Soybean Inoculation
When to inoculate

- Acid or alkaline soils
- Very wet or very dry soils
- High soil temperatures
- Soils low in organic matter
- When soil analysis shows N deficiency
- When previous sowings have shown good nodulation but little evidence of nitrogen fixation
Functional Factors

• Survival and competition with existing strains and other microbes

• Association with the roots

• Nodule occupancy is the key
Functional Factors

• What effects nodule occupancy?
  – Who associates with the root
  – Who is capable of interacting
  – Rhizoplane competency - survival
Qualities of a good inoculant strain

- Nodulates and fixes N with all the varieties of legume for which it is recommended.
- Competes well with native rhizobia in the soil.
- Persistent over time in the soil.
- Tolerant of environmental conditions in the soil.
- Genetically stable.
- Grows well in simple and economic culture media.
Legume inoculants

USE:
• In southern Africa almost 100% of farmers grow legumes, but less than 15% have ever used inoculants (Karanja et al., 2000).
• In the USA only 10-15% of farmers inoculate, and very few reinoculate: in Brazil inoculant use in soybean now ~90%

VALUE
• “Most of the inoculant produced in the world today is of relatively poor quality” with “90% of all inoculant has no practical effect (Brockwell & Bottomley, 1995)
• Gomez et al (Argentina) found only five of 18 inoculants tested to be of good quality
How can you be sure the plant is fixing well?

- The plant is growing well and deep green in color
- It has 50 -300 nodules, mostly at the crown
- The nodules are large and of good weight
- In section, the nodules are pink or red in color
Why can inoculation fail

- Delay between inoculation and planting
- Inappropriate materials used as stickers
- The strain used is wrong for the legume inoculated
- The inoculant is old or dried out
- Soil conditions (temperature or pH) are poor
- Contact between rhizobia and pesticide or fertilizer
- High soil N levels
TerraMax

Inoculant for Soybeans

Contains two strains of *Bradyrhizobium*

Aids nodulation

Fixes nitrogen
TerraMax Soybean Inoculants

- TerraMax Dry – Seed Treatment
  - 40 unit – 5 pounds
  - 10 unit – 20 ounces

- TerraMax Liquid – Seed Treatment
  - 150 unit – 2.5 gallon
  - 50 unit – 106 fluid ounces

- TerraMax IF – In Furrow
  - 2.5 gallon
TerraMax Soybean Inoculants

• Maximize
  – High count / Low volume
  – Liquid seed treatment

• Organic formulations
TerraMax Inoculant Attributes

- 90 plus days survival on seed
- No sticky extender
- Water like consistency
TerraMax™ Liquid IF
Field Studies
TerraMax, Inc.
Nebraska Data 2001

Location

TerraMax had product tests conducted by a local farmer at this site in Geneva, Nebraska. This site was treated with TerraMax™ for inoculating soybeans.

Description

TerraMax™ was applied in furrow at planting.

Treatment –2001

Product: TerraMax™

Application rate: 12.8 ounces per acre

Soybean Yield

![Graph showing soybean yield comparison between Control and TerraMax™ Liquid IF treatments across three fields.](image)
Location

TerraMax had product tests conducted by a local farmer at this site in Geneva, Nebraska. This site was treated with TerraMax™ for inoculating soybeans.

Description

TerraMax™ was applied in furrow at planting.

Treatment – Summer 2000

Product: TerraMax™

Application rate: 12.8 ounces per acre
Location

TerraMax had product tests conducted by a local farmer at this site in Geneva Nebraska. This site was treated with TerraMax™ for inoculating soybeans. The seed was treated with 1% by weight with a dry formulation of TerraMax™.

Description

Variety NK-29-C9

Treatment – Summer 2003

Product: TerraMax™ Dry

Application rate: 1 percent by weight of seed planted
TerraMax™ Liquid IF  Field Studies
TerraMax, Inc.
Iowa Data 2001

Location

TerraMax had product tests conducted by a local farmer at these sites in Central Iowa. This site was treated with TerraMax™ for inoculating soybeans.

Description

TerraMax™ was applied in furrow at planting.

Treatment – 2001

Product: TerraMax™

Application rate: 12.8 ounces per acre

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Soybean Yield

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Field 1</th>
<th>Field 2</th>
<th>Field 3</th>
<th>Field 4</th>
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<tbody>
<tr>
<td>Control</td>
<td>46.7</td>
<td>48.6</td>
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<td>49.3</td>
<td>52.1</td>
<td>56.9</td>
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“Maximizing Earth’s Potential”
Location

TerraMax had product tests conducted by a local farmer at this site in Milligan, Nebraska. This site was treated with TerraMax™ Dry or Liquid for inoculating soybeans. The seed was treated with 1% by weight with a dry formulation and 12.8 ounces per acre of the liquid.

Description

Irrigated

Treatment – 2003

Product: TerraMax™

Application rate:

Dry - 1 percent by weight of seed planted
Liquid – 12.8 ounces per acre
TerraMax Nodulation

CellTech

TerraMax
# Field Summary Report

**Grower:** Brad Spinler  
**Farm:** Spinler Farm  
**Field:** MINSKE  
**Year:** 2008  
**Operation:** Grain Harvest  
**Product:** SOYBEANS  
**Operational Instance:** Harvest - 1

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Area (ac)</th>
<th>Average Moisture (%)</th>
<th>Estimated Weight (Wet) (lb)</th>
<th>Estimated Volume (Dry) (bu)</th>
<th>Average Yield (Dry) (bu/ac)</th>
<th>Actual Weight (Wet) (lb)</th>
<th>Error (%)</th>
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| Totals | 64.90 | 13.03 | 207,976 | 3,459.9 | 53.31 |

**Average**  
**Average**
TerraMax Liquid IF
Morristown, MN

2008 Soybean Inoculant

Bushels per Acre

Check: 60.74
TMI LIQ IF: 62.79