Alpha Synectics Lab Development/Improvement 2015/16 Research Reports & Field Trials

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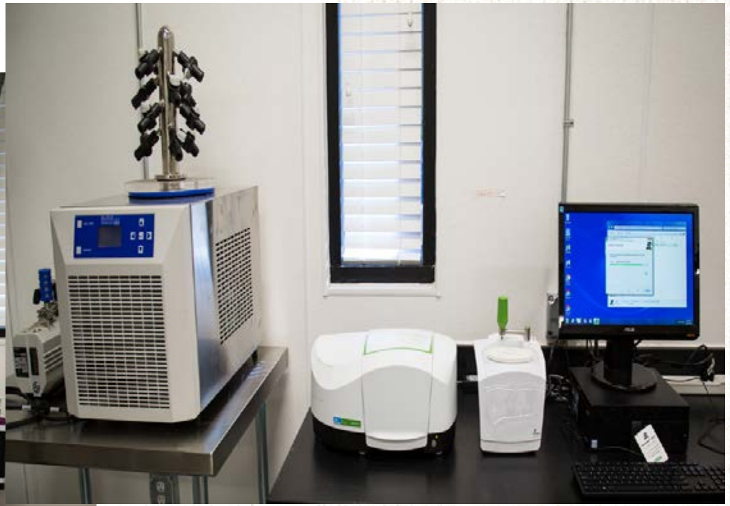
Sr. Director of R&D

Alpha: Number 1
Synectics: Problem Solving

We are trying to be #1 in Problem Solving!

HUMA GRO®

AlphaSynectics™ LABORATORIES



AlphaSynectics™ LABORATORIES

1 Quality Control & Verification

2 Product Improvement & Development

3 Carbon Extraction & Characterization

4 Bioassay & Microbial Studies

List of Development Products

- **Products improved:** D-Fend®, Activol®, Vitol®, Buffer K®, Boro-Max®, Iro-Max™, Promax®.
- **New products developed:** Nitr-O 5.5, AN-20, Calm+, 2-16-16™, Curiosity™, Breakfree™, Surf-Max®, Mag-i-cal, Blu-Max, Nickel, Pur Cal™, Micro-A Powder.
- **Products in development:** 8-20-4, Gaishi, Foliar Spreader Sticker, Non-Ionic Surfactant, Soil Penetrant.

Research Trials

Summary of 2015/16 Research & Field Trials

Research Trials:

1 – Super Phos® Efficacy on Spring Wheat

2 – Super Phos® Efficacy on Bermudagrass

3 – Vitol®, Breakout®, and Golden Pro™ Efficacy on Black Bean

4 – Proud 3® Efficacy on Alternaria Leaf Spot

5 – Promax® and Zap® Efficacy on Stunt Nematodes

6 – Sili-Max® for Limiting As Uptake

Field Trials:

1 – Efficacy Test of Huma Gro® Super Phos® on Corn

2 – Efficacy Test of Huma Gro® Breakout®, Vitol® and Crop-Gard® on Soybeans

1 – Evaluation of Micro Carbon Technology® Based Foliar Phosphorus Fertilizer for Improved Grain Yield and Quality of Spring Wheat

Olga Walsh, PhD, Montana State University

- Objective:

Compare the effectiveness of topdress and foliar application of **Super Phos®** (SP) with traditional P fertilizers – APP and DAP – for optimizing spring wheat grain yield and quality.

Materials and Methods

- Field with P = 12 ppm was cultivated with spring wheat (vr. Choteau) near Conrad, MT.

Table 1. Treatment Structure

Trt	N fertilizer				P fertilizer			
	Source*	Target Rate, lb N ac^{-1}	Time	Method	Source	Application Rate, lb P_2O_5 ac^{-1}	Time	Method
1	n/a	0	n/a	n/a	n/a	0	n/a	n/a
2	UAN	150	seeding	sidedress	n/a	0	n/a	n/a
3	SN	130	seeding	sidedress	SP	30	seeding	sidedress
	SN	20	tillering	foliar				
4	SN	130	seeding	sidedress	SP	15	tillering	foliar
	SN	20	tillering	foliar				
5	UAN	130	seeding	sidedress	APP	30	seeding	sidedress
	UAN	20	tillering	foliar				
6	UAN	130	seeding	sidedress	APP	15	tillering	foliar
	UAN	20	tillering	foliar				
7	UAN	130	seeding	sidedress	DAP	30	seeding	sidedress
	UAN	20	tillering	foliar				
8	UAN	130	seeding	sidedress	DAP	15	tillering	sidedress
	UAN	20	tillering	foliar				

* SN = Super Nitro®; UAN = UAN-32; SP = SuperPhos®; APP = ammonium polyphosphate; DAP = diammonium phosphate.

Results

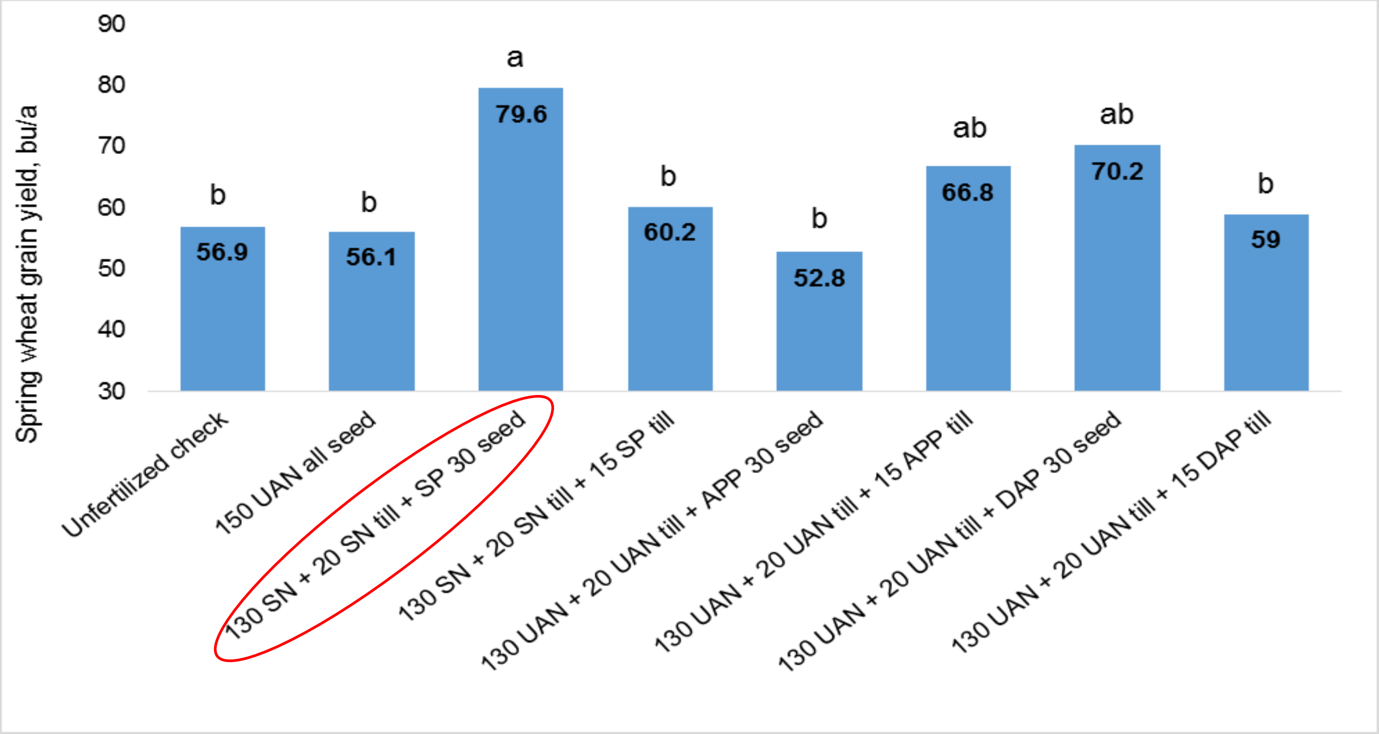


Figure 1. Spring wheat grain yield as affected by fertilizer rate, source, and time of application

Results (cont'd)

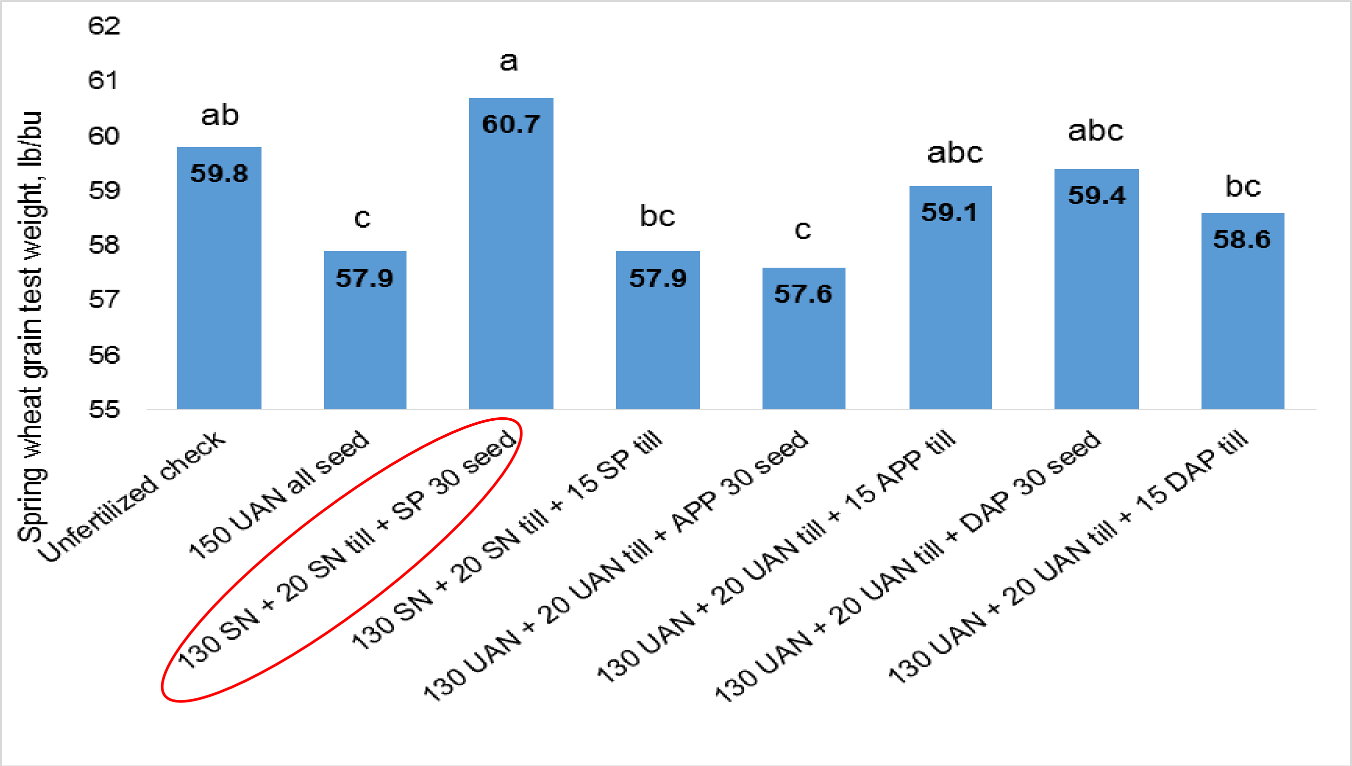


Figure 2. Spring wheat grain test weight as affected by fertilizer rate, source, and time of application

Results (cont'd)

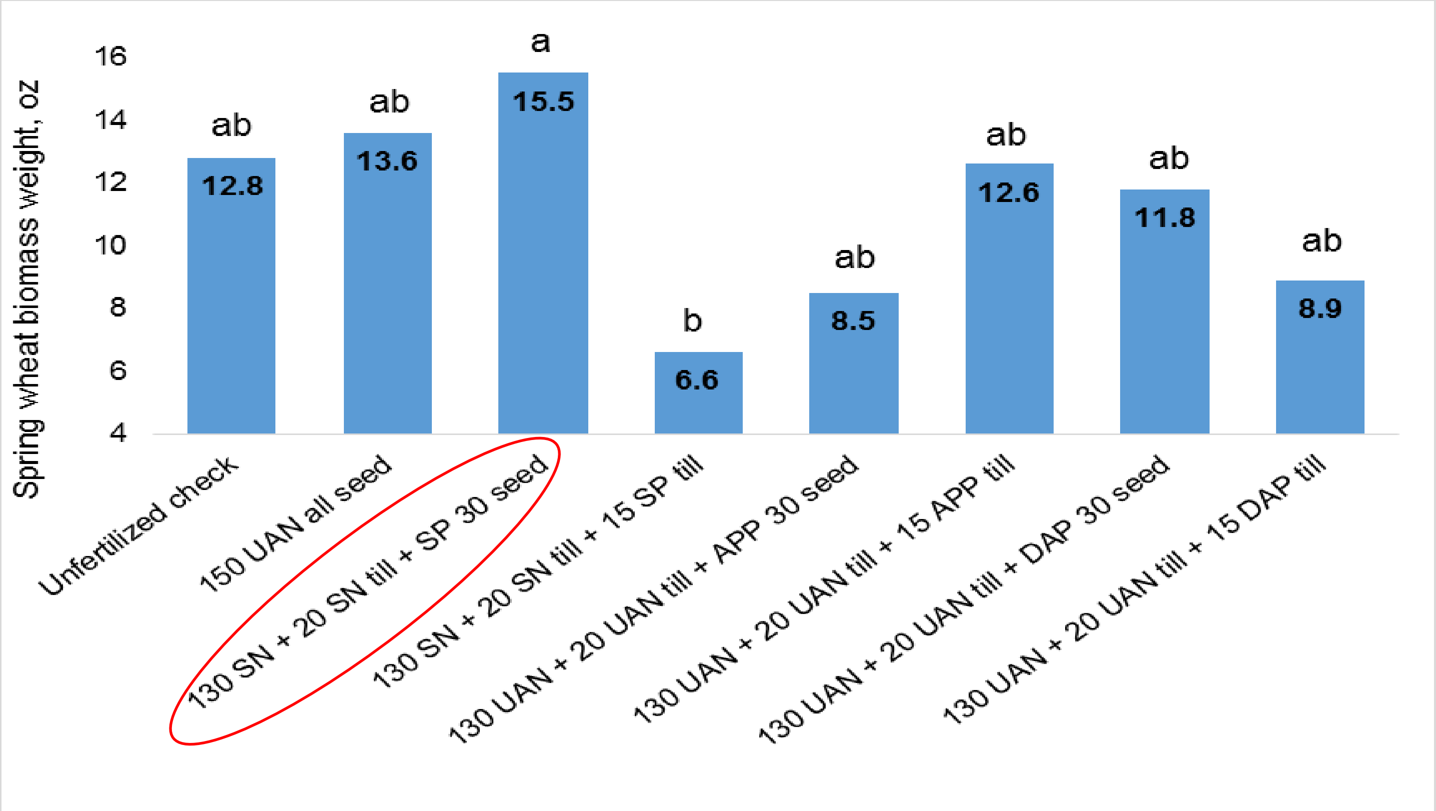


Figure 3. Spring wheat biomass weight as affected by fertilizer rate, source, and time of application

Conclusions

- The best-yielding treatment was treatment 3 (Huma Gro® **Super Nitro**® followed by 30 lb $P_2 0_5$/ac applied at seeding as **Super Phos®**).
- **Super Phos®** has performed very well for grain yields and grain test weights.
- This study also indicates that **Super Phos®** is less corrosive and less likely to cause damage to the seeds as a dribble and suggests that **Super Phos®** could be applied with the seed at a higher rate compared with other P sources.

2 – The Effect of Huma Gro® Turf Super Phos® on Bermuda Grass Shoot Biomass

Mohammad Pessarakli, PhD, University of Arizona

Objective:

The objective of this trial was to compare the effects of Huma Gro® Turf **Super Phos®** with competitive phosphorus fertilizers on the shoot biomass of Bermuda grass.

Materials and Methods

- The Bermuda grasses (Tifway) were grown in cups suspended over polyethylene tubs that are filled with half-strength Hoagland solution prepared without P or N and replaced with a fresh solution every other week.
- The treatments, replicated four times, consisted of the following fertilizers at two rates of P, 10% and 25%:

  (1) **Super Phos®** (SP) solution (0-50-0)

  (2) Ammonium polyphosphate (AP) solution (10-34-0)

  (3) Monoammonium phosphate granular (MAP) (11-52-0)

  (4) Triple superphosphate (TSP) granular (0-45-0)

  (5) Control

Figure 1. Greenhouse experimental setting

Results

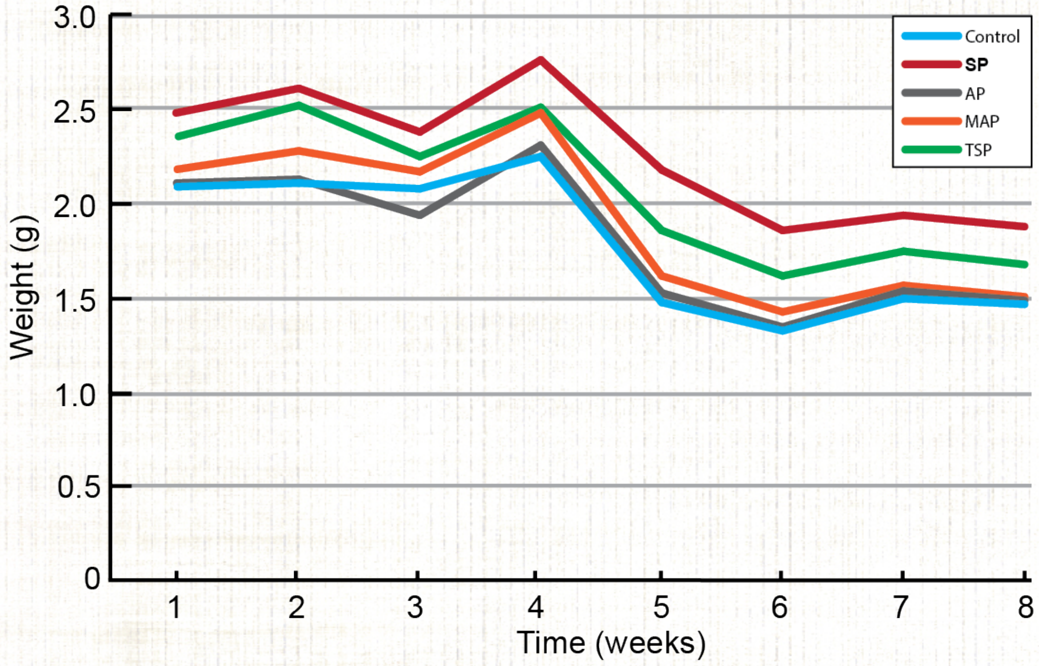


Figure 2. Bermuda Shoot Fresh Weight at 10% P

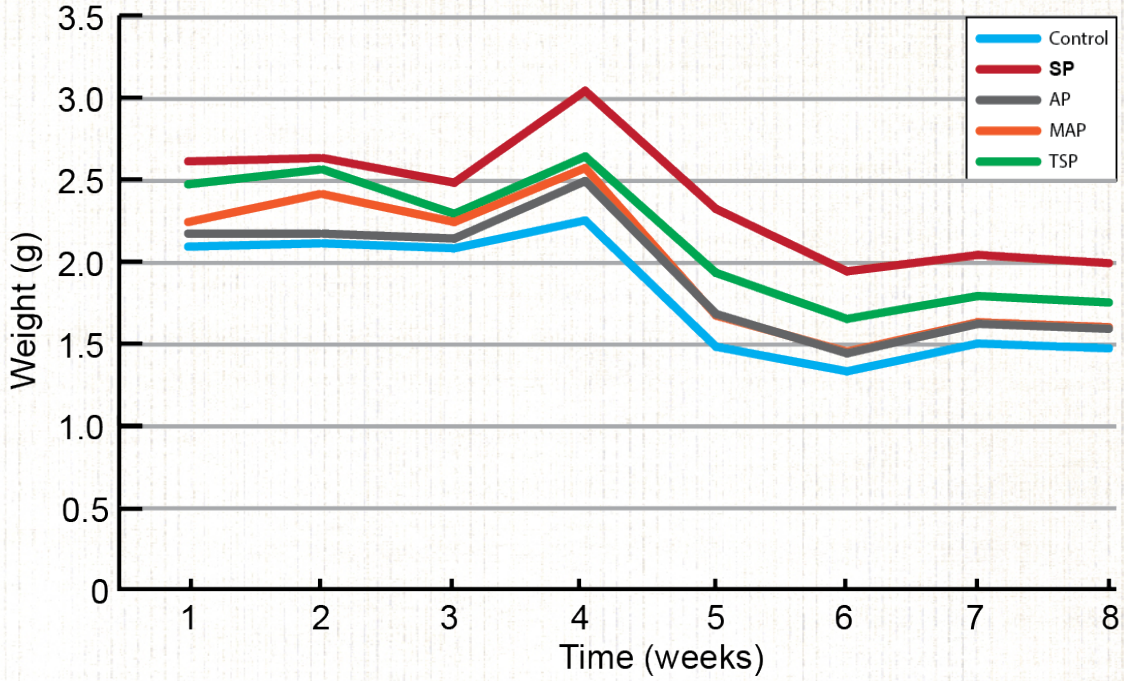


Figure 3. Bermuda Shoot Fresh Weight at 25% P

Results (cont'd)

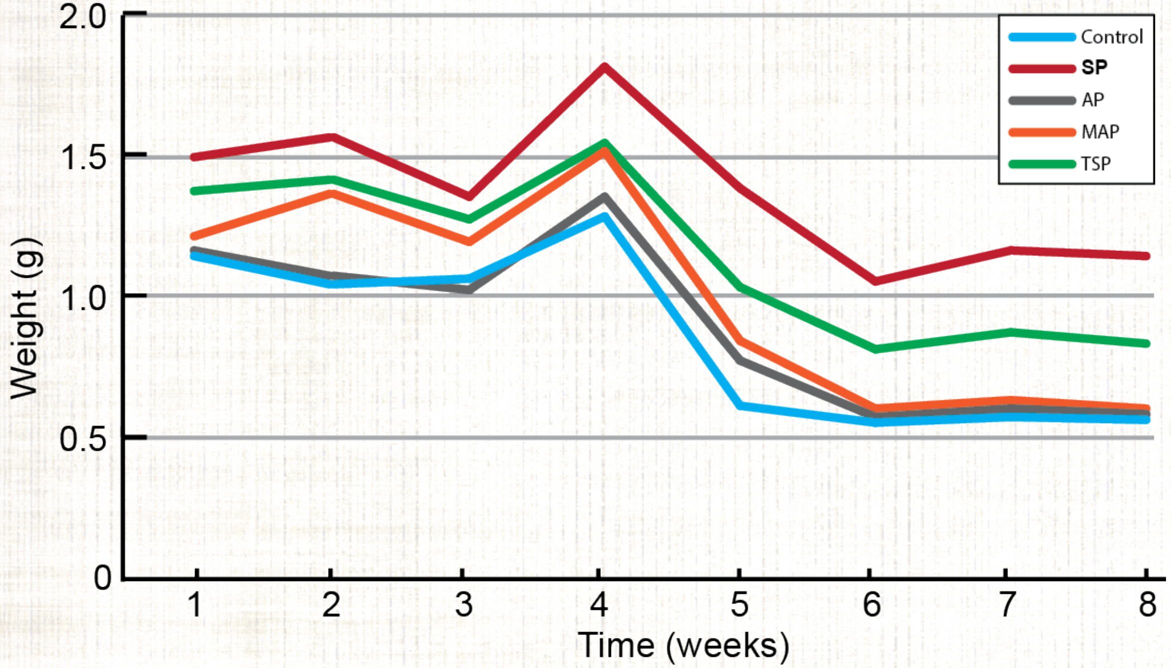


Figure 4. Bermuda Shoot Dry Weight at 10% P

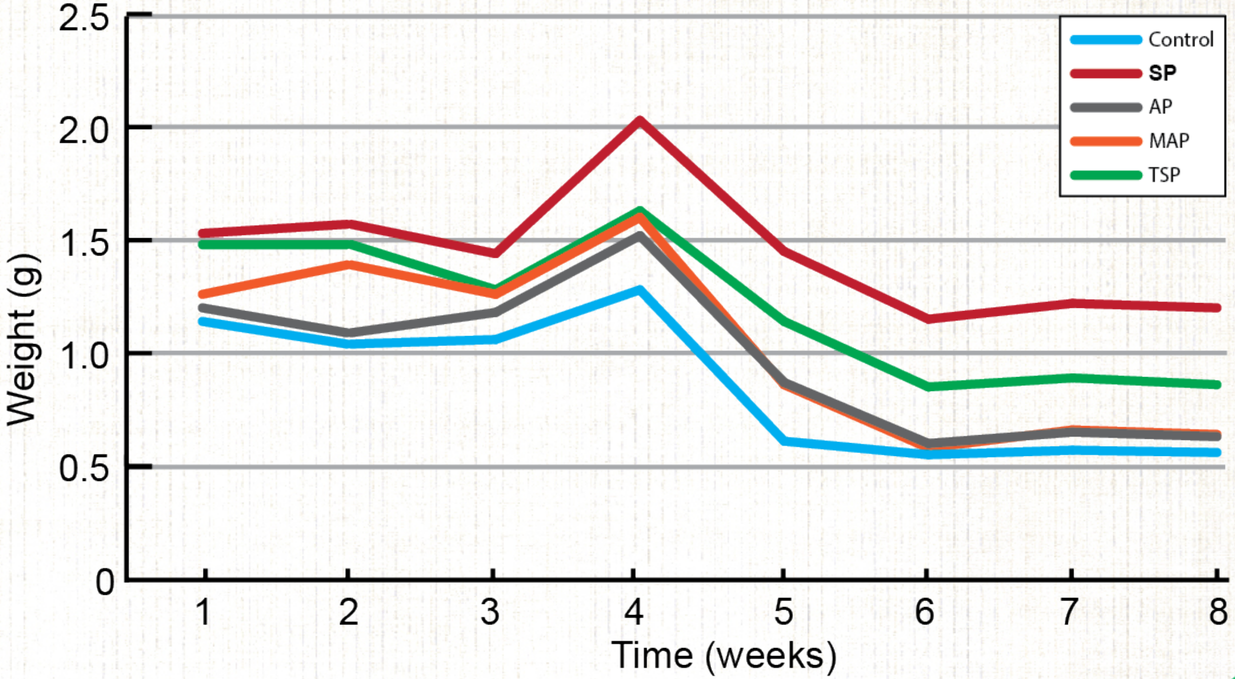


Figure 5. Bermuda Shoot Dry Weight at 25% P

Conclusions

- Huma Gro® Turf **Super Phos®** contributed to a higher Bermuda grass shoot biomass (dry + fresh) than the competitive products at the same reduced rate of applied P.
- The beneficial effect on shoot fresh and dry weights were classified as follows: SP > TSP > MAP > AP > control.

3 – Efficiency Test of Huma Gro® Vitol®, Breakout®, and Golden Pro™ on Black Bean

Jemmett Consulting and Research Farm, Parma, Idaho

Objective:

The objective of this study was to evaluate the effects of Huma Gro® Vitol®, Breakout®, and Golden Pro™ on black bean biomass, root length, and percent nodulation.

Materials and Methods

- Plots planted in Idaho with the black bean Zenith.
- RCBD with 4 replicates per treatment and a non-treated control.

Table 1. Huma Gro® Products

Program #	Products	Rate (qt/ac)	Application Method	Application Placement
1	Vitol®	1	Spray	Foliar Broadcast
2	Breakout®	2	Spray	Foliar Broadcast
3	Vitol® Breakout® Golden Pro™	1 2 1	Spray Spray Spray	Foliar Broadcast Foliar Broadcast Foliar Broadcast

Results

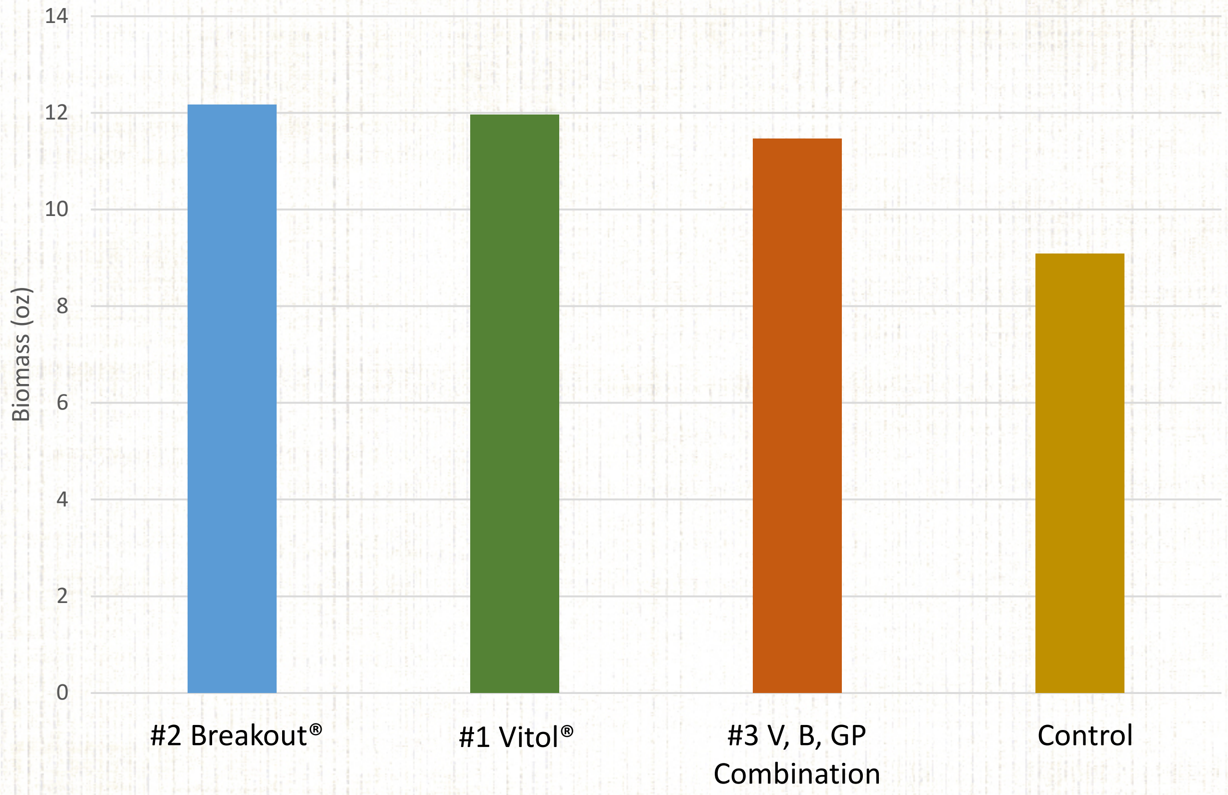


Figure 1. Product Effect on Biomass

Results (cont'd)

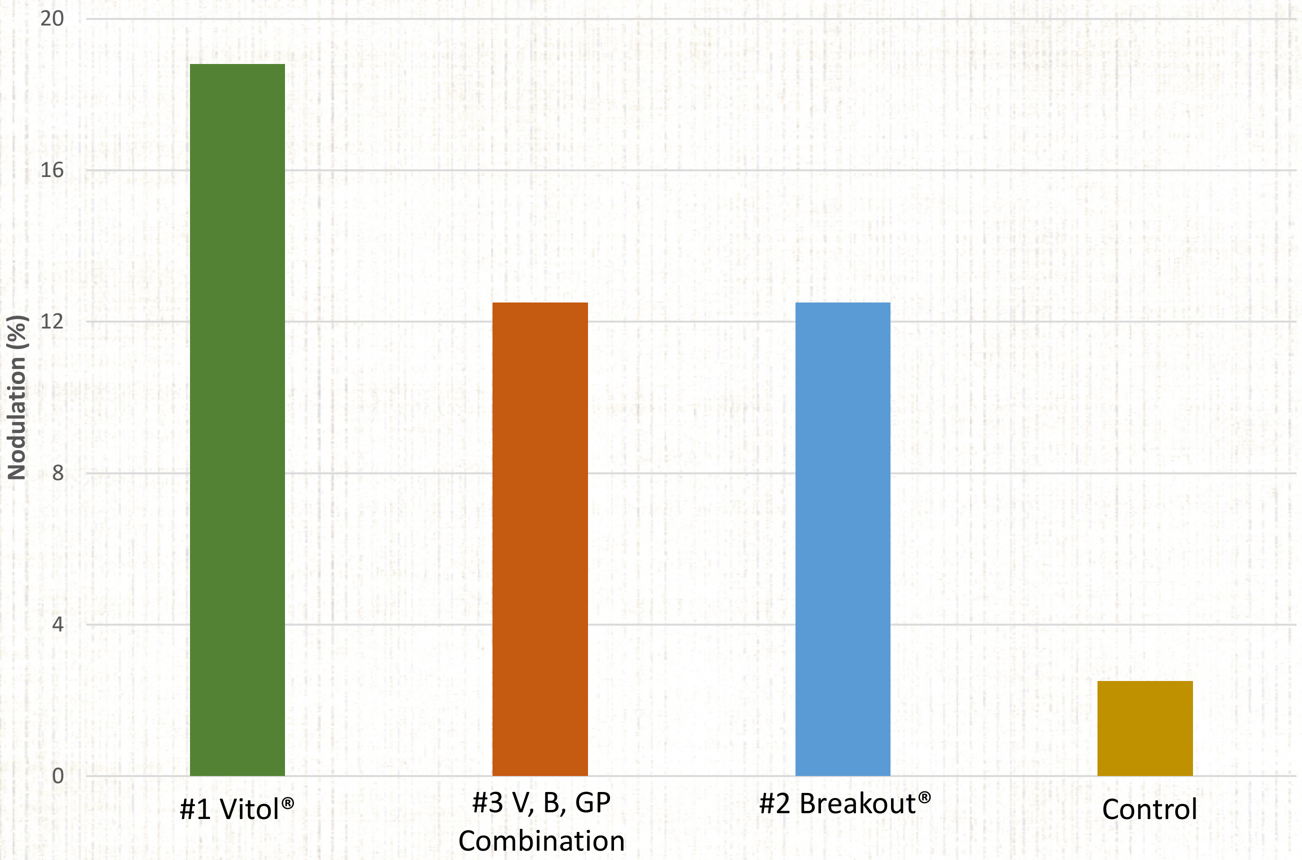


Figure 2. Product Effect on Nodulation

Results (cont'd)

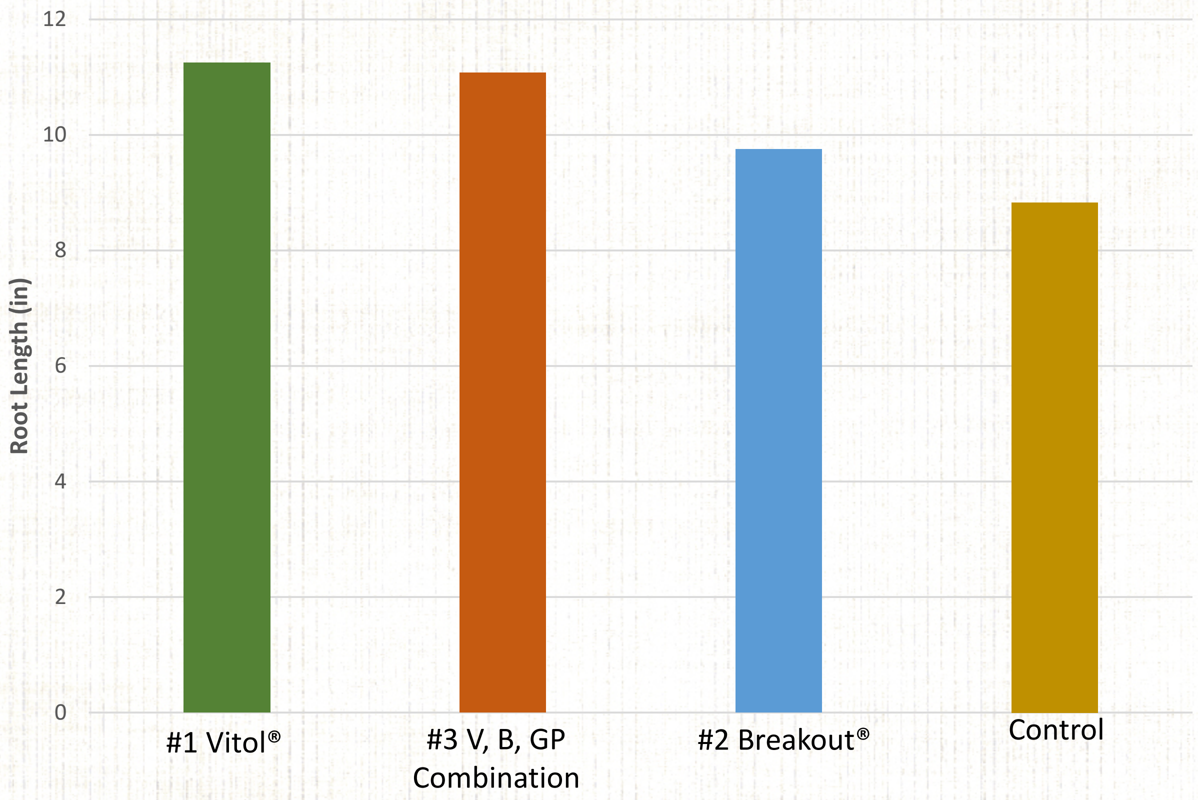


Figure 3. Product Effect on Root Length

Conclusions

- The three programs of Huma Gro® products (Vitol®, Breakout®, Vitol®/Breakout®/Golden Pro™) had higher effectiveness than the control for bean biomass (fresh), root length, and root nodulation.

- Vitol® alone was the highest contributor to root nodulation.

4 – Efficacy of Huma Gro® Proud 3® on Alternaria Leaf Spot

William Kirk, PhD, Michigan State University

Objective:

This study aimed to assess the efficacy of Huma Gro® **Proud 3®** on Alternaria leaf spot infecting the ornamental plant Rudbeckia (*Rudbeckia fulgida* cv. Goldstrum).

Materials and Methods

- Transplants of Rudbeckia were planted at the Horticultural Research Farm, MSU.
- Plants were treated with **Proud 3®** at a rate of 1 gal/100 gal applied weekly.
- The treatments (**Proud 3®** and control) were replicated four times and each plot consisted of 10 plants for a total of 40 plants.
- The percentage of the Alternaria leaf spot disease was recorded after transplanting the plant.

Results

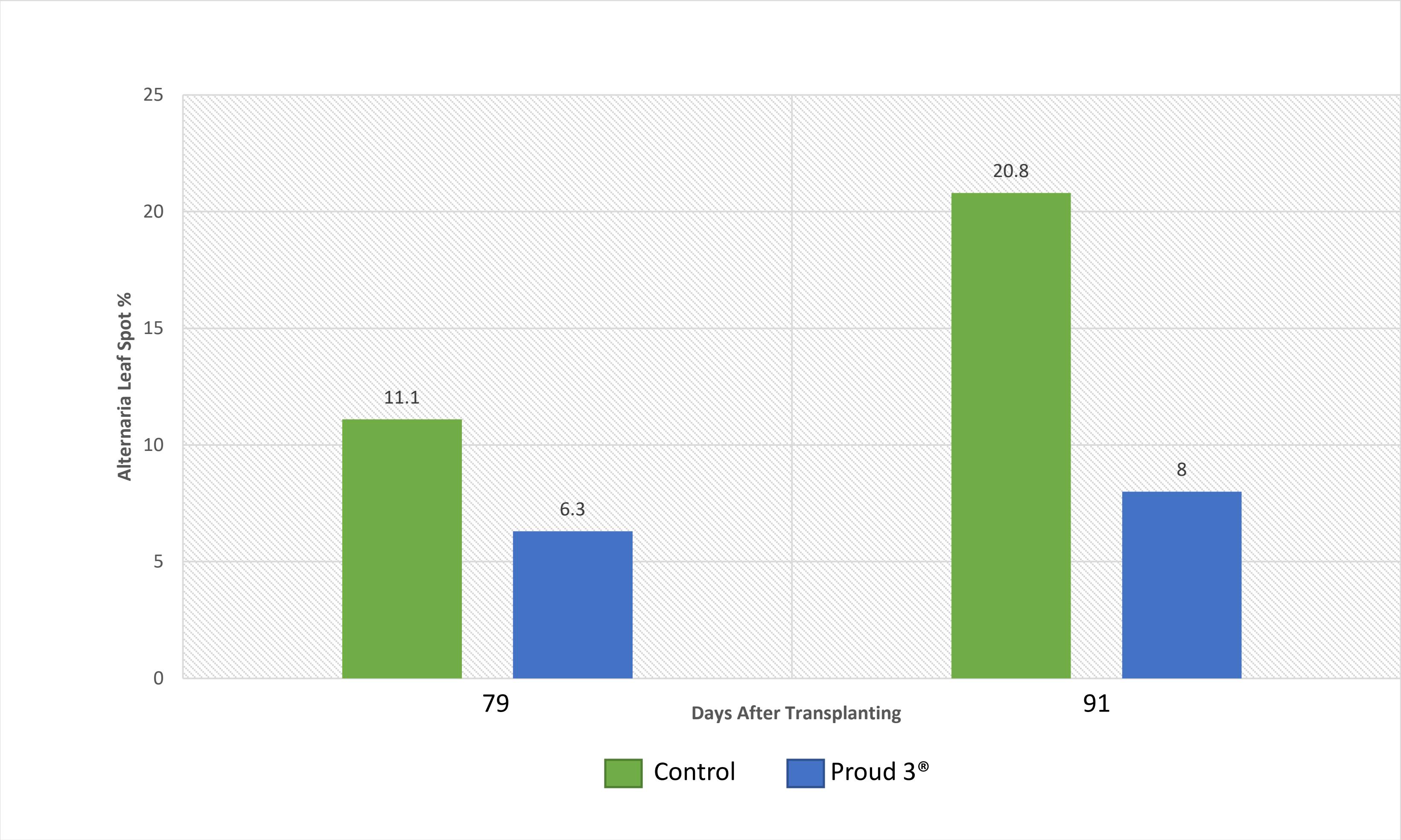


Figure 1. Alternaria leaf spot percentage

Conclusions

- Plants treated with the Huma Gro® **Proud 3®** had significantly less Alternaria leaf spot than the untreated control.
- Huma Gro® Proud 3® controlled Alternaria over time.

5 – Evaluation of Promax® and Zap® on Stunt Nematodes in Turf

Robert Wick, PhD, University of Massachusetts

Objective:

This study aims to assess the efficacy of Huma Gro® Turf **Promax**® followed by **Zap**® to control stunt nematodes (*Tylenchorhynchus*) on turf.

Materials and Methods

- The golf green was located in Westfield Massachusetts and had a history of moderately high populations of stunt nematodes.
- **Promax**® was applied five times with six replicates.
- Dates of application: May 21, June 2, June 17, June 20, and July 7.
- Each plot received the equivalent of two-gallons/acre **Promax**® (and later, **Zap**®).

Results

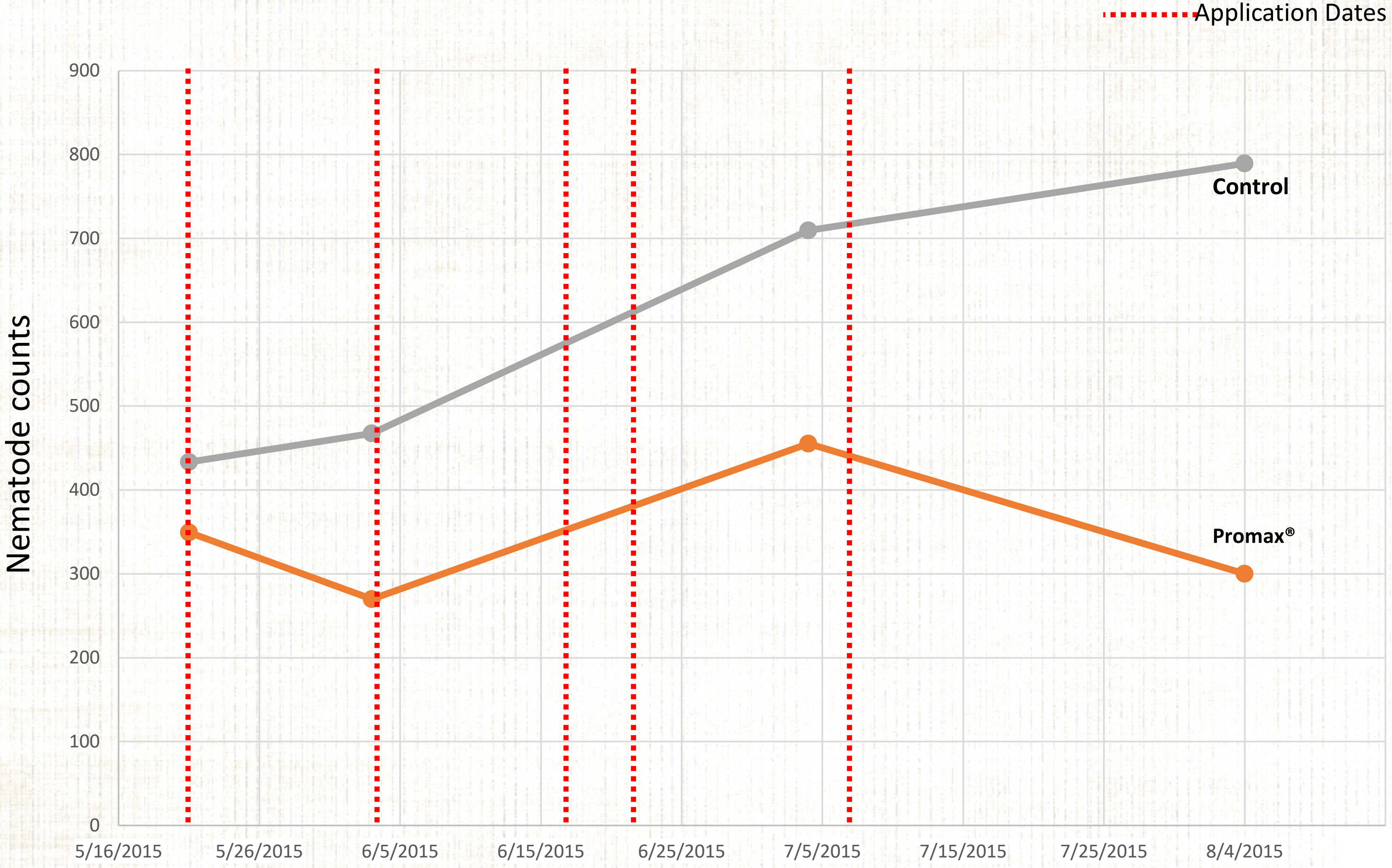


Figure 1. The effect of Promax® on stunt nematodes

Conclusions

- Huma Gro® Turf **Promax®** followed by **Zap®** significantly controlled stunt nematodes (*Tylenchorhynchus*) on turf.

6 – Use of Huma Gro® Sili-Max® for Limiting Arsenic Uptake by Rice Plants

Luisella Celi, PhD, University of Torino, Italy

Objective:

This research aimed at comparing the performance of Huma Gro® **Sili-Max®** (10% Si) to other Si-containing sources in limiting As uptake in rice.

Materials and Methods

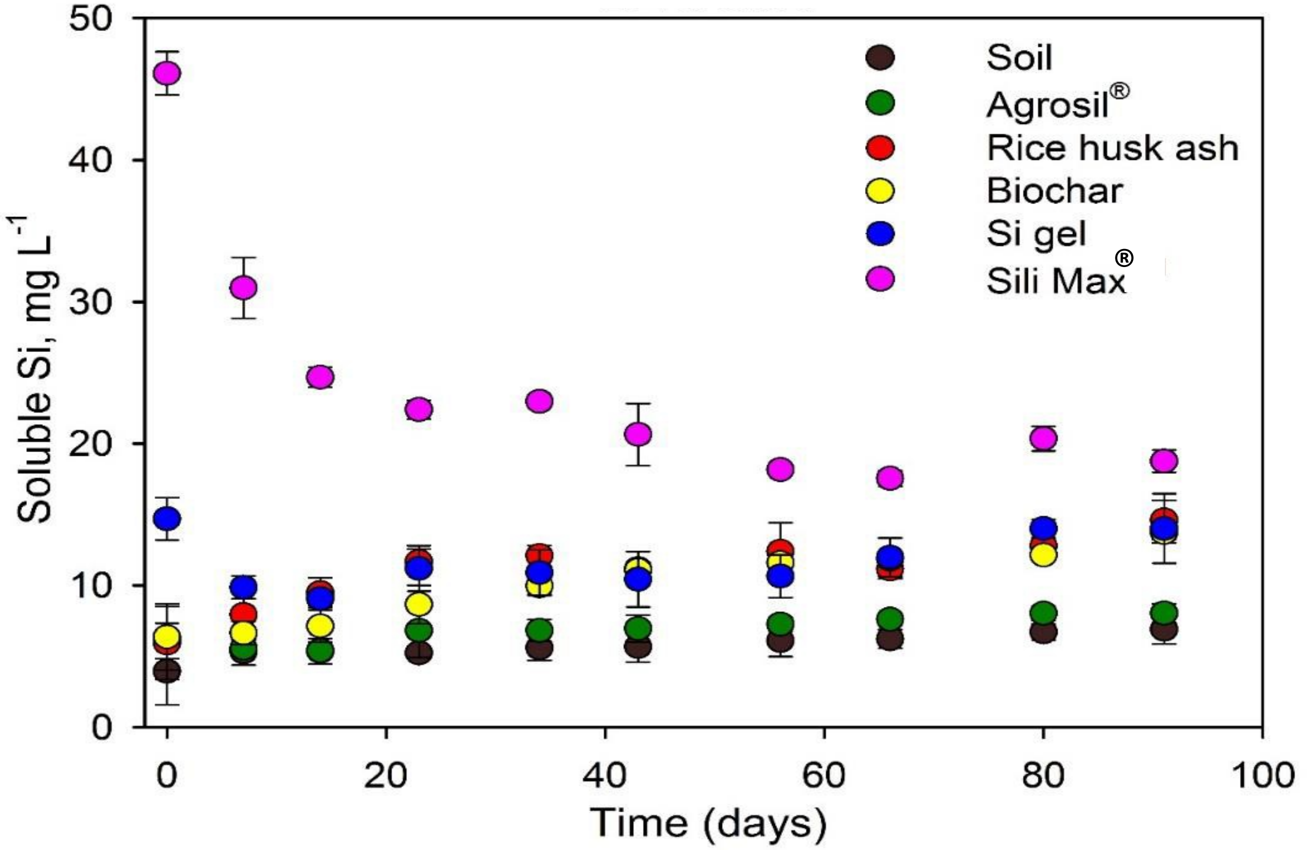
- Five Si sources were selected for this study:
  - Liquid Si source **Sili-Max®** (SiO_2 = 21.4%)
  - Solid Si source Agrosil® (SiO_2 = 39.6%)
  - Rice husks ash (SiO_2 = 85.4%)
  - An experimental biochar derived from burning rice straw (SiO_2 = 23.1%)
  - Silica gel beads (SiO_2 = 88.5%)

Materials and Methods (cont'd)

- The soil was a paddy loam soil from the area of Castello d'Agogna (Pavia, Italy), with low available Si and a pH = 5.9.
- Two laboratory experiments were set up:
  - I) Mesocosm soil incubation tests
  - II) Macrocosm soil-plant tests

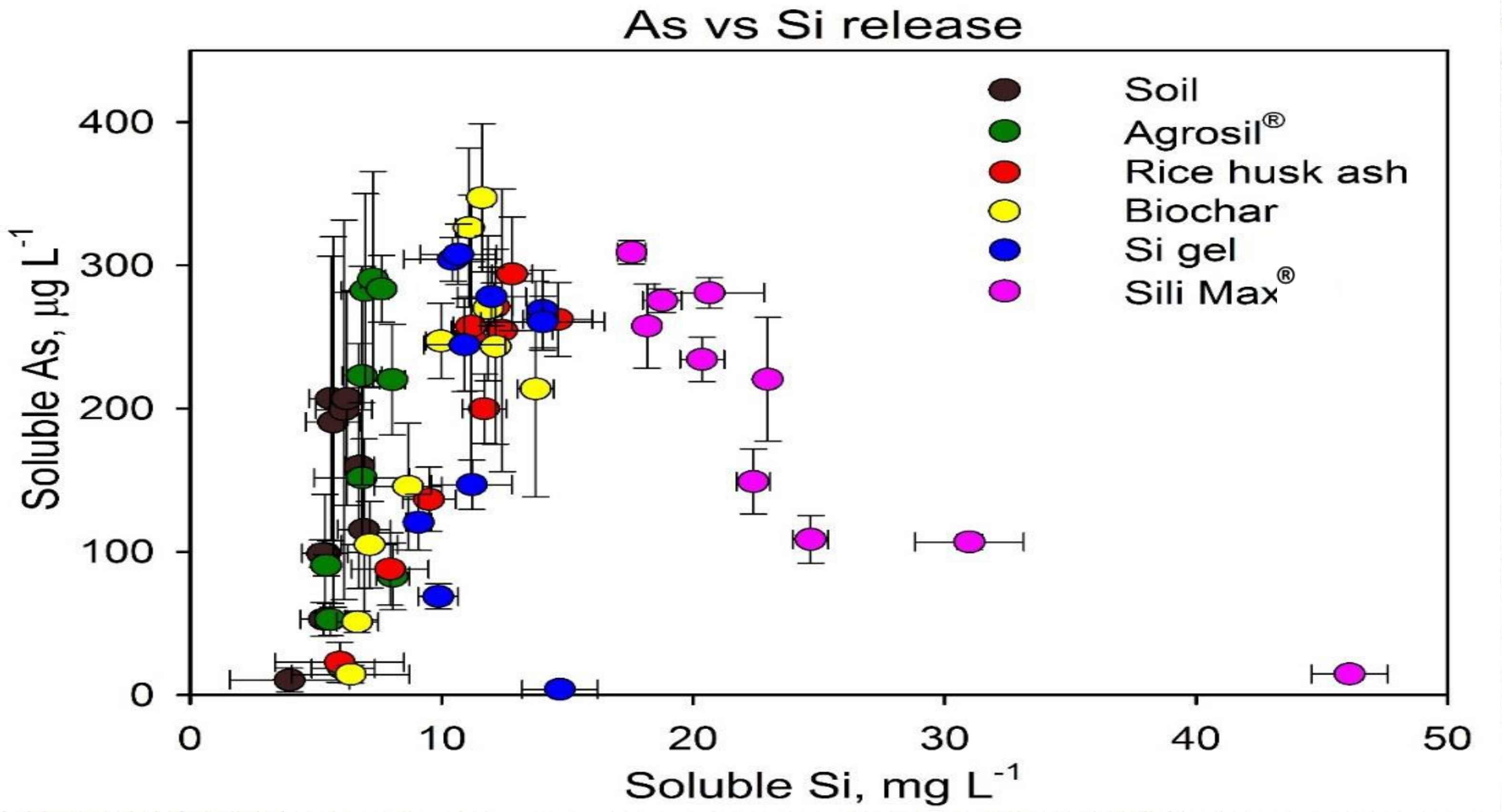
Results

Si Release In the Soil



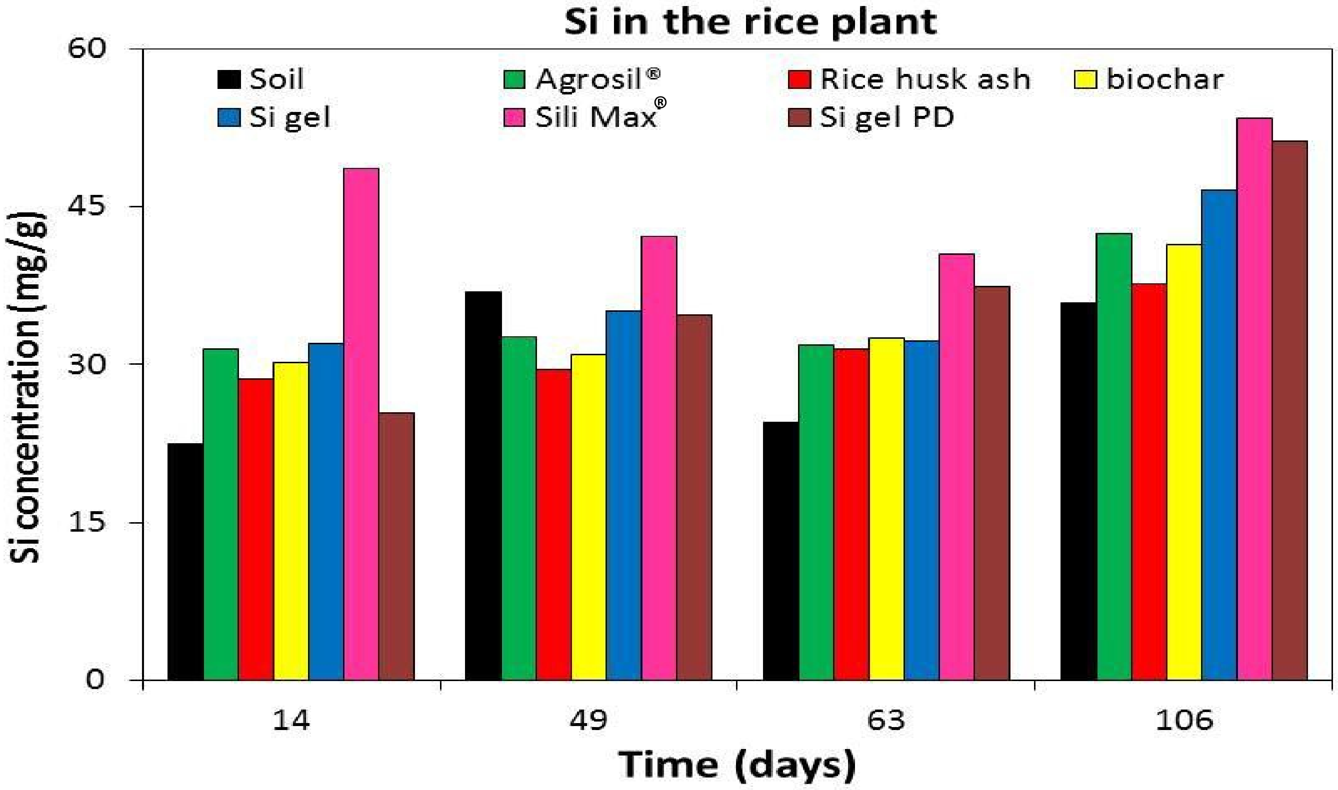
- The amount of Si released in solution by **Sili-Max**® was approximately 2.5 times higher with respect to all other Si sources and the control soil.

Results (cont'd)



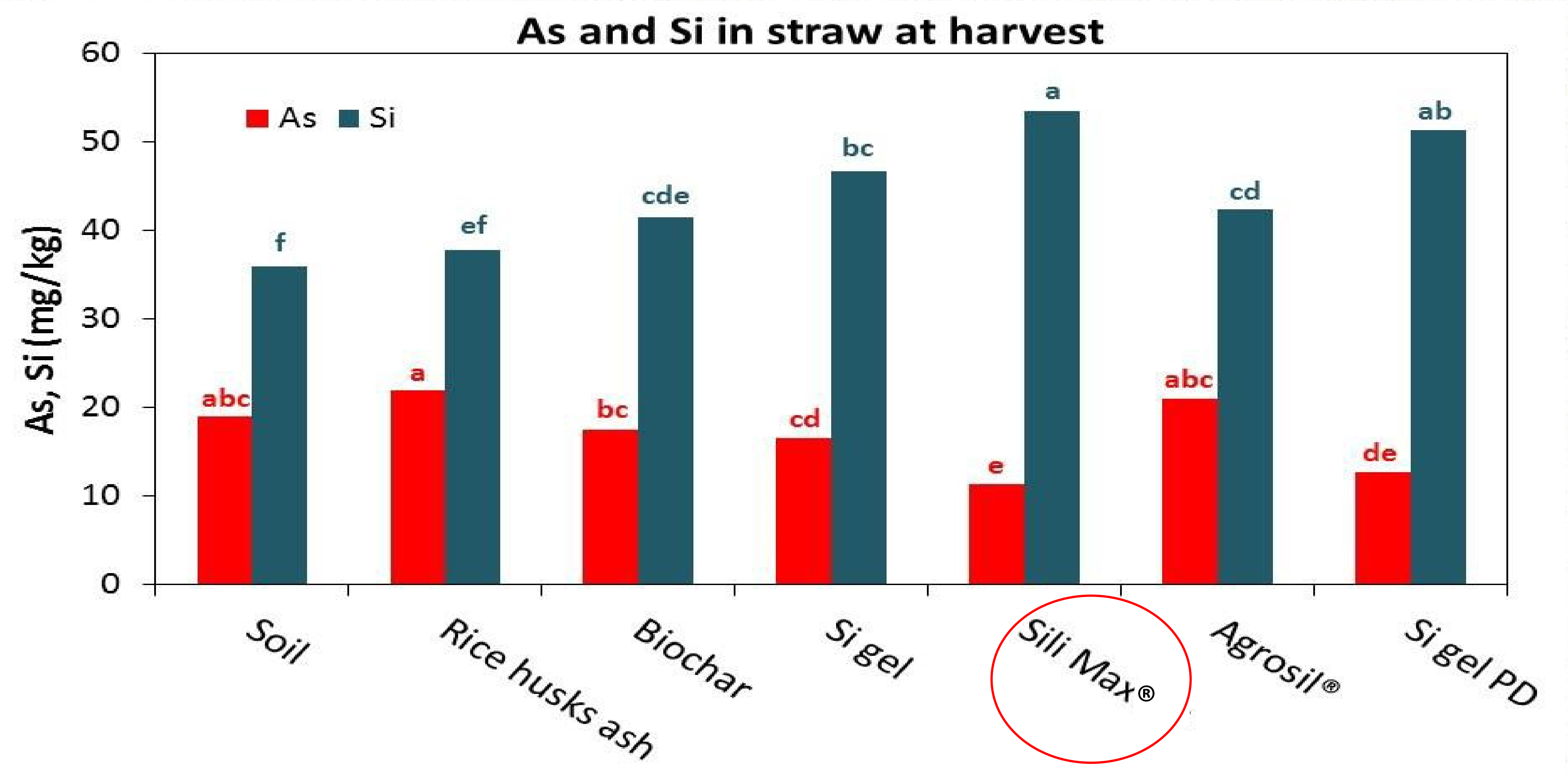
- Arsenic release decreased with the increase of Si from **Sili-Max**® while the other treatments didn't show this correlation.

Results (cont'd)



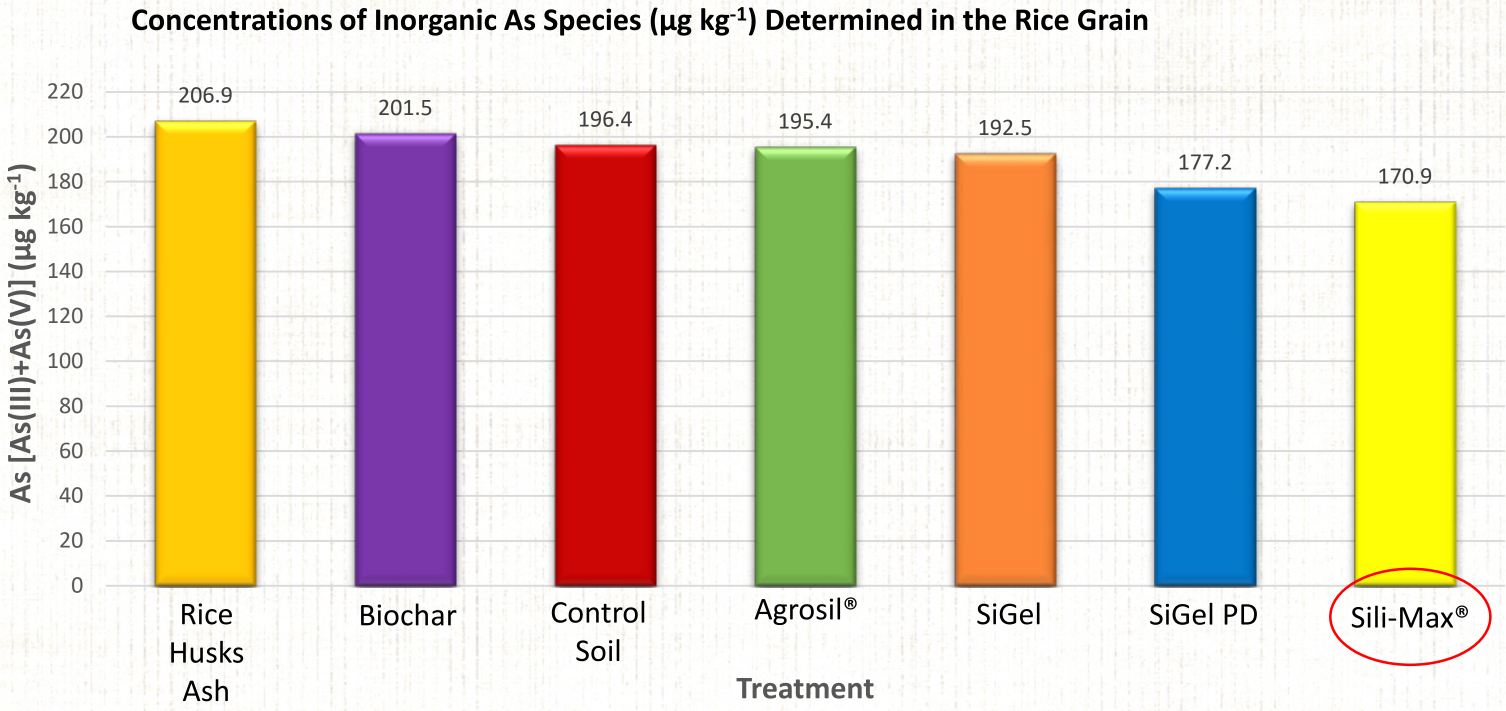
- The highest amount of Si in the plant was observed with **Sili-Max**® treatment at the 14th day of the cropping period (mid-tillering).

Results (cont'd)



- At harvest, **Sili-Max**® -treated rice plants had the lowest As concentration and the highest Si concentrations.

Results (cont'd)



- **Sili-Max®** showed the best results in the prevention of inorganic As accumulation in the rice grain and presented the lowest amount of inorganic As in comparison with the other Si sources.

Conclusions

- In this study, **Sili-Max®** proved to be the most promising source not only for supplying Si but also for limiting inorganic As plant uptake, one of the most toxic elements in rice products.

Field Trials

1 – Efficacy Test of Huma Gro® Super Phos® on Corn

Objective:

This field trial assessed the Phosphorus (P) efficacy of Huma Gro® **Super Phos®** on corn yield in comparison with the standard 10-34-0.

Materials and Methods

- The field was located in Marshall, Minn.
- The soil was a clay loam with 3.8% organic matter and a pH equal to 7.6.
- The treatment included:
  - (1) 100% P supplied with 1.23 GPA **Super Phos®**
  - (2) 100% P supplied by 18.38 GPA 10-34-0
  - (3) 50% P supplied by 0.613 GPA **Super Phos®** plus 50% P supplied by 9.19 GPA 10-34-0.

Results

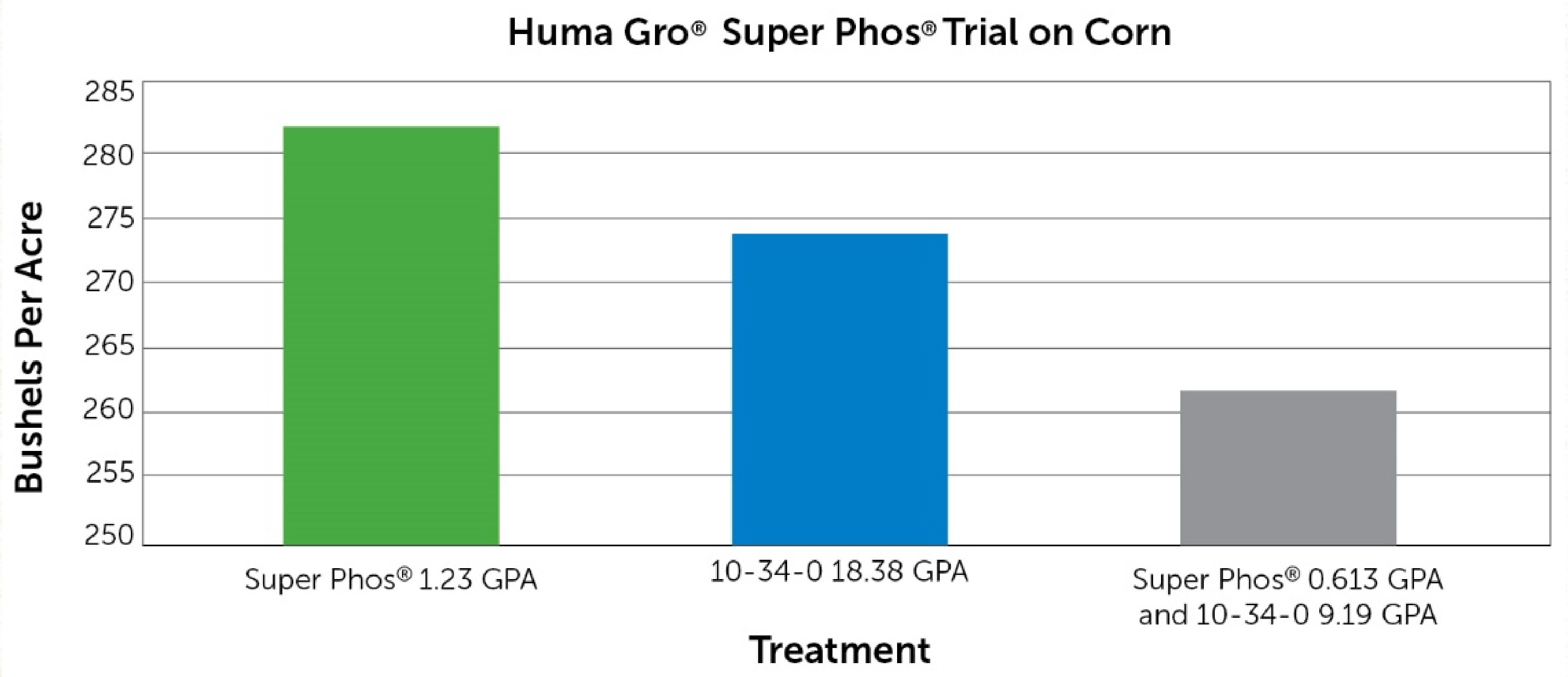


Figure 1. Corn yield assessment in bushels per acre.

Conclusions

- Huma Gro® **Super Phos®** at 1.23 GPA increased the yield by 19.96 bu/ac in comparison to 10-34-0 at 18.38 GPA.
- This demonstrates **Super Phos®** efficiency over 10-34-0 at nearly 1 gallon **Super Phos®** delivering the same equivalent of phosphorus as 15 gallons of 10-34-0.
- The combination of **Super Phos®** and 10-34-0 appears to have kept the plant in a vegetative state, thus affecting final yield.

2 – Efficacy Test of Huma Gro® Breakout®, Vitol® and Crop-Gard® on Soybeans

Objective

- This field trial assessed the efficacy of Huma Gro® Breakout®, Vitol® and Crop-Gard® at two growth stages in soybeans.

Materials and Methods

- The soybean field was located in Marshall, Minn.
- Clay loam soil with 3.8 % OM and pH = 7.6.
- The treatments included:
  - (1) Breakout® at 1.5 qt/ac at early bloom
  - (2) Vitol® 1 qt/ac and Crop-Gard® 1 qt/ac at R3
  - (3) Check (using the grower’s standard fertilizer program)

Results

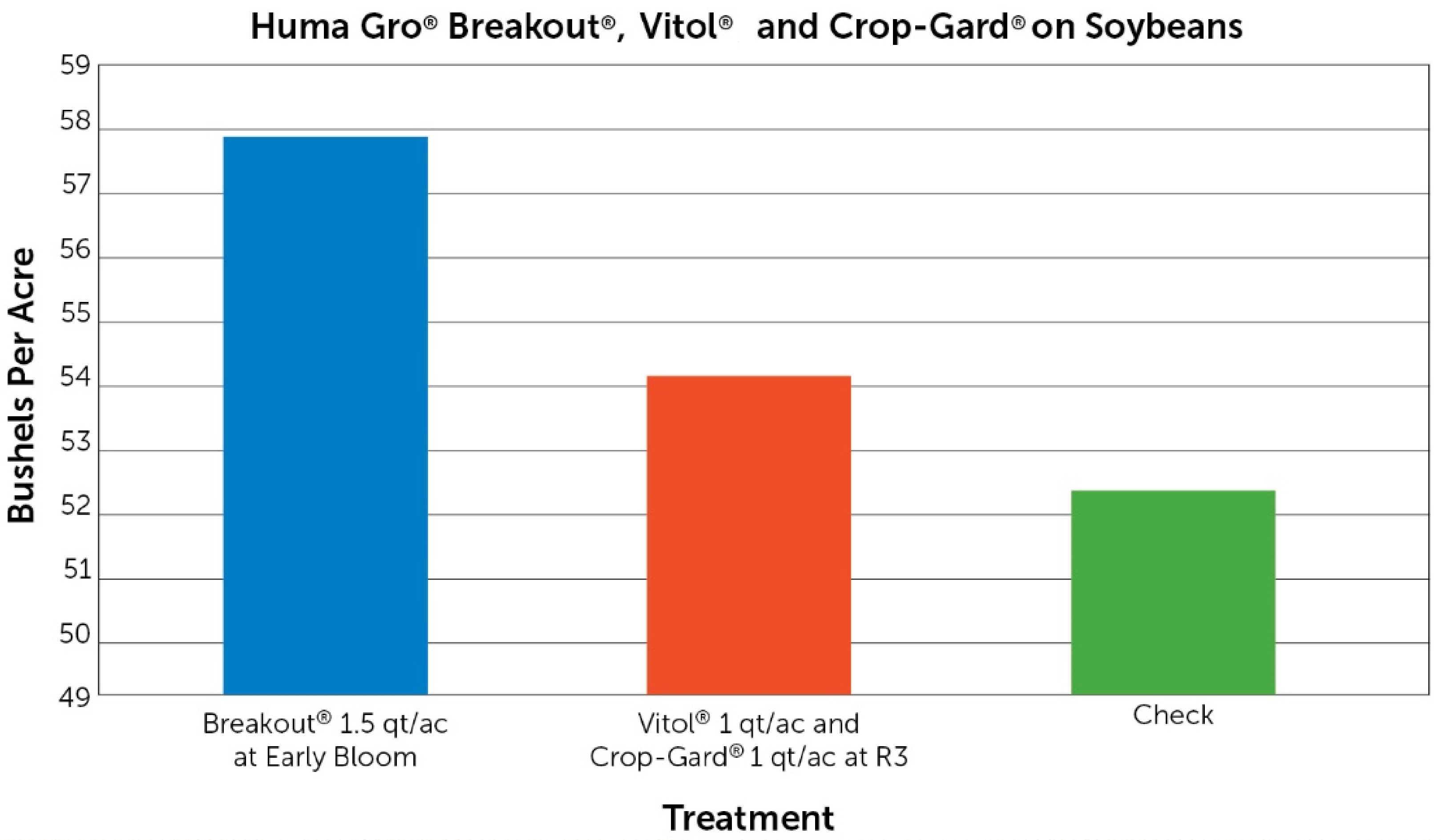


Figure 1. Soybean yield assessment in bushels per acre.

Conclusions

- Huma Gro® Breakout® applied at 1.5 qt/ac at early bloom provides a 5.39 bu/ac increase over the control.
- Vitol® and Crop-Gard® at 1 qt/ac each at R3 led to 1.81 bu/ac higher yield than the control.
- It is recommended that, in the future, Breakout® be applied at first bloom and Vitol®/Crop-Gard® be applied at R3 for pod fill.

Thank You!

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