Including Fertilizer Coating Technologies in a Precision Ag Program

Ryan Bartlett - July 25, 2019
Compass Minerals: A Diversified Global Minerals Company

Products and Markets

- **Salt and Magnesium Chloride**
  - Highway deicing in North America and U.K.
  - Consumer and industrial salt uses in North America

- **Plant Nutrients**
  - Specialty and semi-specialty in North and South America

- **Chemical Solutions**
  - Water treatment and industrial uses in Brazil
There Are Many Types of Fertilizer Coatings

- Sulfur
- Polymers
- N Stabilizers
- Micronutrients
- Surfactants
- Oils

Uses of Coatings
- Stabilization
- Compatibility
- Aesthetics
- Flowability
- Dust Control
- Moisture Control
- Nutrient Release
- Nutrient Delivery

Fertilizer can be a great carrier to the field
Types of Micronutrient Coatings

- Micronutrient coatings may be dry or liquid applied
- Micronutrient applications may improve N-P-K uptake efficiency

Source: Compass Minerals

Source: Yara
Micronutrients Deficiencies are Widespread

Zinc

Percent of Samples Testing Less Than 1.0 ppm DTPA Equivalent Zn in 2015

- No data available
- 1-19% of soil samples report zinc deficiencies
- 20-34% of soil samples report zinc deficiencies
- 35-50% of soil samples report zinc deficiencies
- 51-65% of soil samples report zinc deficiencies
- 66% or more of soil samples report zinc deficiencies

*Only states with 2,000 samples or more are shown on this map*
Why Do Coatings Matter? - Placement

TYPICAL GRANULAR MICRONUTRIENT PLACEMENT

FERTILIZER COATINGS ARE MORE AVAILABLE TO ROOT SYSTEMS
Even Coating is Important

• A more efficient application option
  • Each and every fertilizer granule is coated
  • Improves distribution in the field
  • Use less nutrient to get better uptake
Dispersion Trial – Coated vs. Standard

- Study conducted to look at distribution of micronutrients across a field, comparing a granular zinc source to zinc coated NPK
  - Identical field sections
- 9 ft² tarps laid out systematically across the field
- Fertilizer spread with a calibrated floater
- Fertilizer was collected from each tarp and analyzed for content and concentration
Fertilizer Coatings Provide Even Dispersion Across the Field

RESULTS:
WOLF TRAX ZINC DDP was 86 percent more accurate at delivering the desired amount of zinc per acre versus the granular fertilizer.

Granular Zinc
Target: 2.0 lbs. Zn/ac

Graph 1 shows highly variable granular zinc distribution with a 291% spread between the highest and lowest readings. This represents over application and under application throughout the field. Too little zinc can cause small, yellow plant leaves and reduced root systems limiting crop performance.

Wolf Trax Zinc DDP
Target: 0.22 lbs. Zn/ac

Graph 2 shows an even distribution of Wolf Trax Zinc DDP with only a 39% spread between the highest and lowest readings. This means more zinc uptake and less dollars spent on wasted fertilizer.
Even Micronutrient Dispersion Improves Uptake and Yield Results

### Plant Tissue Uptake Results

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>Measurement</th>
<th>Increase (% of ctrl)</th>
<th>Number of Trials</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn DDP</td>
<td>Plant Tissue Uptake</td>
<td>+16.2%</td>
<td>35</td>
<td>77%</td>
</tr>
<tr>
<td>Mn DDP</td>
<td>Plant Tissue Uptake</td>
<td>+13.3%</td>
<td>16</td>
<td>81%</td>
</tr>
<tr>
<td>Cu DDP</td>
<td>Plant Tissue Uptake</td>
<td>+22.1%</td>
<td>5</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Yield Results

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>Measurement</th>
<th>Increase (% of ctrl)</th>
<th>Number of Trials</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn DDP</td>
<td>Yield</td>
<td>+3.6%</td>
<td>25</td>
<td>76%</td>
</tr>
<tr>
<td>Fe DDP</td>
<td>Yield</td>
<td>+2.8%</td>
<td>9</td>
<td>78%</td>
</tr>
<tr>
<td>Ca DDP</td>
<td>Yield</td>
<td>+2.0%</td>
<td>7</td>
<td>57%</td>
</tr>
</tbody>
</table>
Fertilizer Coating is One Component of a Season-Long Nutritional System

**Fall Fertilizer.**
WolfTrax™ Zn DDP® with EvenCoat® Technology is ideal for uniform micronutrient distribution throughout the field. Zinc plays an important role in protein synthesis, energy production and growth.

**Spring Fertilizer.**
WolfTrax Nu-Trax™ P+ drives early root growth to ensure maximum NPK uptake.

**Planting.**
Rocket Seeds™ PMZ Dry provides a unique combination of crop nutrition with the convenience of a seed flow aid. Positioning phosphorus, manganese and zinc with the seed makes them readily available during the beginning stage of crop growth to help get the corn off to a quick start.

Abundance Organic is a unique combination of three live species of bacteria to aid in nutrient absorption and stress mitigation. Apply in furrow.

**Early Vegetative.**
ProAcqua® Pulse applied at V3 – V5 has a proprietary combination of nickel, molybdenum and cobalt, along with some phosphorus, potassium, sulfur and zinc to aid nitrogen uptake.

**Tassel - R1.**
ProAcqua Flow applied at VT - R1 aids in transporting sugars for building carbohydrates in the developing ear.

---

**VEGETATIVE**

- NPK + Micros
- NPK + Micros
- Herbicide

**REPRODUCTIVE**

- Fungicide
Thank You

Any Questions?

Compass Minerals

Plant Nutrition