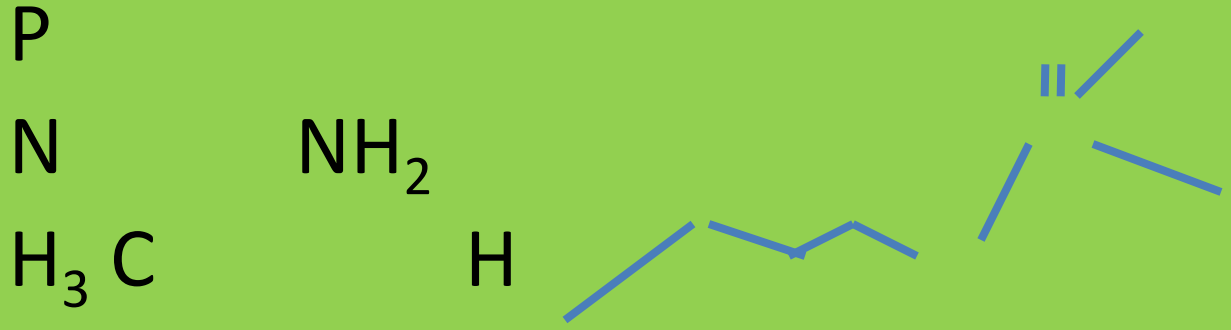
اسمدة متقدم 11

- Draw backs of N- serve *
- - Loss by volatilization from treated fertilizers during storage
- - The bactericidal effect , which may regarded as an undesirable interference in a natural soil process.
- DCD (Dicyandiamide) – about 67% N
- *Exist in two forms
- -cyanamide
- -dicyandiamide
- 1st inhibiting prop. was reported in 1959.
-
-
-
-

- Urease Inhibitors
- * several compounds have test (hand out ,agron. research ,TVA ,1984).
- * only one compound has gain practical and commercial importance :-
- Namely phosphoric triamide (NBTPT OR NBTP)
- N- (n-butyl) thiophosphric triamide .



*Has been marked since 1996 by IMC-Agri.Co. .
company under trade name AGROTAIN[R]

- *Inhibits the activity of urease for 12-14 days in dry soil.
- * it inhibits free urease in the soil without affecting bacterial growth.
- * in the soil , the product degrades into fertilizers elements N,P, and S.(also in flood rise field).

- * it is formulated as a green clear liquid containing :
- -25% N-(n-butyl) thiophosphric - .
- triamide as active ingredient
- -10% N- methyl-pyrrolidone (NMP).
- - 60-65% other non hazardous ingredients.
- Application

  * the recommended rate of application depends the quantity of amide –N applied as urea ,UAN, or in the form NPK fertilizers
- - 0.14 % by weight = 2.8 Ib. active ingredient/t
- (1.14kg/t) of urea = 5.21L/t urea.

CMP

1-carbamoyle-3-methylpyrazole

This nitrification inhibitor had been developed by Agrochemie Piesteritz (now SKW Stickstoffwerke Piesteritz GmbH, Wittenberg, Thuringia). There has been substantial laboratory research and rigorous field testing, practically exclusively in the former GDR, in Central Eastern Europe and in the Former Soviet Union (there called KMP).

For this research and field testing it was formulated as a 50% CMP-formulation, to be mixed into solid ammonium-N containing fertilizers or into solutions. However, because CMP is liable to hydrolysis when incorporated into solid or liquid fertilizers, the CMP-formulation had to be added at the time of applying the fertilizer (or the slurry). This was also the reason for the recommendation that CMP could be mixed with water (at a rate of CMP of 1 - 3 kg/ha) and applied with a pesticide sprayer at rates of 200 to 300 l of spray per ha.

As with nitrapyrin, CMP has to be incorporated into the soil during or immediately after application.

CMP has a bacteriostatic effect on *Nitrosomonas* bacteria, i.e. it only reduces their nitrifying activities for a certain period, thus preventing the conversion of ammonia into nitrite (and further to nitrate).

CMP has a LD_{50} of 1580 mg/kg, oral, rat, the main metabolite 3MP an LD_{50} of 1312 mg/kg, oral, rat.

However, apparently this product has never reached the stage of being marketed and used in agricultural practice. One recent exception is its metabolite 3MP, which is used in combination with DCD (PIADIN®) added to UAN (urea-ammonium-nitrate-solution) (WOZNIAK, 1997).

Neem- or 'Nimin'-coated urea

(see sections 5.1.2. Neem- or Nimin-coated urea, and 11.1).

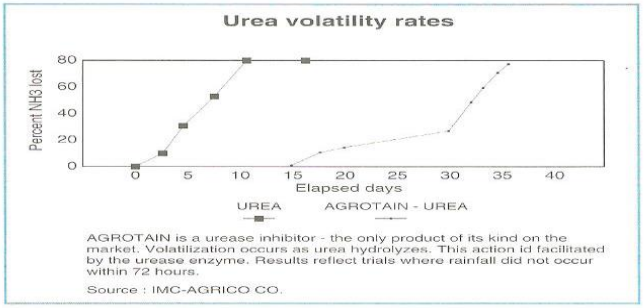
NBTPT - (or NBPT)

N-(n-butyl) thiophosphoric triamide

NBPT, and its main metabolite BNPO (or NBPTO): N-(n-butyl) phosphoric triamide, at present the only urease inhibitor of commercial and practical importance for agriculture, has been marketed since spring 1996 by IMC-Agrico Company under the trade name AGROTAIN®[18] in the United States (IMC GLOBAL, 1996).

Surface applied urea or urea containing fertilizers have the potential for significant volatilization losses (KINCHELOE, 1997b; KINCHELOE and SUTTON, 1996).

[18] AGROTAIN is a registered trademark of Freeport-McMoRan Resource Partners, Limited Partnership, and licensed exclusively to IMC-Agrico Company.



AGROTAIN is a urease inhibitor - the only product of its kind on the market. Volatilization occurs as urea hydrolyzes. This action id facilitated by the urease enzyme. Results reflect trials where rainfall did not occur within 72 hours.

Source : IMC-AGRICO CO.

Field shot of a spring-applied nitrogen rate/nitrification trial, Iowa State University, Ames, IA, 1996. This was a wet season, and nitrogen deficiencies are obvious in the zero N check and in the low N rate plots. Also corn size varied in response to N rate and to nitrification inhibitor. Yield response to the nitrification inhibitor, N-Serve, averaged 10% (160 vs. 145 bu/ac). Typical of what is seen on somewhat poorly drained soils in a wet year. (HUFFMAN, J. - DowElanco)

In most years the majority of nitrogen losses occur before corn becomes a major user of nitrogen. It is to the advantage of the farmer and to the environment to retain a maximum amount of the available nitrogen in the root zone until the major period of nitrogen loss is past. N-Serve® results in delayed nitrification and, accordingly, may reduce the risk of nitrogen loss by leaching and by denitrification (KILLORN and TAYLOR, 1994).

CHRISTENSEN and HUFFMAN (1992) demonstrated in several years of experiments with corn (*Zea mays* L.) that the nitrogen rate could be reduced without loosing yield when nitrogen fertilizers were applied amended with nitrapyrin.

The response of corn to preplant applications of nitrogen and to nitrogen plus nitrapyrin is given in table 15.

Table 15. Response of corn to nitrogen rate and to nitrapyrin, 1982 to 1988

Treatment		Year						
Nitrogen	Nitrapyrin	1982	1983	1984	1985	1986	1987	1988*
kg / ha					t / ha			
0	0	7.44	2.63	4.34	5.42	4.10	4.18	3.94
90	0	8.68	5.03	6.60	7.09	9.10	7.76	5.51
90	0.56	9.44	5.94	7.51	7.61	10.81	8.67	5.88
134/179	0	9.14	5.98	7.19	7.52	11.10	8.70	5.80
134/179	0.56	10.38	6.50	7.59	8.41	12.38	9.18	6.58
CV (%)		3.90	7.10	3.90	2.60	11.9	7.80	5.20

*No treatments applied in 1988. The high rate in 1982, 1983 and 1984 was 120 lb/acre N and was 160 lb/acre N for 1985, 1986 and 1987.
Adapted from: CHRISTENSEN and HUFFMAN (1992)

N fertilization of corn.

- *Corn on the left received a commercial rate of anhydrous ammonia applied in spring prior to planting.*
- *Corn on the right received the same N rate plus Nitrapyrin (N-Serve®).*

Note the difference in firing (caused by nitrogen deficiency) where the nitrification inhibitor was not used.

(HUFFMAN, J. - DowElanco)

Emphasis in research is shifting to the precision application of N-Serve®, targeting applications to soils where N losses are high, such as poorly and somewhat poorly drained soils and sandy soils. According to HUFFMAN, 1997, this will:

a. lower grower cost of N by allowing growers to use lower N rates without fear of yield loss,

b. lower costs of N-Serve® per field by applying only where it offers good potential return, and

c. help to reduce movement of NO_3-N into water supplies due to both reduced N rates and reduction of leaching of N.

Further environmental benefits from the use of nitrapyrin are described in section 11.2.4. Environmental aspects of the use of nitrification and urease inhibitors.

Application of dry nitrogen fertilizer in a research trial. (HUFFMAN, J. - DowElanco)

Application of a nitrification inhibitor over the nitrogen band. (HUFFMAN, J. - DowElanco)

11.2.2. Dicyandiamide - DCD

For the United States, it is assumed that nitrogen fertilizers amended with DCD are applied more or less to the same crops as those receiving fertilizers with nitrapyrin. However, the importance of DCD-containing fertilizers (UAN solutions) is growing, particularly on "no-till" corn and soybeans in the Midwest.

The economics of the use of nitrification inhibitors for farmers are significantly better as compared to those of slow and controlled-release fertilizers (HALL, 1995).

Incorporation of the N fertilizer and the nitrification inhibitor into the soil

Spreading of UAN treated with the urease inhibitor AGROTAIN®. (IMC-AGRICO CO.)

*resistances to radiation .

*necessity of irradiation sterilization .

Fertilization Management

*What is Nutrient Management ?

providing the needed nutrients with possible max. efficiency for achieving economically optimum yield under conditions of a given farming system without depleting soil fertility or harming the environment .