Volume 5 - Issue 02 - February,2025

SABUJEEMA

An International Multidisciplinary e-Magazine

Article ID: SIMM0506

Popular Article

EFFECT OF NANO-UREA ON MAIZE PLANT

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Abstract

Maize is classified as a nutrient-exhaustive crop because it requires a high level of nutrients for proper growth, yield, and output. To meet the nutrient needs of the maize crop, effective nutrient management strategies can be used. The development of slow-release fertilisers, as well as conditional-release pesticides and herbicides, exemplifies how nanotechnology is gradually transitioning from experimental to practical. As a result, nanotechnology is now essential for the advancement of environmentally friendly and sustainable agriculture. Traditional fertilisation processes may be transformed due to nanoparticles' inherent properties, which allow for better nutrient absorption, precise distribution, and increased bioavailability. Numerous studies have shown significant improvements in plant growth indices, seed yield, and overall.

Key Words: Maize, grain yield, harvest index, nitrogen, nano-urea, economics

Introduction:

Nano Urea is a revolutionary nanotechnology-based agricultural feed that supplies nitrogen to Maize (Zea mays L.) is one of India's most important food grains, second only to rice and wheat. Among other cereal crops and members of the Gramineae family, India ranks third in productivity and production, and fifth in acreage. Known as the "Queen of Cereals," it is the third most important crop in Uttar Pradesh. [11][12]. It has significant potential to meet the food needs of all living things, including humans and animals. Maize's nutritional profile includes 1.7% total sugar, 7.6% crude protein, 2.3% crude fiber, 3.6% crude fat, and 63.8% starch. The gross energy content is 3840 kcal/kg. India cultivates 8.49 million hectares of maize and produces 21.28 million tonnes of grain each year.[1][5][8]

Nano urea (water) is made up of nano-sized nitrogen particles that have 10,000 times the surface area and particle count of a 1 mm urea pellet. Nano-urea absorbs 80% more than urea. Instead of adding sandy elements to the soil, they can be sprayed on the leaves during the two stages of crop growth. [11]. "A 45kg bag of urea can be replaced by a 500ml bottle of nano urea." Nanotechnology and Nano fertilizers are being used to improve soil health and productivity. "In recent years, researchers have learned about the potential of using nanotechnology to improve the efficiency of fertilizer use, to design and develop new technologies in agriculture, especially so-called

Nano fertilizers (NF)." Nano fertilizers are essential in modern agriculture with suitable formulations and delivery methods for optimal plant uptake. [4] [12]

Effect Of Nano Urea:

Plant height:

Treatments included recoding the significantly higher plant height (108.10 cm) at 60 DAS with 100% RDN + 4000 PPM (4 ml/L) Nano Urea spray. Nonetheless, the 100% RDN + 2000 PPM (2 ml/L) and 100% RDN + 20000 PPM (2%) urea sprays were statistically comparable to the 100% RDN + 4000 PPM (4 ml/L) urea spray. Higher fertiliser doses with increased nitrogen availability may have improved protein synthesis and photosynthesis, resulting in faster cell division and enlargement. This may have resulted in vigorous plant growth, as described by Elansary et al. Nano urea has been shown to improve nutrient absorption and utilization efficiency when compared to regular urea. Nitrogen is released under controlled conditions.[7]

Yield:

When compared to the control and one spray of Nano urea (4 ml/l water), two sprays of Nano urea (4 ml L-1 water) produced the most cobs. Two sprays of Nano urea (4 ml/l water) increased the number of cobs by 24.05 percent and 9.61 percent, respectively, in comparison to the control and one spray of Nano urea. [4] [7][8]

Number of cobs per plant:

Plants treated with Nano urea spray 100% RDN + 4000 PPM (4 ml/L) had the highest amount per plant by a large margin (1.60). However, 100% RDN + 2000 PPM (2 ml/L) Nano urea Spray, 100% RDN + 20000 PPM (2%) Nano urea Spray, and 75% RDN + 4000 PPM (4 ml/L) Nano urea Spray were all statistically equivalent to 100% RDN + 4000 PPM (4 ml/L) nano-urea spray. Nitrogen is required for rapid wheat growth. Sufficient nitrogen promotes the growth of a strong and vigorous plant, resulting in ideal conditions for plants to produce large amounts of money. Nitrogen promotes tillering, expands leaf surface area, and improves overall plant life. [7]

Cob Length:

The maximal cob length observed after two sprays with Nano urea (4 ml/l water) was noticeably greater than that of any other treatment. Two Nano urea sprays increased the length of the cob by 23.11 percent and 9.29 percent, respectively, compared to the control and one Nano urea spray. Applying nano-N to leaves has been shown to improve growth characteristics by increasing nutrient availability by making it easier for the nano-N to enter the leaves' stomata through gas absorption. [7]

Number of Grains/Cob:

Treatment with Nano urea spray 100% RDN + 4000 PPM (4 ml/L) significantly increased the number of sugar cob grains (249.67). However, the 100% RDN + 2000 PPM (2 ml/L) Nano urea spray and 100% RDN + 20000 PPM (2%) urea spray treatments are similar to the 100% RDN + 4000 PPM (4 ml) treatment. /L) Nano Urea Spray. Nitrogen availability affects the

distribution of carbohydrates in plants. Sufficient nitrogen will ensure an optimal supply for crops. Nitrogen deficiency leads to resource limitation and reduced carbohydrate availability for grain filling. However, optimal nitrogen levels favor the transport and accumulation of carbohydrates in developing grapes, promoting the formation of large amounts of grains per grain. This hormone plays an important role in reproductive processes, including grain development. The application of Nano elements will have a positive effect on the hormonal balance, resulting in more grains per ear. [7]

Grain yield

The treatment yielded the highest grain yield (6.41 t/ha) when 100% RDN + 4000 PPM (4 ml/L) of Nano Urea was sprayed. However, the 100% RDN + 2000 PPM (2 ml/L) Nano Urea spray treatment showed statistical parity with the 100% RDN + 4000 PPM (4 ml/L) Nano Urea spray therapy. [7]. Because nano urea particles are smaller than regular urea, they can be more soluble and have better nutritional availability, which has the potential to enhance plant growth and development, eventually leading to a rise in maize yields. The positive influence of nitrogen in increasing the source size and creating an optimal source-sink relationship may be the cause of the increase in grain production. [4]

Harvest Index (%):

The allocation of photosynthates to grain filling, rather than their accumulation in straw, was primarily responsible for the improvement in harvest index (42.58%) in the treatment with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea; there was no significant difference between the treatments. Nano urea may have an impact on the biomass allocation pattern in maize plants.[7][8]

Conclusion

Based on the above results, it was concluded that varying nitrogen levels and foliar application of nano urea significantly improved the growth, yield characteristics and yield of maize. Use of 100% RDN resulted in higher grain yields and net yields than 50% and 75% RDN. Two sprays of Nano urea (4 ml water 1lit.) on corn crops will increase grain yield and net return to control, and one spray of nanourea (4 ml/l water) increased grain yield and net price. in corn products. Since the interaction effect of nitrogen level and Nano urea on yield and net yield of maize was found to be significant, Nano urea (4 ml/l water) was sprayed twice to request 75% RDN and 100% RDN. To increase grain yield, it is recommended to spray nano urea twice (4 ml/l of water). Higher growth and yield were recorded when combining 100% RDN with 4000 ppm (4 ml/L) nano urea foliar spray. Foliar application of Nano elements to maize resulted in changes in growth, yield and plant growth and breeding for higher yields. IFFCO in India has developed Nano Urea (Liquid) fertilizer to address environmental pollution and hunger issues. Nano-urea reduces pollution, eutrophication, and diseases caused by overuse of conventional urea. It also

improves crop physiological traits and yield. However, it's recommended to replace nano-urea with conventional fertilizers, especially in sandy soils, to avoid leaching and groundwater pollution.

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