# اسمدة متقدم 8

# SLOW ,CONTROLLED- RELESED AND STABILIZED FERTILIZERS

Improve efficiency of fertilizers :-

*Improvement of fertilizers already in use .

Development of new specific fertilizers . *

Finck (1992)

Source :- World Fertilizer use manual . IFA

IFA = International Fertilizer Industry Association .

gives the following induction of nutrients up take the first year

N → 50-70 %

P → 10 – 25 (avg. 15%)

1 -2 % per year will be taken during the following years

K → 50 – 60%

Increasing fertilizers efficiency could be through :-

-Promote root growth . .*

-*Use of soil and plant testing methods and constant crop monitoring

*Application of nutrients corresponding to plants need and growth .

*Reducing possible losses to environment.

Losses : immobilization, denitrification, volatilization, and leaching .

CHALLANG of fertilizers industry is to develop

Special type of fertilizers avoiding or reduce such losses .

These special types could be :

-Foliar fertilizers :- limited amount of fertilizers can be applied. In practice this makes it impossible to economically apply the necessary nutrients via plants leaves.

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Intelligent Fertilizers :

- fertilizers release the nutrients contained according to plants need .
- *Slow –release and controlled –released coated /or encapsulated fertilizers .
- * Stabilized fertilizers (fertilizers associated with nitrification or urease inhibitors)

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Shoji and Gandeza (1992) consider that an ideal fertilizer should have at least the following three characteristics :-

a- need only one single application through out the entire growing season to supply the necessary amt. of nutrient for optimum plant growth .

b- it has a high max. % recovery in order to achieve higher return to the production inputs

C- it has min. detrimental effect on soil, water and atmospheric environments.

Slow and particularly controlled – release as well as stabilized fertilizers meet this requirements .

What are slow and controlled –release fertilizers ?

Fertilizers containing a plant nutrient in a form which either:

a- delays its availability for plant uptake and use after application . or

b- which is available to the plants significantly longer than a reference rapid available nutrient fertilizer as urea , $NH_4NO_3$ , etc

No official differentiation between slow release and controlled release fertilizers ,however,

Microbially decomposed fertilizer

Slow –release fertilizers

Coated or encapsulated product

Controlled – release fertilizers

# A FERTILIZER MAY BE DESCRIBED AS SLOW RELEASE

(X) nutrient release meet the following :-

a- no more than 15% released in 24hr.

b- no more than 75% released in 28 days.

c- at least about 75% released at the state

release time .

The most important manufacturing routs

-:material releasing nutrients through

1- low solubility due complex ,high M.W.

Chemical structure following microbial

decomposion.

(coated fertilizers ) 2- a coated surface

3- a membrane which may or may not it self be soluble ( encapsulated).

nutrient incorporated into a matrix which 4- It self may coated.

5- delayed form due to small surface to volume ratio ( super-granual, tablets …..etc. )

## Advantages and disadvantages :-

### Adv.

1- Reduce toxicity (to seedling) due to high ionic conc. and $NH_3$ voilitization .

2 -Permit application of substantially larger fertilizers dressing as compared with conventional soluble fertilizers.

3-Single fertilizers application ( saving in labor , time and energy)

4- decrease risk of environmental pollution.

5- Reduce gas emissions ($N_2O$,NO, ……etc)

Disadv.

1- No standardized methods for reliable determinations of the nutrient release pattern available yet.

2- N release to soil solution extremely slowly ( urea – formaldehyde fertilizers )

3- Initial nutrient release may be too rapid causing damage to plants.

4- Application of coated – controlled release fertilizers may increase soil acidity.

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5- Polymer coated or encapsulated controlled fertilizers may leave undesirable residue of synthetic material on field.

6- cannot apply fertilizers according to plant needs

7- Cost of coated and encapsulated fertilizers is still higher than of conventional fertilizers .

# Types of Slow and Controlled- Release and Stabilized Fertilizers

The two most important groups according to production are :-

1- condensation products of urea and urea-aldehydes (slow-release fertilizers)

2- coated or encapsulated fertilizers

(controlled- release fertilizers)

3- of lesser or only regional importance are :

-Super granules and others

# Uncoated Slow Release Fertilizers

*Urea formaldehyde (UF)

*Methylene urea (MU)

*Isobutylidene diurea (IBDU)

*Natural organics

# Ureaform and Methylene Urea

* Very similar materials chemically
* Mostly granular, some liquids

  about 40% N, 70% WIN (28% N for liquids, all soluble)

*Formed by reacting urea and formaldehyde = chains of alternating C and N

*Main difference is chain length, and as a result, mineralization rate