

Nano-Urea: A Sustainable Approach

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ARTICLE ID: 28

Introduction

Agriculture provides food and raw resources for several sectors, making it a crucial aspect of global economies. However, traditional agricultural practices have been proven unsustainable and damaging to the environment, as well as reducing soil fertility, and crop yield and causing water pollution. This has resulted in an increased demand for sustainable and environmentally friendly agricultural practices. One of the most recent technologies highlighted as a potential answer is the use of nano-urea in agriculture. Nano-urea is a revolutionary agricultural input based on nanotechnology.

Nano- Urea

Nano urea is a new type of nitrogen fertilizer developed through breaking down normal urea into small particles known as nanoparticles. Nano Urea was developed by Indian Farmer Fertiliser Cooperative (IFFCO). The Indian Farmers Fertiliser Cooperative (IFFCO) nano urea (liquid) is officially recognized by the Government of India under the Fertiliser (Inorganic, Organic or Mixed) Control Order 1985. Nano urea with particle size less than 100 nm and with 10,000 times the surface area than particles of 1 mm Urea prills. Nano Urea contains 4% nitrogen (N) and has a shelf-life of approximately 2 years.

Nano urea has an absorption efficiency greater than 80%. Nano urea in liquid form can be sprayed directly on a crop's leaves during two critical growth periods. A 500 ml vial of nano urea can replace a 45 kg bag of urea." In modern agriculture use of Nano fertilizers are important because these have appropriate formulations and delivery mechanisms to ensure optimal uptake in plants".

Benefits of liquid nitrogen

Nano Urea is an innovative product that utilizes nanotechnology to fulfill the nitrogen requirements of plants. Nano-fertilizers are more reactive and can penetrate plant cuticles. This property allows for controlled release and targeted delivery of nutrients, minimizing wastage

and optimizing nutrient utilization. Controlled release of nutrients during the crop's growth phase minimizes wastage through leaching, allowing plants to absorb the maximum amount and increases its efficiency. Its use reduces excess application, minimizing nitrogen wastage, and environmental pollution. Use of nano urea cost effective and improves farmers income. The increased use efficiency of one bottle (500 ml) of nano-urea has the potential to replace at least one bag of conventional urea. Nano Urea results in higher income for farmers due to reduced input costs. Nano Urea is easy to store and transport because of smaller quantities. Farmers can conveniently carry bottles of Nano Urea.

Effect of Nano urea on crop growth and development

Nano-urea's effectiveness studies across india have demonstrated increased crop productivity while reducing the need for conventional urea by 50%. Application of nano urea increased the height and yield of the maize crop. The yields of wheat, maize, chickpea, and mustard increased by 5.77%, 7.29%, 8.36%, and 3.77%, respectively, in farmer's field trials using 50% less nitrogen compared to the N applied under farmer's fertilizer practice (FFP) and with two sprays of Nano nitrogen in standing crops. Similar results were observed in field trials conducted by IFFCO on the use of liquid Nano urea in various crops like rice, wheat, tomato, capsicum.

Limitations In Use Of Nano Urea

The production of nano-urea involves specialized processes and technologies, which can be cost-intensive. Scaling up production to meet global agricultural demands remains a challenge and Limited availability may hinder widespread adoption by farmers. There is a lack of standardized regulations for nano fertilizers, leading to uncertainty about their safety and environmental impact. This raises safety concerns for farm workers who may become exposed to xenobiotics during their application, impact of this in nano urea need to be studied. There is limited research on the long-term effects of nano urea on soil health and plant growth. The technology is still relatively new, and most studies have been conducted in controlled laboratory conditions. Therefore, more research is needed to evaluate the performance of nano urea in real-world farming conditions, particularly in different soil types and climatic conditions.

Conclusion



Nano-urea holds promise as an innovative solution for sustainable agriculture. Researchers have focused on a number modern agricultural approaches in recent years, especially the potential application of nanotechnology to increase fertilizer usage efficiency. Nano-urea holds promise as an innovative solution for sustainable agriculture. Its ability to enhance nutrient delivery, improve crop yield, and reduce environmental pollution makes it a valuable addition to modern farming practices. As research continues, nano-fertilizer like nano-urea may play a crucial role in ensuring food security while minimizing impacts. “Nanotechnology comes into play and nano fertilizers can go a long way in ensuring sustainable soil health and crop production”.

References:

- Avaneesh K , Hardev R , Sandeep K , Rakesh K , Yadav A , Ananya G , Vipin K and Sharma T. A Comprehensive Review of Nano-Urea vs. Conventional Urea. International Journal of Plant & Soil Science 2023; **35**: 32-40
- Climate Change. 2022;12(11):2700-6. 17. Lakshman K, Chandrakala M, Prasad PS, Babu GP, Srinivas T, Naik NR, Korah A. Liquid Nano-Urea: An Emerging Nano Fertilizer Substitute for Conventional Urea. Chronicle of Bioresource Management. 2022;**6**:054-9.
- Kumar YO, Tiwari KN, Singh T, Raliya R. Nanofertilizers and their role in sustainable agriculture. Annals of Plant and Soil Research. 2021;23:3:238-55.