has better use efficiency than conventional urea. Nano Urea is suitable for application as a source of nitrogen for most of the crops/plants.

Benefits of Nano Urea

Nano Urea (liquid) has manifold benefits:

1. Reduces the requirement of conventional Urea by 50% or more
2. Required less and produces more: Efficacy of one bottle of Nano Urea (500 mL) is equivalent to one bag of urea.
3. Environment friendly product, improve Soil, Air & Water quality thus, helps in addressing the concerns of Global Warming and in meeting the UNSDGs.
4. Cheaper than conventional urea.

5. Reduce input cost to farmers, leads to increase in farmers' income.
6. Improves crop productivity, so and nutritional quality of produce. When sprayed on leaves Nano Urea easily enters through stomata and other openings and is assimilated by the plant cells. It is easily distributed through phloem from source to sink inside the plant as per its need. Unutilized nitrogen is stored in the plant vacuole and is slowly released for proper growth and development of plant. Nano Urea (Liquid) does not involve any government subsidy and will be made available to farmers at a 10% lower price than a bag of subsidized Urea. Transportation would be easier and economical, as one 500 ml bottle would be equivalent to one bag of regular urea fertilizer. Due to the ultra-surface properties of nano urea, it gets absorbed by the plants when sprayed on their leaves. Upon penetration, these nano particles reach plant parts where nitrogen is required and release nutrients in a controlled manner.
7. Nano Urea is developed to replace conventional urea and it can curtail the requirement of the same by at least 50 per cent. It contains 40,000 parts per million (ppm) of Nitrogen in a 500 ml bottle, which is equivalent to the impact of nitrogen nutrient provided by one bag of conventional urea means 50 kg,

एक बोतल = एक बोरी यूरिया

NANO UREA LIQUID



Reduces Input Cost

Environment-friendly

Improves Nutritional Value

Increases Farmers' Income

Enhances Crop Productivity

Cheaper than Conventional Urea



40,000 ppm of Nitrogen in 500 mL Bottle = 50 Kg Bag of Conventional Urea

8. Nano urea has been included in the government's Fertiliser Control Order after the field trials were undertaken under National Agriculture Research System (NARS), 20 ICAR research institutes, State Agriculture Universities and Krishi Vigyan Kendra's on 43 crops
9. The new nano urea liquid will increase the production of crops with improved nutritional quality. Cheaper than conventional urea, the new product is also expected to reduce the environmental pollution caused by the granular form, by reducing its excessive application that exacerbates soil, water and air pollution with climate change problems.
10. The size of one nano urea liquid particle is 30 nano meter and compared to the conventional granular urea it has about 10,000 times more surface area to volume size. Due to the ultra-small size and surface properties, the nano urea liquid gets absorbed by plants more effectively when sprayed on their leaves. Apart from being cost-effective, nano urea liquid also promises to provide a sustainable solution for plant nutrition as despite lower usage than its current version, it provides higher nutrient efficiency for crops while reducing soil, water and air pollution. As of now, just 30-50 per cent of nitrogen from urea is utilized by plants in farms while the rest goes waste due to quick chemical transformation because of leaching, which contaminates soil and water bodies, and volatilization that causes emissions of nitrous oxide in the atmosphere — leading to air pollution and global warming along with low nutritional efficiency for the crop. However, while conventional urea is effective just for 30-50 per cent in delivering

nitrogen to plants, the effectiveness of the nano urea liquid is over 80 per cent. A major reason for this increase in efficiency is because of the fact that nanotechnology, which is the base of this new form of urea, enables designing ultra-small particles that offer higher surface-mass ratios, and help in the controlled delivery of plant nutrients. The size of one nano urea liquid particle is 30 nanometre and compared to the conventional granular urea it has about 10,000 times more surface area to volume size. Due to the ultra-small size and surface properties, the nano urea liquid 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. Furthermore, aside from improving yield, soil health and nutritional quality of crop, nano urea has also been tested for biosafety and toxicity according to norms followed in India and the international guidelines developed by OECD, which are adopted and accepted globally.

Applications

Mix 2 to 4 ml of Nano urea in one Liter of water and spray on crop leaves at active growth stages. For best results apply 2 foliar sprays. 1st spray at active tillering / branching stage (30-35 Days after Germination or 20-25 Days after Transplanting). 2nd spray 20-25 days after 1st spray or before flowering in the crop. Note – Don't cut nitrogen applied through DAP or complex fertilizer at the basal stage. Reduce only top-dressed Urea applied in 2-3 splits; Number of sprays of Nano Urea can be increased depending upon crop and its nitrogen requirement)

Application Instructions

1. Shake well the bottle before use.
2. Use flat fan or cut nozzles for spraying on the leaves.
3. Spray during morning or evening hours avoiding dew.
4. If rain occurs within 12 hours of the spray of Nano urea, it is advised to repeat the spray.
5. Nano Urea can easily be mixed with bio stimulants, 100 % water-soluble fertilizers and agrochemicals. It is always advised to go for a jar test before mixing and spraying for compatibility.
6. For better result Nano urea should be used within 2 years from the date of its manufacturing.

Safety & Precautions

1. Nano-Urea has been tested for bio safety and toxicity as per the guidelines of the Department of Biotechnology (DBT), Government of India and OECD international guidelines.
2. Nano urea is safe for the user; safe for flora and fauna and is non-toxic, however, it is recommended to use a face mask and gloves while spraying on the crop.
3. Store in a dry place avoiding high temperature and keep away from the reach of children and pets.

Conclusions

To combat the uneven and excessive usage of conventional urea, IFFCO created Nano Urea (Liquid) fertilizer in India using nanotechnology. In light of the global hunger crisis and environmental pollution issue, it appears that using nano-urea can not only lessen eutrophication, groundwater pollution, diseases brought on by overuse of conventional urea granular or prills, but also enhance crop yield and physiological traits because of the smaller particle diameters that allow for greater penetration into plant roots and leaves. Because conventional urea fertilizer may leach more readily from sandy soils and cause groundwater pollution, it is therefore advised to replace nano-urea with conventional fertilizers.