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Neem Coated Urea(Ncu): A Boon To Indian Farmers

Dhruvendra Singh Sachan[1] and Medha Pandey[1]
Department of Agronomy, Chandra Shekhar Azad University of Agriculture& Technology, Kanpur-208002

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Introduction

Urea is the most popular Nitrogenous fertilizer containing 46% N. When Urea is applied to soil, it is first hydrolysed (i.e. broken by water) into Ammonical form (Ammonium Ion i.e. NH4+) and then to nitrite (NO2-), followed by to nitrate (NO3-) forms by the process called nitrification. Here, we note that most crops use nitrate as source of nitrogen (A few crops such as Paddy prefer Ammonical form over nitrate.).Thus nitrification process is necessary for making nitrogen available to plants). However, if the process of nitrification is too rapid; nitrogen will escape to atmosphere and plants will not be able to recover it from Urea efficiently. Generally, the plants are able to recover a fraction of all Urea N and this fraction is known as Nitrogen Use Efficiency (NUE). This NUE stands anywhere between 30 to 50%. Thus, two third of Urea Nitrogen escapes from the soil and is not used by the plants. Further, faster conversion of nitrate into Urea also results in accumulation of nitrates in soil/ underground water. Once nitrate reaches underground water, it is most difficult to remove; and causes diseases such as blue baby syndrome.

This implies that urea hydrolysis and nitrification must be regulated. Nitrification inhibitors are chemical or natural agents that accomplish this. However, most nitrification inhibitors are expensive chemicals (for example, nitrapyrin, dicyandiamide, and ammonium thiosulphate) that are out of reach for Indian farmers. Coating urea with neem oil or neem cake has been shown to be an effective natural substitute for these chemicals. It has been scientifically proven that if Neem oil is coated with Urea, it acts as an effective inhibitor.

Benefits of Neem Coated Urea:

- Collection of neem seeds is needed for manufacturing of neem coated urea. This would generate employments in rural areas.
- Neem-coating will help check heavily subsidized urea's pilferage to chemical industry and other uses such as making of adulterated milk.

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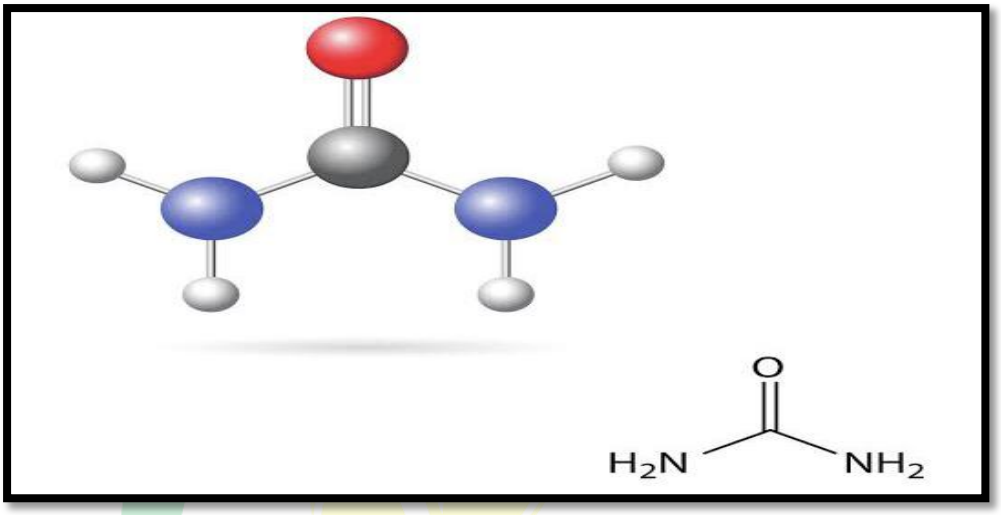
- Neem coating leads to more gradual release of urea, helping plants gain more nutrient and resulting in higher yields.
- Lower underground water contamination due to leaching of urea.
- Neem serves as a natural insecticide



UREA(NH2CONH2)

Process of Manufacturing Urea

The raw materials used in the urea manufacturing process are ammonia and carbon dioxide. Urea is typically produced in an ammonia plant because it produces ammonia as a product and carbon dioxide as a byproduct, and this carbon dioxide can be used directly to produce urea.

Chemical reactions involved in manufacturing of urea-

1. Reaction of Ammonia and Carbon Dioxide to form Ammonium Carbamate.

2NH3+CO2→NH2COONH4

2. Decomposition of Ammonium Carbonate to form Urea and Water.

NH2COONH4→H2O+NH2CONH2(urea)

Liquid ammonia is pumped and carbon dioxide is compressed and transported to an equipment called reaction chamber. Since this is were the reaction happens, it is the heart of the process. The pressure and temperature is maintained at 14 Mpa and 170-190°C for the first reaction to occur. The reaction of ammonia and carbon dioxide is highly exothermic in nature. Most of the heat released is utilized in form of process steam wherever it is needed in to process.

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The product from the first reaction flow into a decomposer where the second reaction occurs and it is endothermic reaction. It requires certain energy to begin. Biuret is also formed as a result of decomposition of ammonium carbamate if temperature rise is excessive. The major impurity in urea is water and also unreacted ammonia, carbon dioxide and ammonium carbamate. These are removed using distillation tower and evaporator. Essential condition is to keep temperature high and pressure low during stages of separation. At these conditions the ammonium carbamate will be decomposed back to ammonia and carbon dioxide also some carbon dioxide and ammonia will flash off. The major process which happens in the evaporator is that of concentration. During concentration optimum temperature should be maintained so that the urea remains in molten state and crystals are not formed inside the evaporator.

The molten urea is passed through nozzles inside the prilling tower. Compressed air is passed in the tower so that its flow is counter current with respect to that of molten urea. The urea gets solidified in the prilling tower and air helps in shaping it in the form of prills or granules. The urea is then stored and ready to be sold.

The Government's Policy on Neem-Coated Urea:

In January 2015, the government authorised urea producers to produce up to 100% of their output as Neem coated urea. Furthermore, the government required that at least 75% of domestic urea be coated with Neem. The government has mandated that all indigenous urea producers only produce Neem coated urea.

Facts:

1. IFFCO ranked top company in India in urea sale with 8.686 MMT(2020-21)
2. National Fertiliser Limited ranked 2nd top company in India in urea sale with 5.01 MMT(2020-21)
3. Chambal Fertilisers and Chemicals Limited ranked 3rdtop company in India in urea sale with 3.379 MMT(2020-21)
4. IFFCO ranks top company in India in Urea Production with 4.68 MMT(2020-21)
5. National Fertilizers Limited **(**NFL) ranks second Top company in India in urea production with 3.8MMT(2020-21)

On November 82022, the production of neem coated urea began at the Sindri plant of Hindustan Fertilizers and Chemicals Limited (HURL) in Jharkhand. The existing Sindri

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fertilizer unit of Fertilizer Corporation of India Limited (FCIL) is located in Dhanbad district of Jharkhand state.