

International Conference on Enhanced-Efficiency Fertilizers

An IFA-New Ag International Event
23-24 March 2010
Hotel Hyatt Regency, Miami, FL, USA

A BIOLOGICALLY-BASED APPROACH FOR ENHANCED
FERTILIZER USE EFFICIENCY

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A Biologically-Based Approach for Enhanced Fertilizer Use Efficiency

IFA / New Ag International Conference on Enhanced Efficiency Fertilizers
Miami, FL, March 23 – 24, 2010

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Solutions for the Soil

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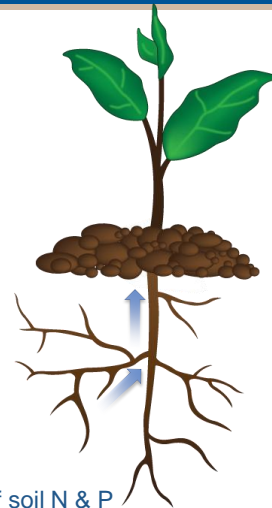
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Soil Factors Affect Fertilizer Efficiency



Soil Factors
Influence Nutrient
Uptake by Plants

- ✓ Structure
- ✓ Moisture
- ✓ Chemistry
- ✓ Organic Matter
- ✓ Microbiology
- ✓ Biochemistry



Enhanced Efficiency Fertilizers (EEF)

- Slow release fertilizers – physical control
- Stabilized fertilizers – chemical inhibition of soil N & P transformations
- **Biologically-based – microbiological & biochemical**

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Growing Support in the Research / Science Community



Examples of biologicals and fertilizer efficiency:

- Enhanced plant **nutrient use efficiency** with PGPR and AMF in an integrated nutrient management system
 - Adesemoye et al (2008) Can. J. Microbiol. 54:876-886.
- Fertilizer-dependent efficiency of Pseudomonads for improving growth, yield and **nutrient use efficiency** of wheat
 - Shaharoona et al Naveed (2008) Appl. Microbiol. Biotechnol. 79:147-155.
- Effectiveness of organic-/**bio-fertilizer supplemented with chemical fertilizers** for improving soil water retention, aggregate stability, growth and nutrient uptake of maize
 - Ahmad et al, (2008) Jour. Sust. Agric. 31(4):57-77.
- **Integrated nutrient management** for production, economics and soil improvement in winter vegetables.
 - Dass et al, (2008) Inter. J. Veg. Sci. 14(2):104-120.

“Integrated Nutrient Management” is a concept supported by USDA, FAO, International Food Policy Research Institute and many others

Tests Show Biologically-based EEF Efficacy



- Independent studies (field and greenhouse)
- Testing across diverse formulations:
 - *N and N-P-K blends*
 - *Co-applied, tank mixed and incorporated*
 - *Variety of crops, geographies and applications*
 - *Full and reduced fertility rates*
- What the data show:
 - *Consistent increases in nutrient uptake*
 - *Increase yield / plant mass*
 - *Reduced nutrient loss (especially N)*

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Plant Response to Fertilizer – A ‘Nutrient Priming Effect’

Fertilizer stimulates root growth

Untreated

Fertilizer + biological stimulates greater root growth

Treated

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A Priming Effect on Root Growth and Nutrient Uptake

Before Fertilizer Application

After Fertilizer Application

Root growth before fertilizer application – Biological only

Root growth after fertilizer application

Control **Treated**

Control **Treated**

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Root Improvement is Not Dependent on Crop or Soil Type

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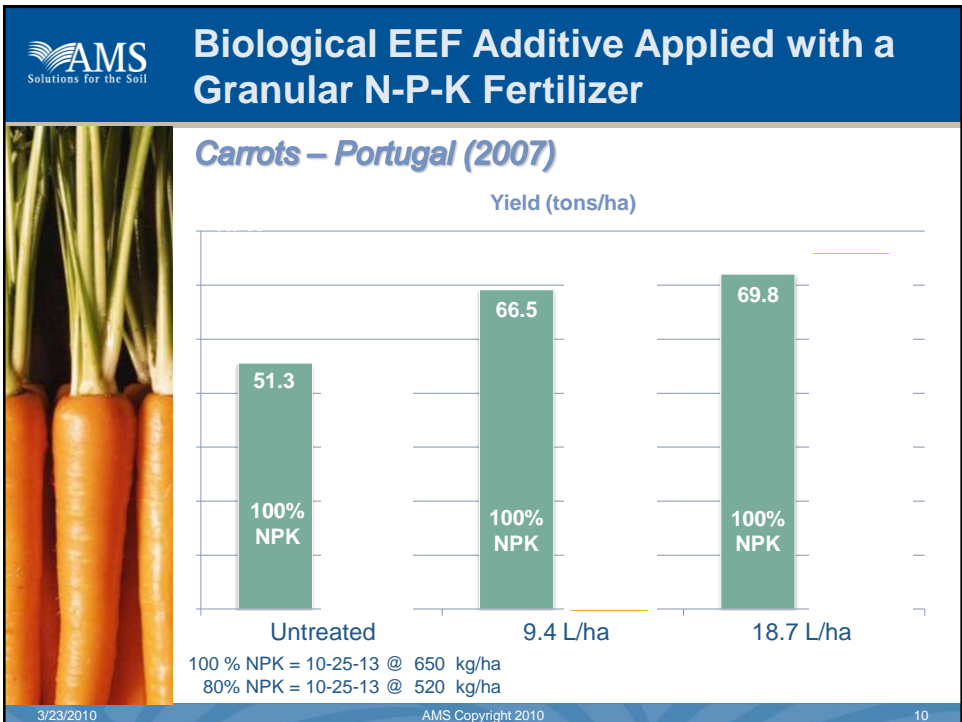
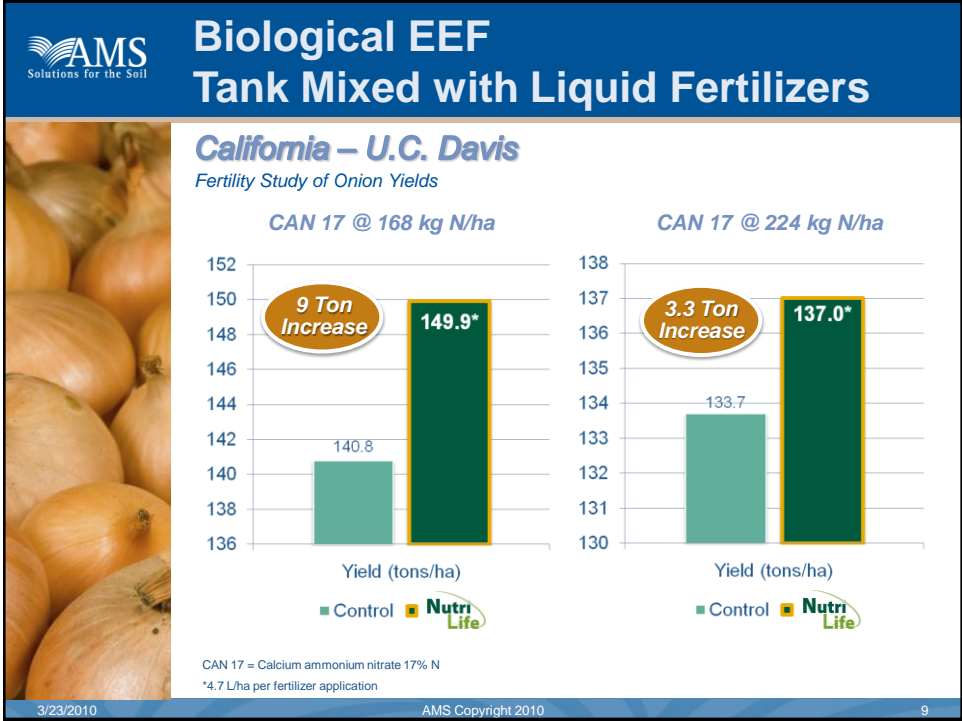
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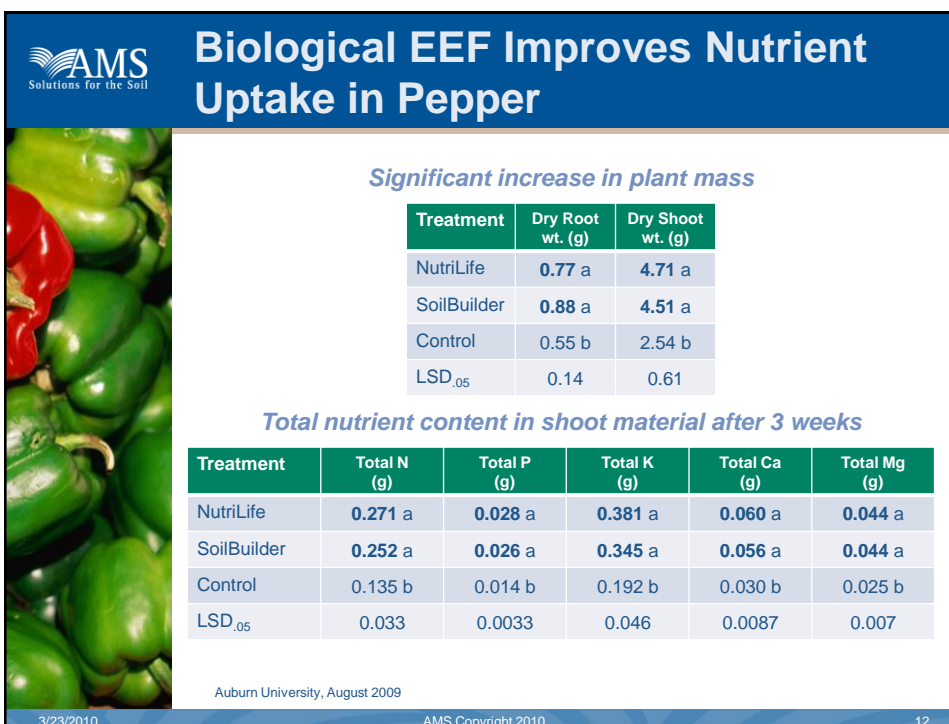
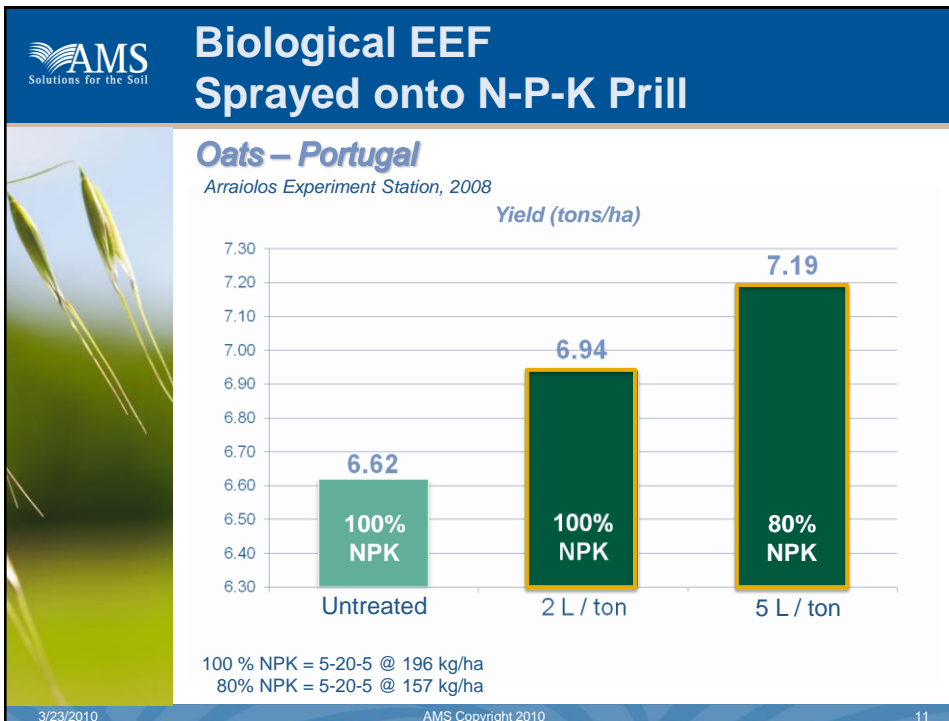
Biological EEF Applied to Soil at Planting

Auburn University, Broccoli Field Study (2004)

Days After Transplanting	SB @ 19 L/ha + 80% N (344 kg/ha)	SB @ 19 L/ha + 100% N (430 kg/ha)	100% N (430 kg/ha)	80% N (344 kg/ha)
18 Days	~320	~310	~200	~200
32 Days	~680	~600	~500	~480
46 Days	~830	~810	~550	~540

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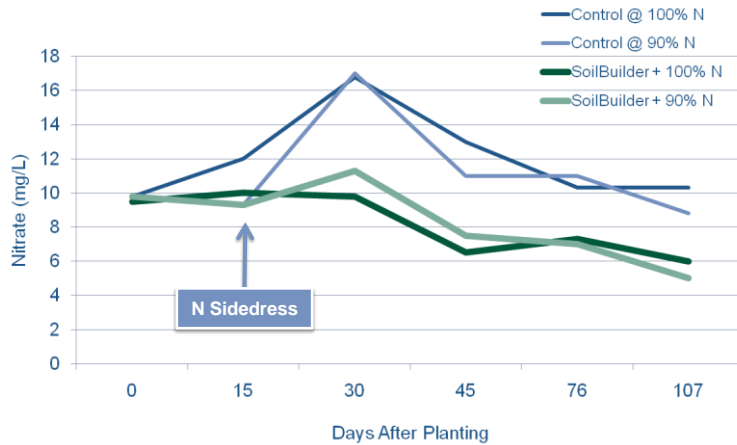




Reduced Leaching of Nitrates

Arise Research – Illinois

Field Corn Lysimeter Study, 2008



100% N = 207 kg N/ha, 90% N = 186 kg N/ha, SoilBuilder applied @ 9.4 L/ha with UAN-28 at seeding

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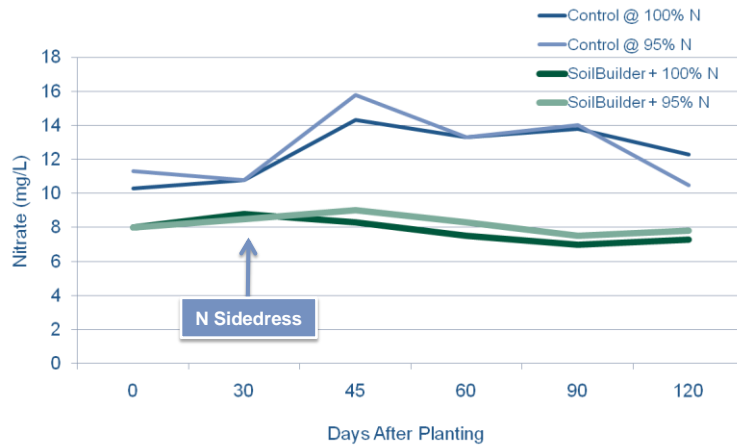
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Reduced Leaching of Nitrates

Arise Research – Illinois

Field Corn Lysimeter Study, 2009



100% N = 207 kg N/ha, 95% N = 197 kg N/ha, SoilBuilder applied @ 9.4 L/ha with UAN-28 at seeding

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Important Aspects of Biologically-Based EEF



- Unique Characteristics
 - No location effect (in US and elsewhere)
 - Not affected by soil type or crop species
 - Works with all fertilizer types (inorganic, organic, granular or liquid)
 - Many methods for application
- Major Benefits
 - Increased crop uptake of applied fertilizers
 - Reduced nutrient loss