

# NEEM COATED UREA AN ECO-FRIENDLY APPROACHES

***“NEEM COATED UREA” VS “ORDINARY UREA”***

***Slow release of***

***Nitrogen***

***16-20 %Prod increased***

***Like this***

***Nitrogen***

***Leaching/Votalization***

***8-10 %N<sub>2</sub> losses***



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**Fig. -1(Tree of Neem (Indian name), “Azadirachta indica”)**

## **INTRODUCTION**

The ‘Neem’ Botanical & Scientific name “Azadirachta indica” Neem tree is a tall tree that is found in India and Indian subcontinent, mainly grown in tropical and semitropical region. It has very bright leaves. Neem tree has hard brown greyish bark and it blossoms during spring season with small white colored flowers. Neem tree can be very easily cultivated in dry and stony soils and also it requires little quantity of water but too much Sunlight. Traditionally many Indian farmers used Neem cake as fertilizers in their fields. Neem leaves are also used to enrich the soil for crops. For this Neem cakes are ploughed in fields and after this the cash crop is sown in the fields.

There is a lot of difference in Neem coated urea and the Plain one. In Neem coated urea, they put a layer of neem over the plain urea that increases the land fertility capacity that leads to the higher production of crops. The oil coating of neem in Neem coated urea mixes up slowly with the land and the crops soaks it according to the need. The unwanted urea washed away with the water or gets diluted in the air as nitrogen. If the farmer uses Non- Neem coated urea i.e. the Normal urea or Plain urea, the maximum unit of the manure is left unused.

## IMPORTENCE

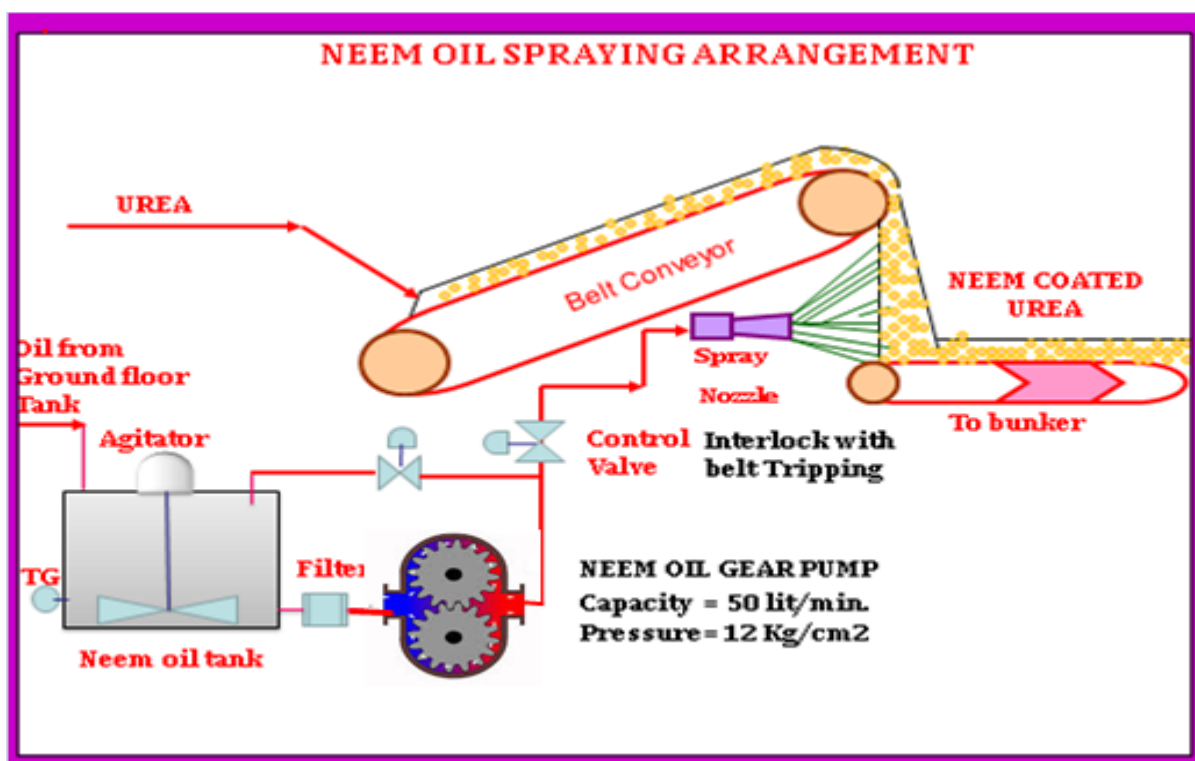
Nature Neem Urea coat is a special formulation of Nature Neem oil and humid acid which contains high quantity of Triterpenes, the denitrifying factors. Use of neem urea coating powder helps to retard the activity and growth of the bacteria responsible for de nitrification. Triterpenes in Nature Neem urea coating agent will inhibit the process of nitrification and reduce formation of nitrates which in-turn will reduce  $N_2O$  emissions. It prevents the loss of urea in the soil. It can also be used to control a large number of pests such as caterpillars, beetles, leafhoppers, borer, mites etc. The other commercially available neem coating agents contains some of the isolated compounds of Neem. But Nature Neem urea coating agent contains all natural unaltered form of nutrients which enables it's to be an effective denitrifying agent and as well as an natural soil insecticide.

Nature Neem Urea Coat is also available as a dry powdered form of special neem seed cake that enables a free mix with urea. Soil fertility depletion due to inadequate and imbalanced fertiliser use is one of the major factors of stagnation in crop productivity. Widespread nutrient deficiencies and deteriorating soil health care cause of low nutrient use efficiency, productivity & profitability. The lack of adoption of soil test based recommendations among farmers has aggravated the problem of imbalanced fertiliser use. Sustainable production can be achieved through adoption of site-specific balanced and integrated nutrient management involving major, secondary and micro nutrients, organic manures, bio fertilizers and amendments.

## PROCESS DESCRIPTION OF NEEM COATED UREA

### REQUIRMENTS FOR NEEM COATED UREA

1. One unloading pump, one storage tank (10 Te capacity)
2. One Gear pump for transfer self-priming
3. Size = 25 x 25 MOC = AISI 316  
Capacity = 20  $M^3$ /hr at 5 Kg/cm<sup>2</sup> pressure  
Working Temp. = 60 degree  
Viscosity = 34.8 CST
4. Neem Oil Storage Tank  
MOC = M.S Capacity = 15,000 liters
5. Neem Oil Day Tank  
MOC = M.S. Capacity = 2500 liters
6. Neem Oil Unloading Pump  
Flow = 10  $M^3$ /hr , Head = 13.6 mtr.  
Motor = 2.2 KW, 1450 rpm.
7. Neem Oil Injection Pump  
Capacity = 50 ltr/min. Pressure= 12 Kg/cm<sup>2</sup>
8. Nozzle Specification  
Capacity=1.78 ltr/min. at 1.75 Kg/cm<sup>2</sup>  
Make : Spraying system Company Vee Jet Spray Nozzle Flat Spray  
MOC = SS 316 Spray angle = 110 degree



**Fig.-2 (Process Flow diagram for Neem Coating)**

For Neem coating a gear pump, Nozzle, Two number tanks (cap. 2500, 15000Lit), an electrical heater for heating Neem oil tank or steam coil may be used for this purpose. Control valve for regulating Neem oil spray, filter, and strainer before pump. The arrangement as shown in the figure No. 2. A recycle line Control valve also required for recycling the Neem oil. The Neem coating process control by following three parameters.

1. Oil Temperature(control by Heater electrical or steam coil)
2. Oil Pressure.
3. Oil Flow (gpm or lit/min)

The Neem oil day tank fitted with level transmitter it may be ultrasonic level indication device. An on/Off switch provide for temperature control of the tank range given to 55-70 °C) an instrument airline inside the tank provided for uniform temperature throughout.

**Properties of Neem Oil:** The Neem oil can be obtained through crushing of seed (Kernel) both through cold pressing and through a process incorporating temperature control. Neem seed oil can also obtained by solvent extraction of the Neem seed, fruit oil, cake or Kernel. Generally the oil extracted through n-hexane. Neem Oil or Neem Seed Oil is a Brownish Yellow colour Liquid, with smell of Garlic. Neem Oil is slightly soluble in water and has 6.5 to 7.5 pH value; it boils at more than 200 degree Celsius and freeze at 13 degree Celsius.



Moisture = 0.2 % Max.  
Specific gravity = 0.94 at 30 degree  
Iodine Value = 75.57  
Azadirachtin Content = 530 ppm  
Saponification Value = 191.69  
Unsaponifiable matter = 1.91 %

## COST OF NEEM OIL

Rupees ₹ 75 (USD 1.15) per lit

Requirement for 1.0 tone Urea

0.5 lit Neem oil is required for one tone Urea.

Cost increased for one tone Urea

Rupees ₹ 80-90 increased cost for one tone



Fig.3 (Packing of Neem Coated Urea)

In summary, the advantages of the neem coated urea can be enumerated as follows:

- 1 Saving of 10% of the losses of urea would amount to 2 million tons of urea or a reduction in subsidy component to the tune of ₹ 1,700 crores per annum (considering total subsidy on urea to be ₹ 18,000 crores per annum).
- 2 Proportional saving in the consumption of naphtha or natural gas.

- 3 **Increased crop yields due to better nitrogen utilization.**
- 4 **Reduction in environmental pollution of ground water due to leaching of nitrates and gaseous emissions.**
- 5 **Opportunity for entrepreneurs to commercialize local Neem Resources and Development of Small Scale Industries in rural areas.**

## **OTHER BENIFITS**

Apart from the increase in yield, Neem Coated Urea application has other use full effect in paddy and wheat crops. At one of the locations in the state of UP, farmers have observed that the menace of Neel Gai has reduced significantly in paddy crop. In yet another observation, at Panipat, farmers observed no incidence of leaf folder and, stem borer in paddy crop. At Sangrur and Gurdaspur, in the States of Punjab, farmers observed that the incidence of white ant was reduced with the use of Neem coated Urea in wheat crop. This is because of fragrance of Neem oil that on dissolution was released in the standing water in the standing water and insecticidal properties of Neem.

### **Production of Neem Coated Urea at National fertilizers ltd. India**

National Fertilizers Limited, in the year 2002, standardized the techniques for production of Neem Coated Urea in situated, at its Panipat Unit. Since then many changes have been made in the process and applicant solution, to have a uniform and consistent coating of Neem oil on urea prills, to maintain the concentration of Neem oil content as per the specification prescribed in FCO (Fertilizers control Order). Based upon the results of extensive field trial where Neem Coated urea was found to be agronomical superior to normal prilled urea, Coating urea with neem prevents its misuse as well as puts the fertiliser in slow release mode, nourishing the saplings for a longer period, and thus avoiding the repeated use of fertiliser. The process reduces pollution of groundwater. There is an increase in crop yield and efficient pest control management leading to savings. It also increases the shelf life of the product. Now NFL started 100 % Neem coated urea.

### **Why Neem Coat is required?**

Soil fertility is determined by three major elements namely Nitrogen, Phosphorus & Potassium (N, P, K) of which nitrogen plays a very important role. For this reason, Urea (containing 46% of N) consumption is very high all over the world. Unfortunately, more than half (up to 60%) of the nitrogen leaches out or vaporizes in the form of nitrogen gas, ammonia & nitrous oxide due to the presence of denitrifying bacteria in the soil.

### **Featured Benefits of Neem Coated Urea**

1. Slow down the process of nitrification of urea.
2. Neem Coated Urea reported improved yield up to 48%
3. Decrease urea requirement by 50%.
4. Controls soil born nematodes, termites and other pest due to pesticide properties.

## Mode of Action

When uncoated urea is applied to the soil, the urea (Amide) nitrogen is rapidly converted to ammoniacal nitrogen and subsequently to nitrite and nitrate forms. Nitrogen in these forms, besides being absorbed by plants, is also rapidly lost from the soil due to leaching, run off, volatilization and de-nitrification. When neem UCA coated urea is applied to soil, the Neem Triterpenes inhibit the activity of nitrifying bacteria results in delayed transformation of ammoniacal nitrogen into nitrite nitrogen. Thus ensures slow and continuous availability of nitrogen through the crop growth. Coating urea with neem prevents its misuse as well as puts the fertiliser in slow release mode, nourishing the saplings for a longer period, and thus avoiding the repeated use of fertiliser. The process reduces pollution of groundwater. There is an increase in crop yield and efficient pest control management leading to savings. It also increases the shelf life of the product

To correct the widespread deficiencies of secondary and micronutrients in soils fortified and coated fertilisers with these nutrients were included. To promote these fertilizers on large scale, the manufacturers are allowed to sell all the fertilizers Control Order approved fortified/coated fertilizers at a price up to 5% higher than the MRP of the subsidised fertilizer, except zincated urea and boronated SSP which has been made up to 10% above MRP. Generally the high usage of Urea reduces the fertility of the land. In Initial years, it may higher the production of crops but simultaneously affects the production capacity of the land and after successive years, farmers get low production.

Out 17 nutrients essentially required by crop plants for their normal growth and reproduction, nitrogen (N) is generally required by them in the largest amounts. Urea is one of the most widely used sources of fertiliser N in the world. It also has high nitrogen content (46%), in comparison to many other popular nitrogen sources. When applied to soil, urea is first transformed into ammoniacal ( $\text{NH}_4^+$ ) form after its hydrolysis and then to nitrite ( $\text{NO}_2^-$ ), followed by to nitrate ( $\text{NO}_3^-$ ) forms by the process of nitrification. Most of the crop plants use nitrate as a source of nitrogen except rice which prefers ammoniacal form over the nitrate. Though nitrification is a necessary phenomenon for making nitrogen available to crop plants, but the rapid nitrification is one of the key processes that encourage Nitrogen losses from the soil. This leads to reduced recovery of urea-N by crop plants. The percent recovery of fertilizer N, say urea-N for example, is generally called as nitrogen use efficiency

Urea is an important supplier of nitrogen, which is necessary for the development of plants. "But only 30-40 per cent of nitrogen present in the urea is utilised by crops. The rest gets degraded," When ordinary urea is applied, it gets converted to ammonium carbamate. Some of this gets converted to ammonia gas in what is called ammonia volatilisation. "About 8-10 per cent nitrogen is lost during volatilisation," "Volatilisation is more pronounced in alkaline soils like that of India." The rest of the ammonium carbamate undergoes chemical transformation and nitrates are formed. Some of these are absorbed by the plants. The rest are either leached into the underground water or are denitrified to gaseous nitrogen and nitrous oxide under anaerobic conditions (absence of oxygen). Neem has properties that check nitrogen loss at each stage. It slows down the process of nitrate formation and hence excess nitrate is not available for de nitrification. It will reduce caking during storage and also improve availability of nitrogen to crops at the time of growth. It will also result in better crop yield". The price

of Neem-coated urea will be marginally higher than the cost of normal urea. The results obtained under the general parameters have shown an increase in crop yield and efficient pest control management with an average saving. The process will help in harnessing unique properties of Neem for regulating release of nitrogen to crops when mixed and applied with urea into soil and making available to farmers a more efficient nitrogenous fertilisers based upon the research work conducted by scientists of Indian Agriculture Research Institute, New Delhi. Urea can be used in an effective manner. Smaller quantities of urea can be more effective than normal quantities being used by farmers currently.

This will especially help the paddy crop in low land conditions,” During the ongoing Rabi season, the company proposes to have more field demonstrations for crops like sugarcane, potato and wheat with reduced doses of nitrogen to extent of 80 per cent through Neem coated urea as compared to full recommended dose through normal urea to establish benefits accruing in terms of increased productivity. Neem coated urea (NCU) applied to rice can result in high N use efficiency as it contains nitrification inhibition properties. Field experiments were conducted for three years (clay loam soil) for evaluating the relative performance of NCU vis-à-vis ordinary urea as a source of N for transplanted wetland rice. Along with a no-N control, the two N sources were tried at three N levels—40, 80 and 100% of the recommended level of 120 kg N ha<sup>-1</sup>. Different doses of N were applied in three equal split doses at transplanting, 21 and 42 days after transplanting (DAT). For need based site specific N management for improved N use efficiency, the two sources of N were applied using leaf colour chart (LCC). In this treatment a basal dose of N at the rate of 20 kg N ha<sup>-1</sup> was applied after 7 DAT and LCC readings were recorded at weekly intervals starting 14 DAT. Whenever the intensity of green colour of the first fully opened leaf from the top was less than shade 4 of the LCC, N was applied at the rate of 30 kg N ha<sup>-1</sup>.

The application of N through NCU and ordinary urea increased the rice grain yield significantly with increasing levels of N at both the locations. The application of NCU at recommended rate (120 kg N ha<sup>-1</sup>) produced significantly higher rice grain yield than the yield obtained with ordinary urea at Ludhiana. The differences were not significant at Gurdaspur (India). Need based N management using LCC reveal that rice required only 110 kg N ha<sup>-1</sup> irrespective of the N sources. The application of NCU using LCC produced significantly higher (8.6%) rice grain yield than ordinary urea at Ludhiana but increase was not significant at Gurdaspur (Punjab), India. The superiority of NCU over ordinary urea at Ludhiana was accompanied by spectacular increase in N uptake and nitrogen use efficiencies when applied on soil test basis or using of LCC.

In summary, the advantages of the Neem coated urea can be enumerated as follows:

1. Saving of 10% of the losses of urea would amount to 2 million tons of urea or a reduction in subsidy component to the tune of 1,700 crores per annum considering total subsidy on urea to be 18,000 crores per annum)
2. Proportional saving in the consumption of naphtha or natural gas.
3. Increased crop yields due to better nitrogen utilization.
4. Reduction in environmental pollution of ground water due to leaching of nitrates and gaseous emissions.
5. Opportunity for entrepreneurs to commercialize local Neem.
6. Resources and Development of Small Scale Industries in rural areas





**Fig.-4**

## **CONCLUSION**

In addition to the entire medical and environment benefits Neem tree is also considered as insurance for a way to heaven. Evil spirits are kept away from home by keeping Neem leaves at the entrance. Even the newly born babies are laid upon Neem leaves so as to give them a protective aura. Thus Neem tree indeed is a wonderful tree that has many benefits and without any side effect.



**Fig. 5(Neem Coated urea on belt conveyor)**





Using Neem coated urea not only increase crop yield but also lower input cost to farmer. Cost of Neem coated is only higher about 3-4 %.Increasing nitrogen efficiency means reducing ground water pollution by nitrates as well as ammonia gas pollution in the air. It also reduces import of precious fertilizers as well as reduces ground and soil pollution. Neem Coated urea has been demonstrated to improve nitrogen use efficiency and consequently crop yield especially in paddy crop and wheat. Coating with Neem oil also reduces caking of urea and chances of powder formation during transportation and handling. Repellent action of Neem oil also protects crops for many insects; pest and even rats are also go away due to bitter smell of Neem oil. Neem Oil is used to manufacture Neem oil insecticide because it contains Azadirachtin which effects over 600 species of pests including insects, nematodes, fungi and viruses and is completely safe to non-target organisms like beneficial predators, honey bees, pollinators, fish, birds, cattle and human beings. Azadirachtin of Neem oil is a famous natural Anti-fee dent, growth regulator and ovi-positional repellent for insects, as a major active ingredient which make it a perfect alternative to chemical pesticides.

Fig. 6(Advantages of Neem tree)

References-Neem oil & Neem coated urea, published on [www.ureaknowhow.com](http://www.ureaknowhow.com) by Prem Baboo

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