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INNOVATIVE MICRONUTRIENTS

Feeding a Hungry World

An innovative approach to
Micronutrient Efficiency



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**Fertilizer Industry
Round Table**

Wolf Trax



- ◆ Micronutrient/plant health specialists
- ◆ Head office in Winnipeg, Manitoba, Canada
- ◆ Sales worldwide
 - ◆ DDP® Micronutrients
 - ◆ PROTINUS® Seed Nutrition





What are the fertilizer industry's responsibilities, opportunities and challenges in addressing the world's food crisis?

Our Responsibility...



To increase the quality and production of food in a:

- ◆ reliable,
- ◆ environmentally sound, and
- ◆ socially sustainable way

Our Role



*We improve plant health by developing innovative, **research-proven** plant nutrition technologies backed by professional technical support for the agriculture and horticulture industries.*

Importance of Micronutrients



- ◆ Small amount needed
- ◆ Vital for crop production (yield, disease resistance), quality, oil levels, protein, fibre content, seed quality, human health...





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**Micronutrient
deficiencies have been
well documented...**

Global boron deficiency



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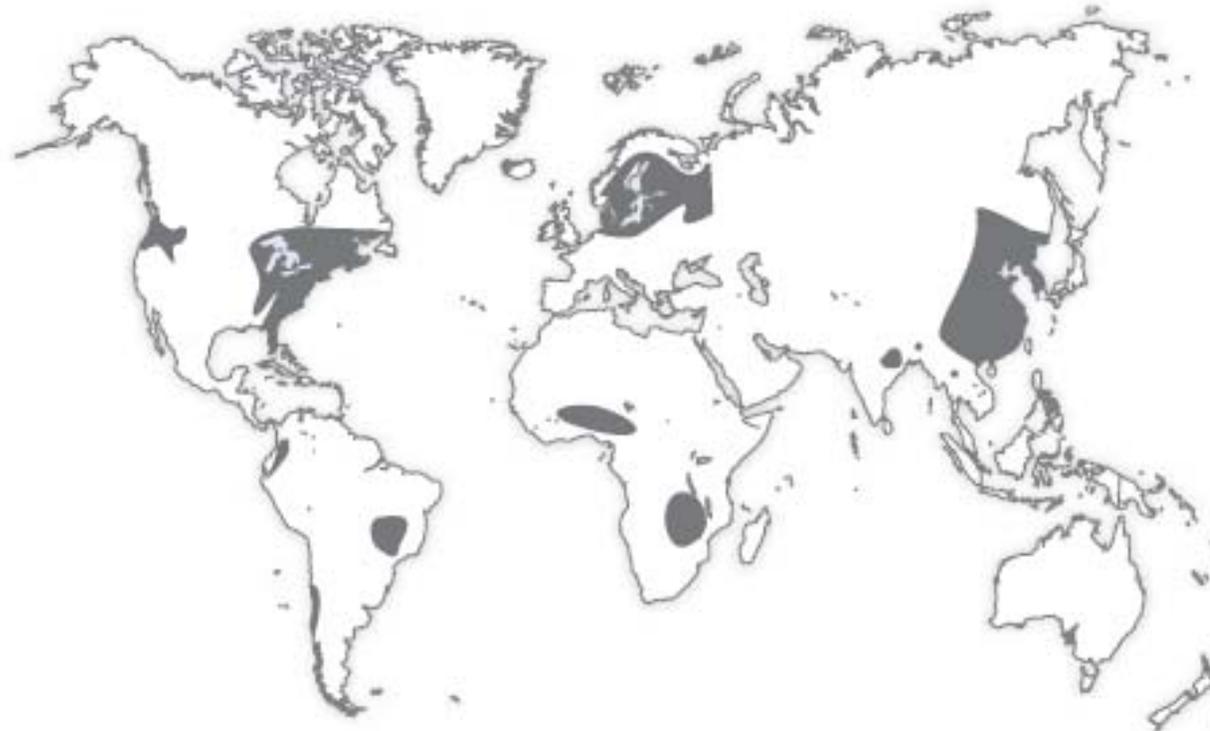


Figure 1.1. Global distribution of B deficiency (adapted from Shorrocks, 1997).

From: Micronutrients for
Sustainable Food,
Feed, Fibre and
Bioenergy
Production

Global zinc deficiency

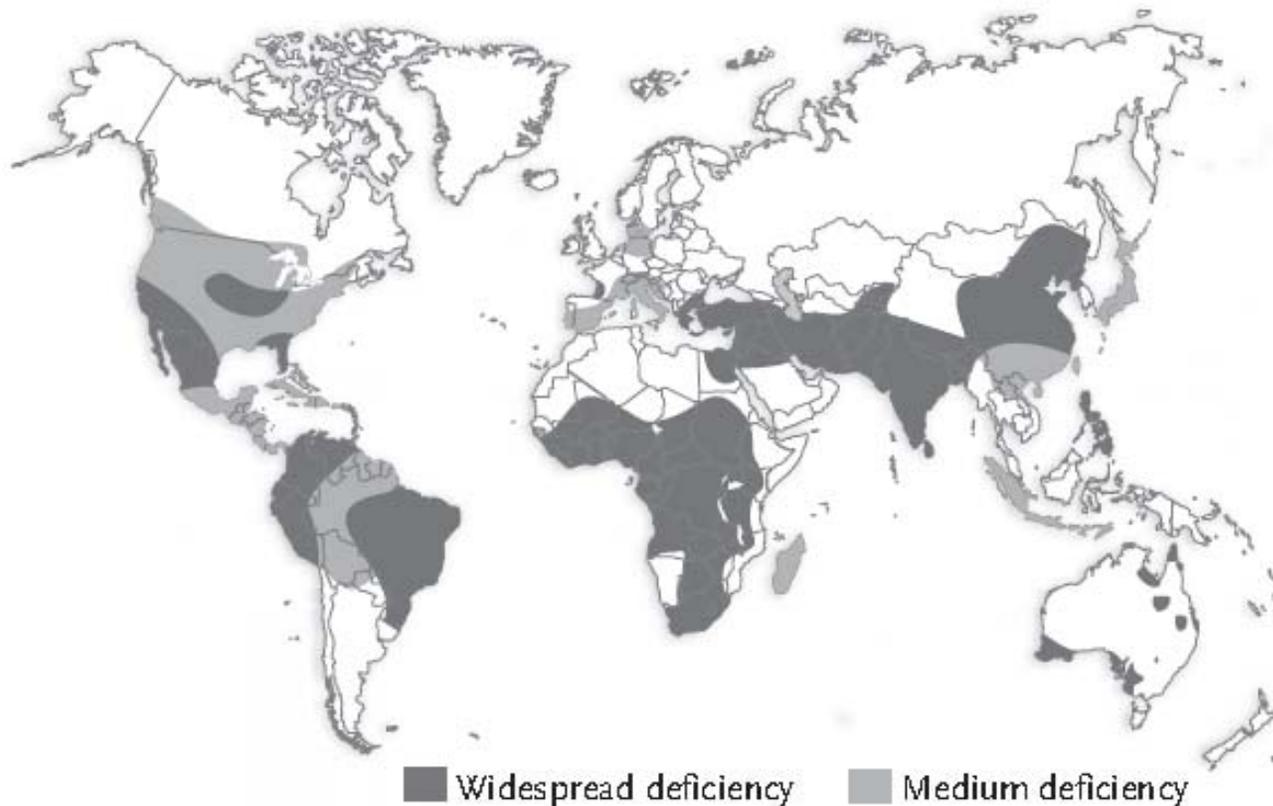


Figure 1.2. Zn deficiency in world crops: major areas of reported problems (adapted from Alloway, 2008a).

From: Micronutrients for Sustainable Food, Feed, Fibre and Bioenergy Production

But micronutrient needs are changing...



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- ◆ Changes in genotype
- ◆ Increases in yield output deplete natural micronutrient reserves





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“Lack of calories - hunger- is a headline-grabber...But the hidden hunger of micronutrient deficiencies harms even more people and inflicts lasting damage...”

The Economist, March, 2011



The answer is not just applying “more”



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- ◆ Inefficient or over-application
- ◆ Unsustainable practices
- ◆ High heavy metal
- ◆ Freight and storage

The answer is to apply “smarter”



4R NUTRIENT STEWARDSHIP SYSTEM
RIGHT SOURCE, RIGHT RATE,
RIGHT TIME, RIGHT PLACE



The Fertilizer Institute
Nourish, Replenish, Grow

THE FERTILIZER INDUSTRY ENDORSES BEST MANAGEMENT PRACTICES BASED ON THE USE OF THE
RIGHT SOURCE AT THE RIGHT RATE, RIGHT TIME AND RIGHT PLACE
to protect the environment & support the efficient
production of nutritious, abundant & affordable food.

Our Responsibility...



- ◆ To increase the quality and production of food in a reliable, environmentally sound and socially sustainable way

... through 'smarter' micronutrient technology

Not an easy job!



- Overall, very few technology advancements in fertilizer industry

Patent Applications	1996	1998	2000	2002	2004	2006
US Chemical	4200	3200	5000	5000	5100	5000
US Fertilizer	8	10	10	2	8	10

Patent applications of the U.S. Patent office, 1996 – 2006

Source: Eurostat, R&D Statistics, 2008

Wolf Trax Approach to Innovation



- ◆ Providing solutions to problems inherent in old technologies
- ◆ Learn from processes found in nature

Wolf Trax Innovations



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DDP[®] Micronutrients



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In a whole different ball park.



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Formulation

- ◆ Unique, **patented** formulation designed to enhance crop availability
- ◆ Chemically and physically formulated to do specific things



Flexible application options



Foliar application



Mixed with liquid fertilizer



Fertilizer Coating

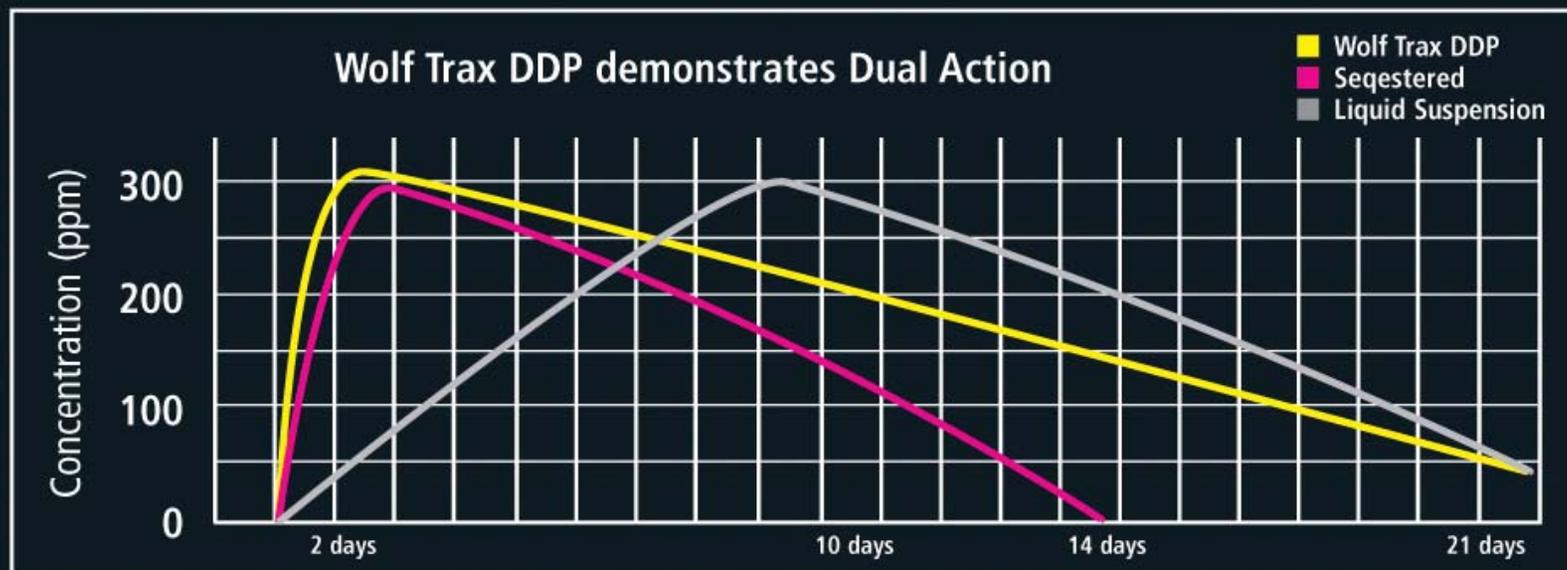
High quality Formulation



- ◆ High purity
- ◆ Low heavy metals



DUAL ACTION Formulation



Thanks to Wolf Trax proprietary Dual Action formulation, the crop has immediate and extended access to micronutrients.

Fertilizer coating technology



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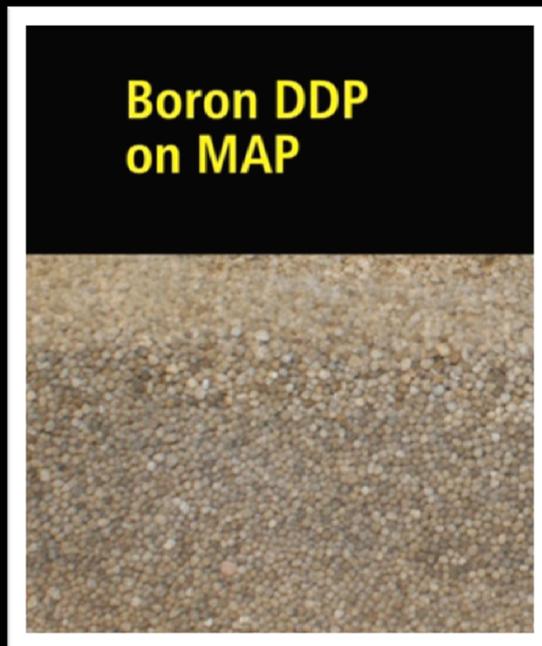
- ◆ Each and every fertilizer prill is coated



Fertilizer coating technology



- ◆ Do not fall out or segregate



Better distribution across the field



Fertilizer use *efficiency*



FORMULATION for enhanced availability

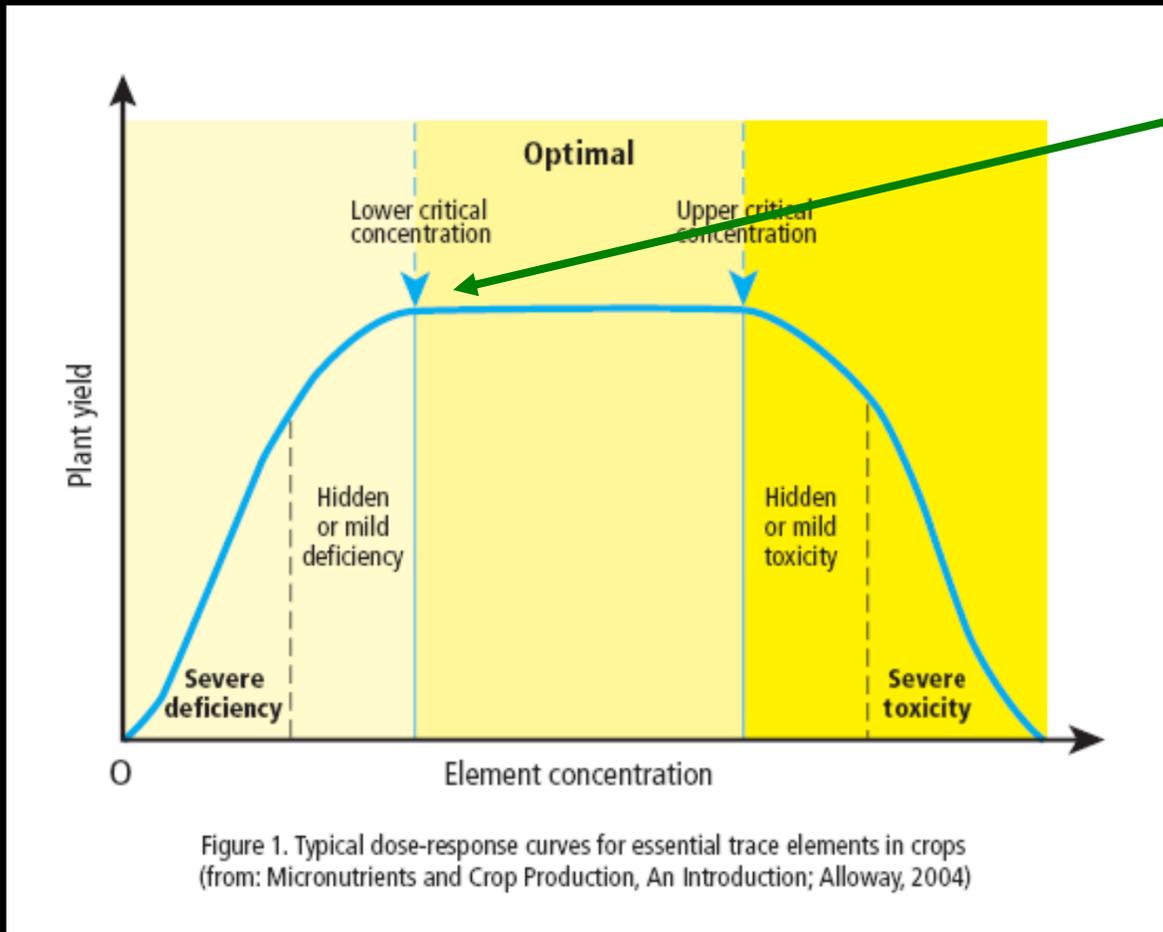
+

More precise DISTRIBUTION

=

Greater Fertilizer Use EFFICIENCY

Our job: Deliver the right amount of micronutrients to maximize yield potential



THIS is where enough is!

Zinc:

Corn = .45 lb/ac

Rice = 0.26 lb/ac

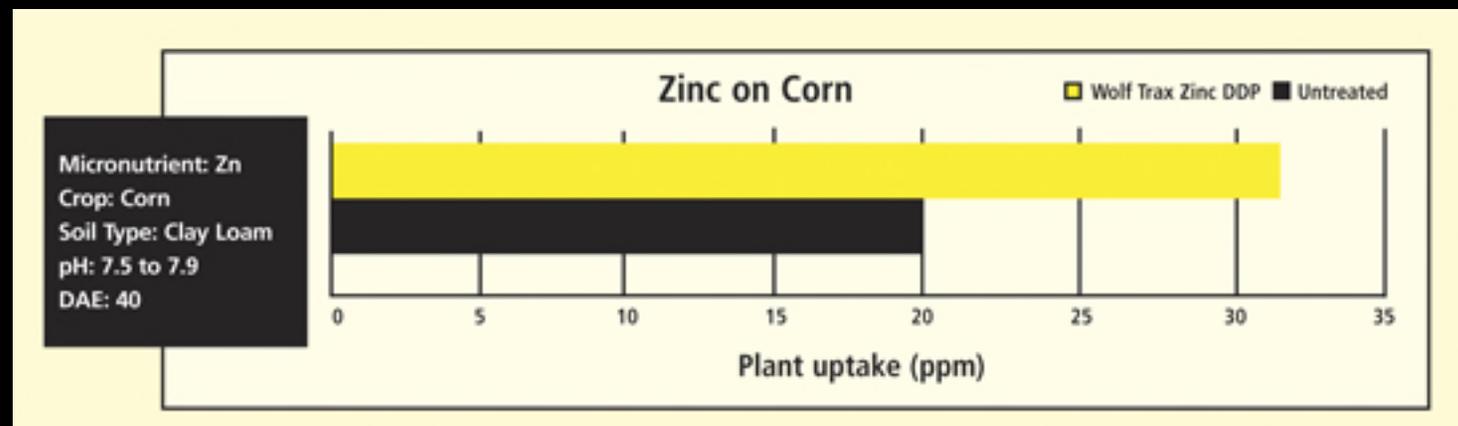
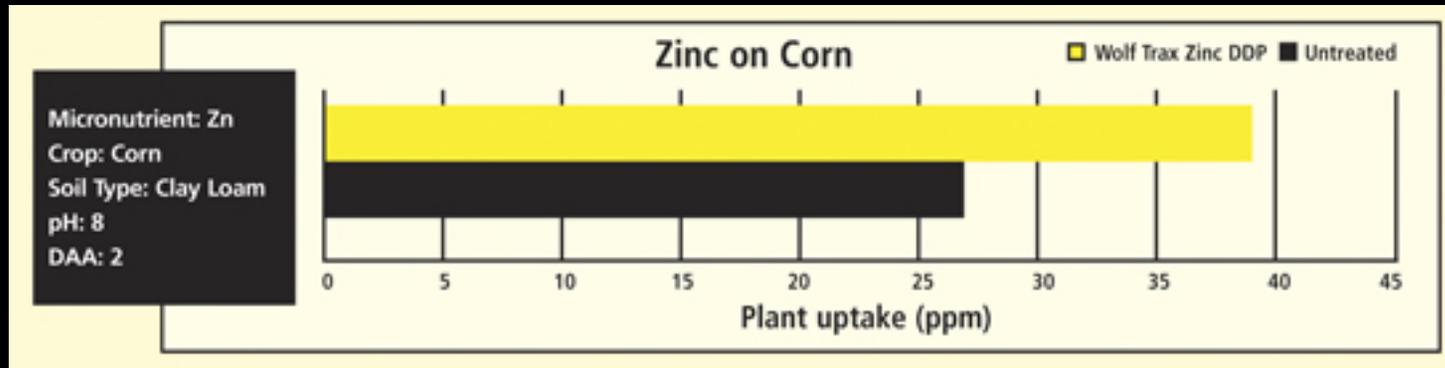
Apples = .08 lb/500 bu

Alfalfa = .42 lb/4 tons

Product Efficacy



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Dominican Republic



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With DDP Micronutrient



Control

Nebraska



Control

Zinc DDP

Denmark



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Manganese DDP

Control



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Fertilizer use *efficiency*

- Environmental stewardship
- Distribution efficiencies



DDP Technology



- ◆ Reliable performance
 - ◆ Early uptake
- ◆ Environmentally Sound-
 - ◆ High quality
 - ◆ Smaller environmental footprint
- ◆ Increased efficiency
 - ◆ Right Rate, Time, Place, Source

PROTINUS™

SEED NUTRITION



Proprietary plant nutrition
product applied directly
onto the seed

A logical next step in
seed-applied technology

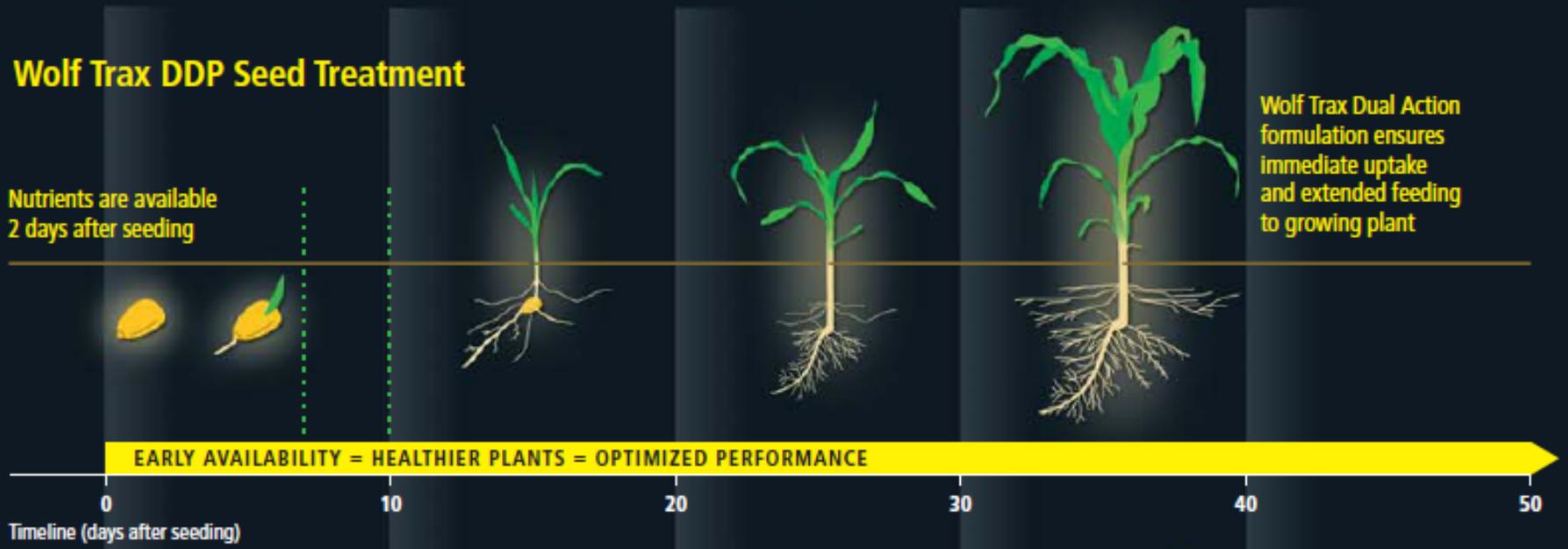
Early uptake of nutrients...



Critical growth stages occur within the first 38 days after seeding – avoid deficiencies and ensure a healthier plant by making micronutrients available to the plant as early as possible.

Wolf Trax DDP Seed Treatment

Nutrients are available
2 days after seeding



Earlier, more even emergence



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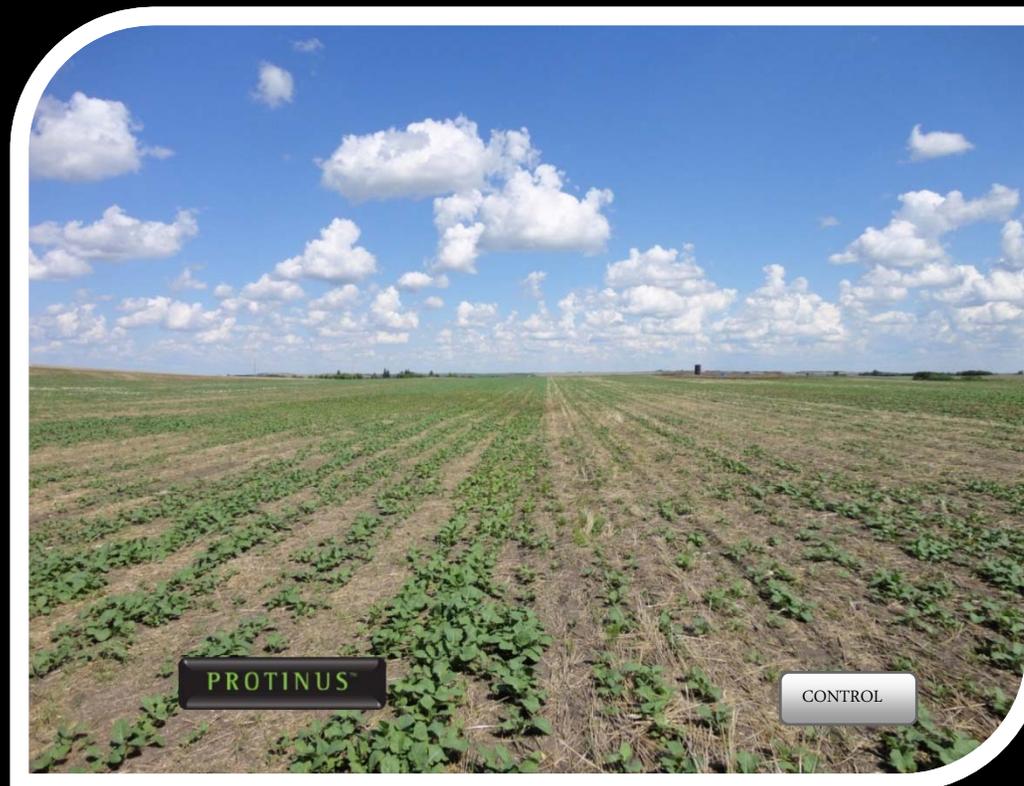
PROTINUS™

CHECK

Faster, more even emergence – oilseeds



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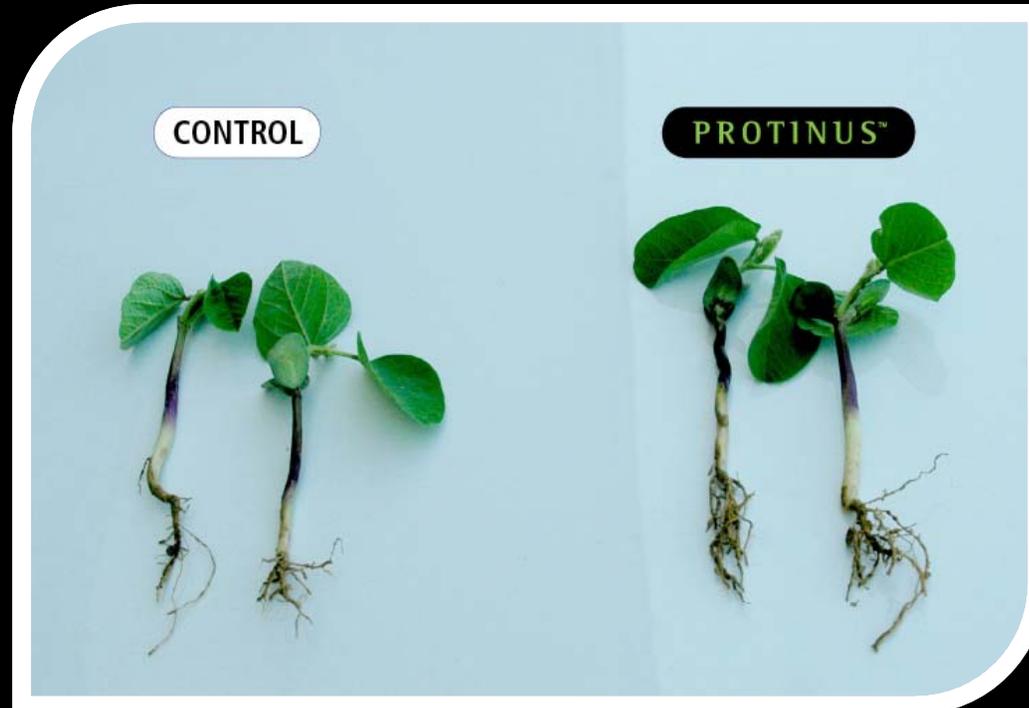
CONTROL

PROTINUS™

Larger, more vigorous seedlings



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Larger seedlings



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Larger Seedlings



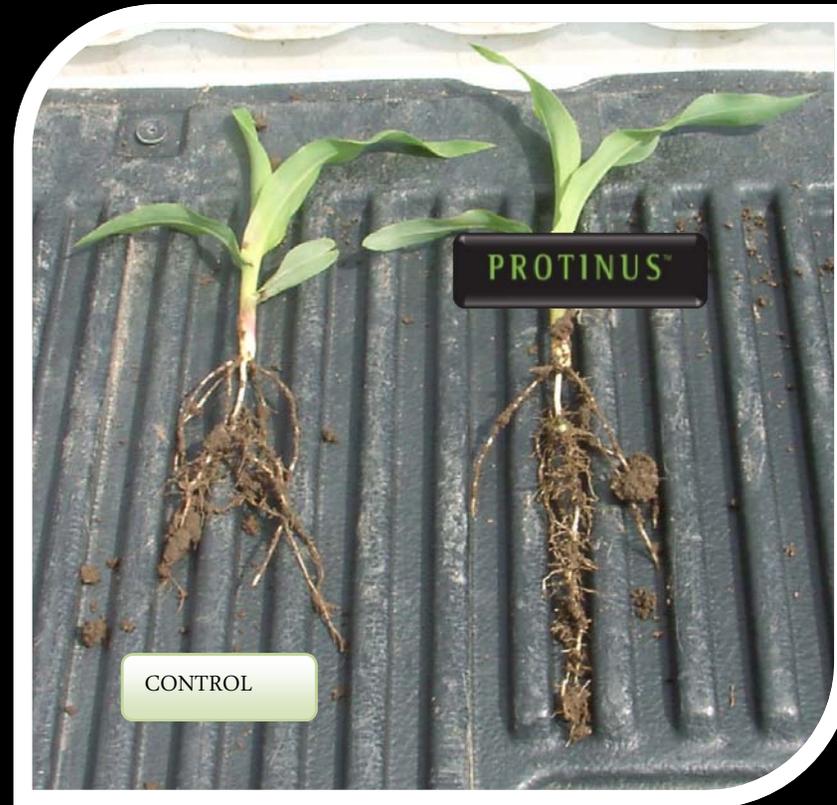
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Longer, more developed root systems



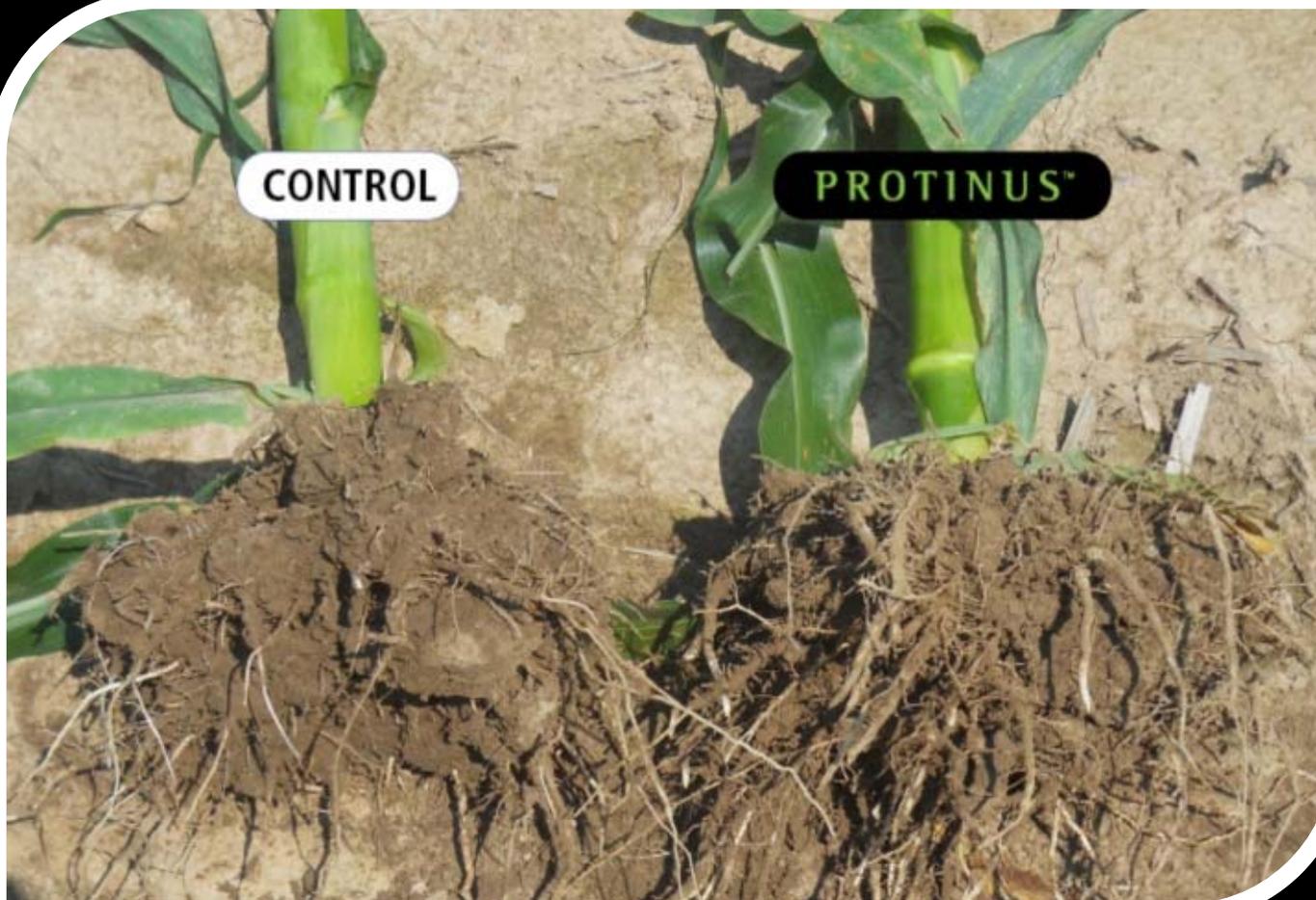
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Longer roots



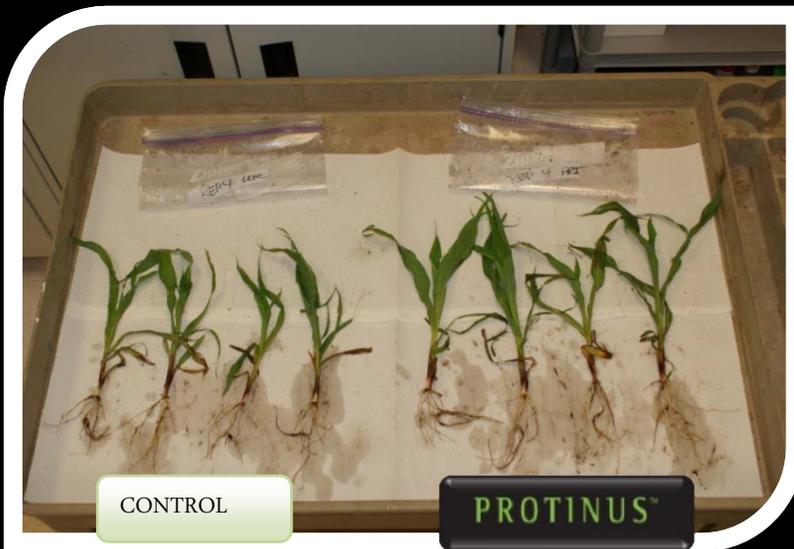
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Ability to withstand early season stress



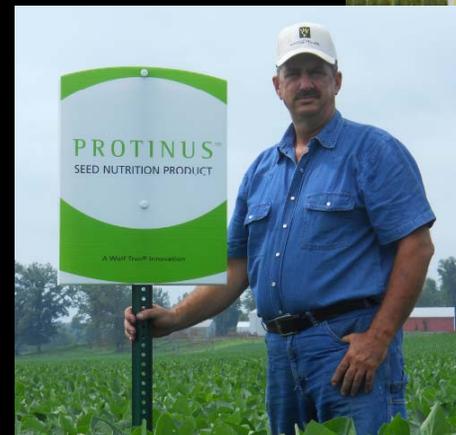
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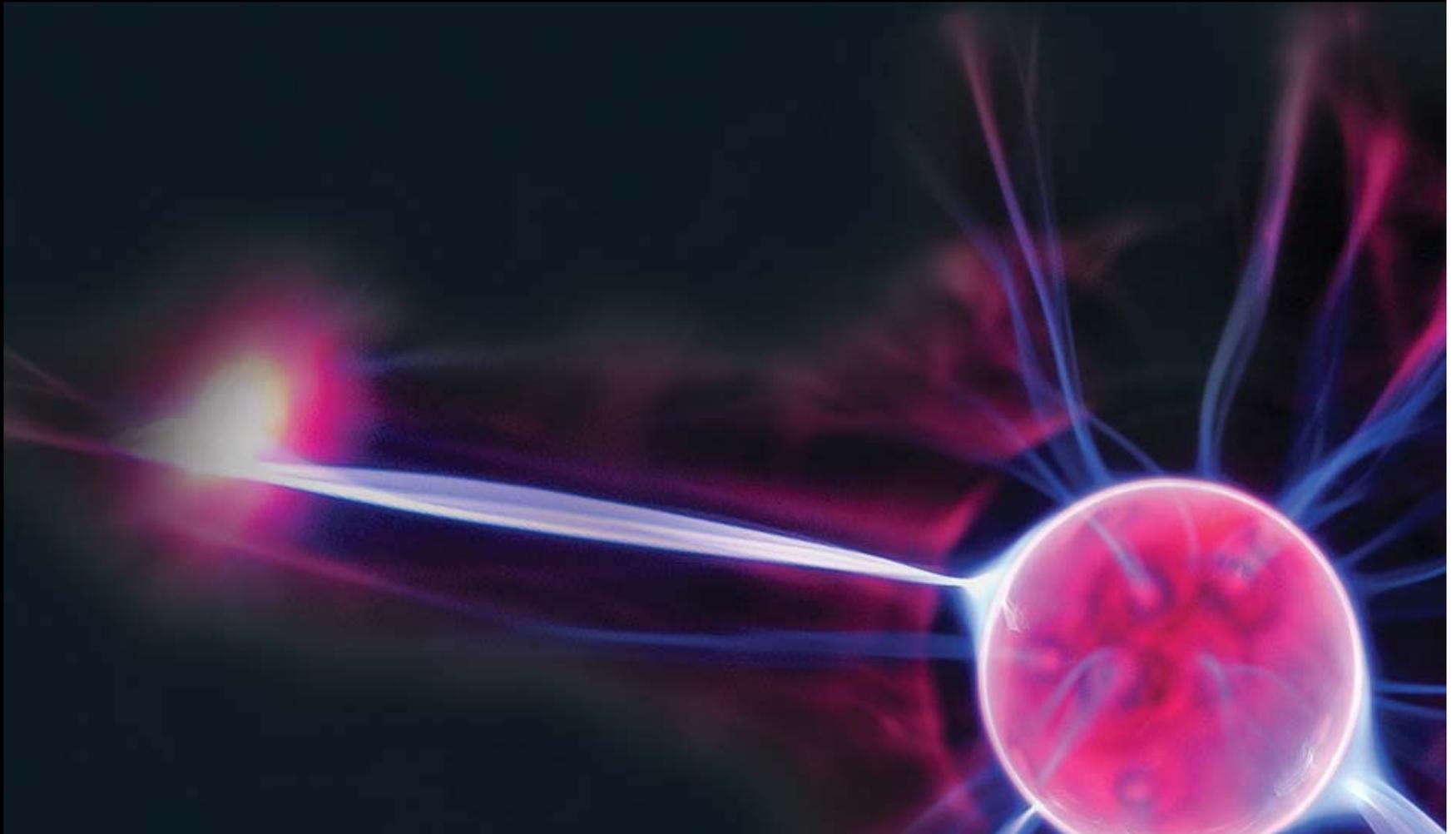
Our Responsibility...



- ✓ Increase the quality and production of food
- ✓ Reliable
- ✓ Environmentally sound
- ✓ Socially sustainable



Growing Forward with Wolf Trax



Thank you!



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www.wolftrax.com