اسمدة متقدم 10

Coated or Encapsulated controlled Fertilizers L3

Conventional water soluble

Fertilizer

Treated with water insoluble coating (to control water penetration)

fertilizers with low dissolution and release

- There are three groups of coating material :-
- Sulphur
- Sulphur- polyolefin material
- Sulphur + polymeric material ,including wax polymeric material
- Agents used for coating :-
- sulfur
- Polymers
- Fatty acid
- Latex ,rubber ,petroleum derived
- Peat (encapsulating in peat pellets) OMF

*To reduce cost coated/ or encapsulated are blended with conventional fertilizers in different ratio

* Coated or encapsulate fertilizers offer greater flexibility in determining the nutrient pattern release

*Could be used with nutrients other than N .

Nyborg (1995) have found that slowing release of P Into soil by coating fertilizer granules (polymer coating)

can markedly increase recovery by crops and increase yields.

- Sulphr Coated Urea (SCU) (30—40% N)
- *Gain the greats importance to date.
- *sulphur coating may be considered to be an impermeable membrane which slowly degrades
- through microbial , chemical , and physical process
- *N (other nutrients) release varies with thickness of coating and purity of urea used. .
  - The basic process was developed in lab. and pilot
- scale test in 1961 by TVA.
- Hand out (Fig. 9 , New development in fertilizer tech. TVA, sulphur coating process)

- Final product :-
- N 31-42%
- S 10-27%
- Sealant agents 5%
- Currently manufactured product :-
- N up to 42%
- S 6-30%
- Various sealant and conditioners are used
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- Physical and chemical prop. Of SCU .
- (Table 8 . P. 32 in New fertilizers Tech. TVA)
- Why favoring the combination of urea and S.?
- 1- Urea with 46% N is highly concentrated ,thus
- coating with S. still results in product with about
- 30-40% N .
- 2-Reduce leaching and/or NH_3 volatilization.
- 3- Sulphur is a low cost product.
- 4-Sulphr is available secondary plant product.
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POINTS OF CONSIDERATION :-

-dissolution of urea from SCU into soil solution follows the microbial and hydrolytic degradation.

-microbes first have to attack the sealant to reveal the imperfections in the sulfur coating.

-the quality of SCU is characterized by the rate of N

released into soil sol. with 7 days

- Currently marketed SCU fertilizers have dissolution
- values of about 40-60%.
- SCU-30 designates a product with N release of 30 % within 7 days
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- Nitrifications and Urease Inhibitors – Stabilized
- Fertilizers
- In soil NH_4^+ is oxidized to NO_2^- and then to NO_3^-
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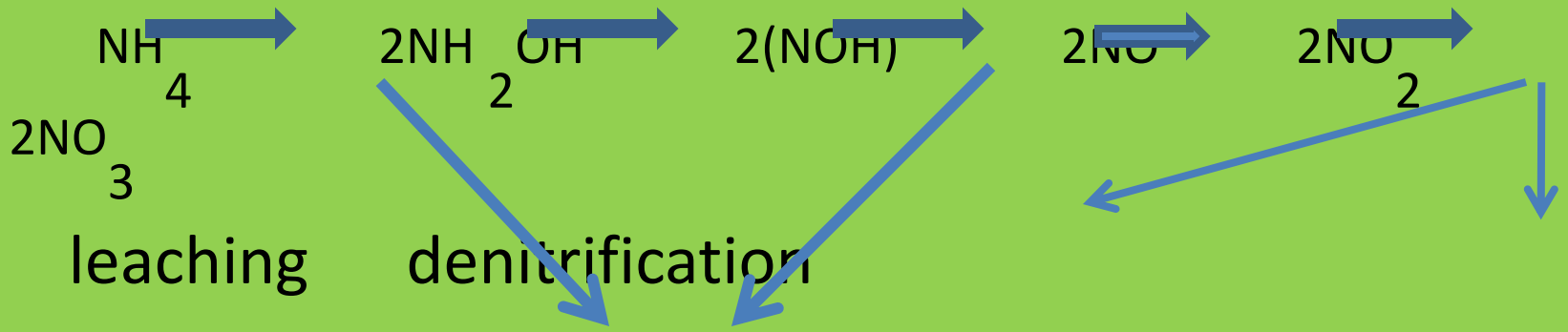
- 

- NO2
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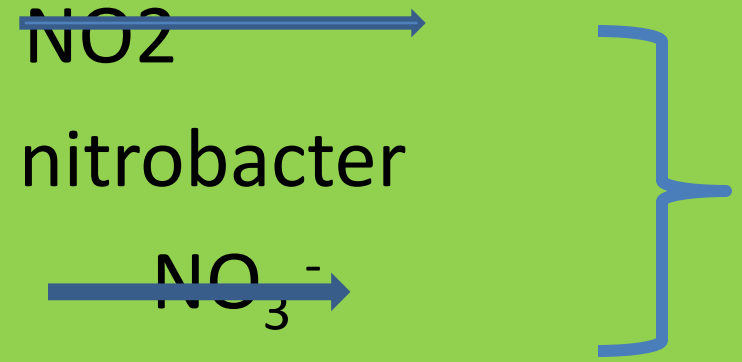
- nitrosamines
- NH_4^+ NO2
- Nitrification nitrobacter
- NO_2^- NO_3^-



- X 3X
- NH_4^+ NO_2^- NO_3^-
- Why? Hint: energy !

- Toxic to plant and soil microbes
- nitrification inhibitors delay transformation of NH_4^+ to NO_3^- by slowing down the activity of nitrosomonas . (bacteristatic effect)
- This leads to :-
- *plants take N in NH_4^+ form which P uptake
- (why is that?)

- * Reduce N losses through leaching and/or denitrification .
- * Suppression of CH_4 emission and reduction of nitrous oxides(N_2O) emission.
- Urease inhibitors :-
- Out of world total of 77.3 million tons of N used in 1995/1996 approximately 37.3 million tons of were in form of amide –N in form of urea ,UAN, and other ,corresponding to approximately 49%.
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- When amide –N is applied to soil , it is transferred
- relatively through the activity of urease enzyme
- Urease
- $CO(NH_2)_2 + H_2O \longrightarrow H_2NCOONH_4$
- ammonium carbonate
- (unstable)
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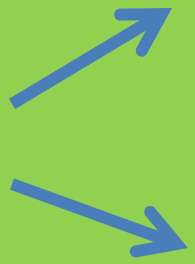
- $2NH_3 + CO_2$

- Major draw backs of the RX.
- Volatilization
- NH_3
- Seed damage



Urease inhibitors inhibit or reduce the e transformation of urease enzyme , so depressing the transformation of amide to NH_4 OH or NH_4

Types of Nitrification Inhibitors

Hand out p .31 in slow and control fertilizers

p. 37 in New development in fertilizers tech.

- Up to now only two nitrification inhibitors have gain practical or commercial importance in agric.
- Nitrapyrine
- trade mark N- Serve
- Structure (hand out p.41 in new devlop. In fertilizer tech.)
- 2-chloro-6-(trichloromethyle) pyridine (and related chlorinated pyridines ,such as 4,6 dichloro-2-trichloromethyl pyridine)
- The product is exclusively produced by Dow Elanco in USA

- * In soil (or in plants)
- N- serve
- chemical &biological
- Process
- 6- chloropicolinic acid

- N , Cl , CO_2 and H_2 O
- *Decomposition is complete in 30 days or less in warm soil, however , is very persistent in cool soils.
- (fall & winter N application)

- *Activity against Nitrosomonas is:-
- 6-8 weeks in warm *soils*
- about 30 weeks or longer in cool soils.
- *In corporation in conventional fertilizers is difficult

due to its vapor pressure.

*The active ingredient formulated as liquid product.

- N-serve 24^{R}

Nitrogen stabilizers with 2 pounds active

Ingredients / gallon (240 g/L) for use with anhydrous ammonia and impregnation onto urea.

- Application methods
- with all type of NH_4 – N fertilizers
- - incorporated into band or zone in soil at depth of
- at least 2 to 4 inch. during or immediately after N
- fertilizers application.
- *The recommended application rate is 1.4 to 5.6 L/ha.
- *In USA farmer used as time management.
- (N fall application vs. spring application)
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