



NANO-UREA FOR ENHANCING NITROGEN USE EFFICIENCY IN CEREAL CROPS

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INTRODUCTION

Cereals are the staple food for majority of the population hence more cereals per unit area is the demand of today's faster increasing global population. Basic nutrient for most of the crop growth is nitrogen. Urea is the foremost nitrogen based straight fertilizer having 46% of nitrogen in the form of amide with critical relative humidity of 72 and equivalent acidity 80. But it is costly, bulky and over use of this fertilizer in soil leads to alter the natural composition of soil hence lowering the fertility as well as the productivity of the soil. Nano-urea is freshly developed at Nano Biotechnology Research Centre (NBRC), Kalol, Gujarat. Nano-urea is the new stair towards more sustainable and precision agriculture. It is accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) and Good Laboratory Practice (GLP) laboratory. It is favorable, environmentally safe, feasible, sustainable liquid nitrogen concentration hence boosts about 80% of nutrient availability to crop and increase the nitrogen use efficiency.

WHAT EXACTLY NANO-UREA IS?

Nano is derived from the Greek word which means dwarf. Again nano means one billionth of a meter i.e. 10^{-9} . When urea is prepared using nano technology then termed as Nano-urea. It is manufactured by spinning cone reactor and nano channel reactor at Indian Farmers Fertilizer Cooperative Limited (IFFCO) by one of the youngest scientist Ramesh Raliya. Size range for nano-urea varies from 1-100 nm while optimum size is 20-50nm. It has 4% nitrogen by weight in nanoform and 40000 mg/L of nitrogen in a 500 ml of bottle. Nano-urea reduces the urea requirement up to 50% and 10% less costly than indigenous urea.



ROLE OF NANO-UREA IN ENHANCING NITROGEN USE EFFICIENCY IN CEREALS:

Cereals belong to the family Poaceae and crops included in this family are Rice, Wheat, Maize, Sorghum, Barley etc. As they belong to same family physiological activities of these crops are approximately same hence the consequence of application of fertilizers are same. Requirement of nitrogen is high for the cereal crops as they are heavy feeder. The application of conventional fertilizers like urea results in increase the loss of nitrogen nutrient in terms of leaching, volatilization, denitrification etc. But if nano-urea is applied at specific growth stages to this family leads to tremendous increase in growth and yield. Nano-urea is slow releasing, biodegradable nitrogen formulation which enter to the plant by means of stomatal opening of plants so absorption of nutrient without significant loss leads to increase nitrogen use efficiency. Simply efficiency means output per applied input here we apply nano-urea as the input and the output is in terms of economic yield (kg/ha). Application of 50% recommended dose of nitrogen with 50% nano-urea as foliar application gave maximum yield as the output than the other combination of treatments. Nano-urea facilitates the absorption, accumulation, assimilation of nitrogen. Enhance the root growth so other essential as well as beneficial elements are up taken by the plant. It influences the development of resistance against biotic and abiotic stress. Encourage enzymatic activity so more photosynthate accumulates in the grain. Uptake and utilization of nutrients results in more number of panicles/m², more number of grains/panicle, more number of filled grains /panicle which subsequently leads to production of an appreciable amount of economic as well as biological yield hence

more harvest index.

Nutrient use efficiency can be calculated by partial factor productivity, agronomic efficiency and crop recovery efficiency. Partial factor productivity for nitrogen (PFPN) can be defined as the yield obtained in the fertilized plot to the amount of nutrient applied. Here nutrient applied is the nano-urea which contains nano based nitrogen and yield obtained by application of nano-urea is far better than use of conventional urea. Whereas agronomic efficiency for nitrogen (AEN) with respect to application of nano-urea is high i.e. increase in yield per applied nanourea is significantly higher than other nitrogen sources. Similarly crop recovery efficiency (CREN) which denotes kg increase in nutrient uptake per nutrient applied is also superior than normally used urea. By application of nano-urea nitrogen use efficiency is increased by about 3 times.

MERITS OF NANO-UREA:

- ✓ It gives higher surface area for various metabolic reactions which enhance the rate of photosynthesis and gives a significant dry matter yield as well as grain yield.
- ✓ Reduce biotic and abiotic stress and affect the physiological traits of plant so plant can survive under drought condition.
- ✓ Cost effective, required in less amount and reduce dependence on conventional urea about 50% so ultimately enhance farmers income.
- ✓ Environment friendly with benefits

to soil biota, animal health as well as human being.

- ✓ Highly efficient for increase nitrogen use efficiency and increase in quality of the crop.

DEMERITS OF NANO-UREA:

- ✓ Enhance the growth up to a limit then after the yield decrease due to increase in concentration.
- ✓ Required to pay attention and some precautions while using nano-urea. It may damage eye of the farmer and cause itchiness on skin of the farmer.
- ✓ Storage of nano-urea is a problem in most of the cases as it is in liquid form and highly soluble in water.

CONCLUSION

Nano-urea is one of the best approaches for sustainable agriculture development. It is effective in enhancing the nitrogen use efficiency in cereals hence increase the quality and quantity of yield of major cereal crops. As cereals are the backbone of society on the basis of dietary need Nano-urea acts as a blessing for today's generation as well as future generation. Repeated application of chemical fertilizers leads to depletion in soil productivity as well as fertility status of soil which leads to decrease in an appropriate agricultural production in near future. Nano-urea acts as an effective alternative to the chemical fertilizers. It may become the theme of second green revolution in India.

