Winter Crops Meeting
Noble Co.

Brian Arnall
Precision Nutrient Management
Ok State
<table>
<thead>
<tr>
<th>Forage</th>
<th>Occurrences &gt; FP</th>
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Nitrogen Products and Nutrient Stabilizers
Slow Release

› Prevents immediate release into soil where environment and biological’s have impact.
  • Coated
  • Chemistry

Inhibitors

› Prevent the biological activity that impacts the Nitrogen Cycle
› Since early 60’s at least 15 substances thoroughly researched
Coated Urea’s
- Sulfur Coat
- Polymer Coat

Urea/N Chemistries
- Isobutylidene diurea
- Ureaformaldehyde
- Urea-Triazine
- Methylene Urea
Controlled-Slow Release

- Advantage of these materials is that one application may provide a uniform supply of N to the plants for several weeks.
- S-coated urea (32-36 %N) breakdown of the S coat (physical barrier) Moisture
- Polymer Coated Ureas ESN: Temp and Moist
- IBDU (isobutylidene diurea) is synthetic organic. particle size, soil moisture content and pH.
- Urea-formaldehyde: microbial & temp
- Methylene di-urea -CoRoN, Dura_N: Microbial & temp
- Urea-Triazon- N-Pact, N-Sure: Moist & Microbial.

LOOK AT PERCENT SLOW RELEASE

6 to 20%
ESN contains a urea granule nitrogen (N) within a micro-thin polymer coating. This coating allows water within the soil to move into the granule and dissolve the urea inside. The urea solution then moves out through the coating into the soil where it is available to the crop.

The rate at which the urea solution moves out through the coating is determined by soil temperature and moisture. In cool soils when the crop is growing slowly, N release is slow. As the soil warms and crop growth increases, the granules release N more quickly and steadily.
Low Salt Nitrogen

- Yield and Protein Always equal to UAN when used as a fertilizer source.
- Reduced amount of Tissue Damage
- Increased rate w/ seed possible. Using 10-34-0
  - Wheat <30 lb N i.e. 25 gal/ac
  - Canola <10 lb N i.e. 8 gal/ac
CoRoN at Flag Leaf w/fung

3 yr Average

Relative yield 100% is Producer Standard.

- No flag leaf: 1.00
- Quilt: 1.16
- Quilt + CoRoN: 1.16
- No flag leaf: 1.02
- Quilt: 1.18
- Quilt + CoRoN: 1.21
- Kitchen sink: 1.18
- Zero Fertility: 0.80

Received Humic Acid with Top-dress
(NH₂)₂CO₂ → UREASE

H₂O: Rain, Mist, Dew, Humidity, Soil Moisture

NH₃ (gas) → H₂O → SOIL

NH₄⁺ → SOIL

NH₄⁺
**N Stabilization**

- **Urease Inhibition**
  - Basically prevents/slow urea’s conversion to ammonia
  - If ammonia (gas) is formed in absence of moisture or soil surface it will be lost to the atmosphere

\[
\text{H}_2\text{O} \quad \text{(NH}_2\text{)}_2\text{CO}_2 \quad \text{SOIL}
\]
Urea Exp.

Wet Soil 70°F

0

4

8

Wet Soil 35°F

0

8

32

56
Urea Exp.

Dry Soil 70°F

Sub Soil 70°F

Rain 1/2”
Urease Inhibition

- NBPT: Studied since the 80’s Agrotain
  - 7 Day half life
- (MIC) Maleic Itaconic Coploymer Ca binding of nickel ions necessary for the formation and function of the enzyme Nutrishpere
  - Results Consistently show No benefit
To Use or Not to Use

- **When less or not beneficial**
  - Incorporated
  - Rain or irrigation of \( \frac{1}{2} \)" or more
  - Soil and air temp < 50
  - Dry soil and Air
  - Banding
  - No rain expected for 14+ days
  - UAN vs Urea
To Use or Not to Use

- When **more** beneficial
  - Surface applied
  - No-till
  - High humidity
  - Light rains, heavy dews, mists
  - Soil and air temp > 50
  - Wet soil
  - Soil with high pH >7.5 Lots of OH in soil
  - Rain within 10 days
Nitrification Inhibition

- Basically prevents/slow ammonium’s conversion to nitrate
- Ammonium(+) is immobile in the soil Nitrate(-) is mobile. In high rainfall, irrigated, well-drained soil NO₃ is easily lost.
- NO₃ can be lost by leaching and Denitrification
  - Both Take WATER!!!!
Nitrification

Mineralization + Nitrification

Microbial/Plant Sink

NO₃⁻ Pool

Nitrification

Nitrobacter

2NO₂⁻ + H₂O + 4H⁺

Nitrosomonas

2NH₄⁺ + 2OH⁻

O₂

Additions

Losses

Oxidation Reactions

Reduction Reactions

Joanne LaRuffa
Wade Thomason
Shannon Taylor
Heather Lees

Department of Plant and Soil Sciences
Oklahoma State University

Leaching

IP 50°F

0-40 kg/ha
**NO3 Losses**

**Diagram Description:**
- **N2 Fixation**
  - Symbiotic: Mesquite, Rhizobium, Algae, Soybean
  - Non-Symbiotic: Blue Green Algae, Azotobacter, Clostridium
- **Industrial Fixation**
  - Haber Bosch (1200°C, 500 atm)
  - \(3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3\)
- **Lightning Fixation**
- **Fertilization**
- **Plant Loss**
- **Amino Acids**
- **NH3**
- **NH2OH**
- **N2O2**
- **NO2**
- **Denitrification**
- **Organic Matter**
- **Immobilization**
- **Mineralization + Nitriﬁcation**
- **NO3 Pool**
- **Leaching**
- **Oxidation States**
  - \(\text{NH}_3\) Ammonia -3
  - \(\text{NH}_4^+\) Ammonium -3
  - \(\text{N}_2\) Diatomic N 0
  - \(\text{N}_2\text{O}\) Nitrous Oxide 1
  - \(\text{NO}\) Nitric Oxide 2
  - \(\text{NO}_2^-\) Nitrite 3
  - \(\text{NO}_3^-\) Nitrate 5

**Flow Diagram Details**:
- 15-40 kg/ha
- 10-30 kg/ha
- 0-40 kg/ha
Nitrification Inhibition

- **Nitrapyrin**: Registered Pesticide, studied since the 60’s **N-Serve**
- **(MIC) Maleic Itaconic Coploymer Ca** binding of nickel ions necessary for the formation and function of the enzyme **Nutrishpere**
- **DCD** – Suppresses, does not kill nitrosomas
- **Ammonium-Thio-Sulfate**: Low pH keep NH4 from going to NH3, short lived.
To Use or Not to Use

- When less or not beneficial
  - Arid environments
  - Well drained soils that allow infiltration but have limited leaching
To Use or Not to Use

- When more beneficial
  - Tile Drainage
  - Wet soils
  - Irrigated fields
Avail®, which is marketed as a phosphate enhancing product, contains the same active ingredient as Nutrisphere. The Avail activity is attributed to binding of calcium or iron ions in the soil normally bind p.

AI of Nutrisphere/Avail, the compound is highly negatively charged and would tend to bind with any compound with a positive charge, not distinguishing one ion over another.
Reference Strips

• Are Very Visual.
• Definite Yes or No
• Risk Aversion?
• Sales and Service?
Thank you!!!

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