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# **Manures , Fertilizers and Soil Fertility Management**

## **05. Nitrogenous fertilizer**

**Edited by Monisankar Bera**



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# 05.1

## Nitrogenous fertilizers

Nitrogenous fertilizers take the foremost place among fertilizers since the deficiency of nitrogen in the soil is the foremost and crops respond to nitrogen better than to other nutrients.

More than 80 per cent of the fertilizers used in this country are made up of nitrogenous fertilizers, particularly urea.

It is extremely efficient in increasing the production of crops and the possibilities of its economic production are unlimited.

# 05.2



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## Nitrogenous fertilizer



### Ammoniacal

1. Ammonium Sulphate
2. Ammonium chloride
3. Anhydrous ammonia

### Nitrate

1. Sodium Nitrate
2. Calcium Nitrate
3. Potassium Nitrate

### Ammoniacal and Nitrate

1. Ammonium Nitrate
2. Calcium Ammonium Nitrate
3. Ammonium Sulphate Nitrate

### Amide fertilizer

1. Urea
2. Calcium Cynamide

[http://agritech.tnau.ac.in/agriculture/agri\\_nutrientmgt\\_fertilizers.html](http://agritech.tnau.ac.in/agriculture/agri_nutrientmgt_fertilizers.html)



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## 05.3

# Nitrate fertilizers:

As the name, 'nitrate fertilizers' indicates, these fertilizers contain nitrogen in nitrate form which is preferred by a majority of the plants.

**There are three main nitrate fertilizers use the world over:**

Sodium nitrate	16% Nitrogen (N)
Calcium nitrate	15.5% N
Potassium nitrate	13% N

The use of nitrate fertilizers in our country is very limited due to their limited availability, high cost, difficult handling and also their harmful effect of soil.



## 05.4

# Character nitrate fertilizers

- These fertilizers are readily soluble in water and quickly available to the plants.
- If plants need nitrogen urgently, soil use of nitrate fertilizers gives quick response.
- Use of nitrate fertilizers is not recommended for very moist and waterlogged soils because in these situations nitrate nitrogen is either leached down along with excess moisture or converted into gaseous form and lost to the atmosphere due to lack of oxygen.
- In both conditions, it becomes unavailable to the plants. In sandy soils also, there use is avoided as the sandy soils are incapable of retaining nutrients and even with a little moisture, nitrate is leached down.
- If necessary, in sandy soils nitrate fertilizers are applied in 2-3 split doses.



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## 05.5 Ammonical Fertilizers:

Ammonical fertilizers contain nitrogen in ammonical form.

The following ammonical fertilizers are used in our country:

<b>Ammonium sulphate</b>	<b>20% N</b>
<b>Ammonium chloride</b>	<b>24-26% N</b>
<b>Monoammonium phosphate</b>	<b>11-20% N, 20-48 P<sub>2</sub>O<sub>5</sub> (Phosphate)</b>
<b>Diammonium phosphate (DAP)</b>	<b>18%N, 46%P<sub>2</sub>O<sub>5</sub></b>
<b>Ammonium solution</b>	<b>20-25%N</b>

All the ammonical fertilizers exert negative residual effect on the soil.



## 05.6

# Character ammonical fertilizers

- These fertilizers can be applied also to those crops which absorb nitrogen in nitrate form. It is because ammonical part of the fertilizers can be easily converted into nitrate ( $\text{NO}_3$ ) form.
- As the ammonical portion of the " fertilizer ( $\text{NH}_4$ ) is positively charged, it easily , gets attached with very fine clay or humus a, particles of the soil which are negatively charged.
- Ammonical fertilizers are, therefore, quite resistant to leaching. These fertilizers can also be applied in waterlogging conditions, because in such conditions, they do not so easily convert into gases.
- Ammonical fertilizers are especially suitable for paddy crop for a couple a of reasons:
  1. paddy prefers nitrogen in ammonical form and ammonical form of nitrogen is not easily converted into gases and lost to atmosphere.
  2. Although these fertilizers are readily soluble in water, they are not as quickly available to plants as nitrate fertilizers.
  3. A little time is required for the conversion of  $\text{NH}_4$  to  $\text{NO}_3$ , the most preferred form of nitrogen. Ammonical fertilizers are suitable for slow growing, long duration crops.



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## 05.7

# Ammonical-nitrate fertilizers

Ammonium-nitrate fertilizers contain nitrogen in both the forms: ammonical and nitrate. Fertilizers of this category can be used in a wide variety of soils and cropping conditions. Nitrate meets the immediate demand of nitrogen and ammonical form supplies nitrogen to meet the growth and developmental needs of N as the plant ages. Fertilizers of this category are acidic in reaction. The following fertilizers of this category are marketed:

<b>Ammonium nitrate</b>	<b>33%N</b>
<b>Calcium ammonium</b>	<b>26%N</b>
<b>Ammonium sulphate Nitrate (ASN)</b>	<b>26%N</b>





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# Characteristics of Ammonical-nitrate fertilizers

- **Ammonium nitrate** is nutritionally very rich, it has several undesirable features.
  - It is highly hygroscopic and shows a marked tendency to absorb moisture from the air and to cake (lump formation).
  - It is highly explosive and, therefore, requires careful handling and storage. This fertilizer is not manufactured in India but imported on a limited scale.
- **Calcium ammonium nitrate:** Calcium ammonium nitrate fertilizer has very good physical condition. It is attractive, dust free; easy flowing and granular in form. This fertilizer is now-a-days not used in India due to its high cost. This is, in fact, a chemical mixture of ammonium nitrate with calcium carbonate.



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## 05.9 Amide fertilizers:

Amide group fertilizers are agronomically very significant. They are readily soluble in water and easily decomposed by micro organisms in the soil. In the soil, they are quickly changed into ammonical and then nitrate form and becomes available to the plants. The two main [ amide fertilizers used in our country are: i (a) Urea -46%, (b) Calcium cyanamid -21%N.

**a. Urea:** Urea is readily soluble in water and is, perhaps, the cheapest among all the nitrogenous fertilizers based on per unit cost of nutrient. It is a white, granular, solid and slightly hygroscopic fertilizer. It can also be applied in solution form as spray. Urea exerts acidity equivalent to neutralizing amount of 80 kg calcium carbonate per 100 kg of fertilizer material. Most of the crops respond effectively to the urea application. When applied to the soil, urea - undergoes decomposition in the presence of enzyme 'urease', secreted by soil microorganisms. Conversion of urea in to nitrate form due to decomposition is completed in about - one week's time. Urea is somewhat resistant to leaching.

**b. Calcium cyanamide:** Calcium cyanamide is not used in India. This fertilizer creates a high basicity/salinity in the & soil as residual effect which requires sulphur as neutralizer. This fertilizer, if available, can be used in acidic soils.



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05.10

# Nitrogen Buffering Mechanisms

- 1. Increased Applied N results in increased plant N loss ( $\text{NH}_3$ )
- 2. Higher rates of applied N - increased volatilization losses
- 3. Higher rates of applied N - increased denitrification
- 4. Higher rates of applied N - increased organic C, - increased organic N
- 5. Increased applied N - increased grain protein
- 6. Increased applied N - increased forage N
- 7. Increased applied N - increased straw N



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**Thank you**