Exceed the seed™ an AgriThority® Initiative

Panel Discussion

Seed Treatment Technologies Now and in the Future

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Bayer CropScience

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VALENT

Science For A Better Life

Exceed the Seed Symposium

Bayer **SeedGrowth**™

Seed Treatment Technologies

Now and In The Future

Bill Hairston – Bayer CropScience

Definition of Seed Treatment

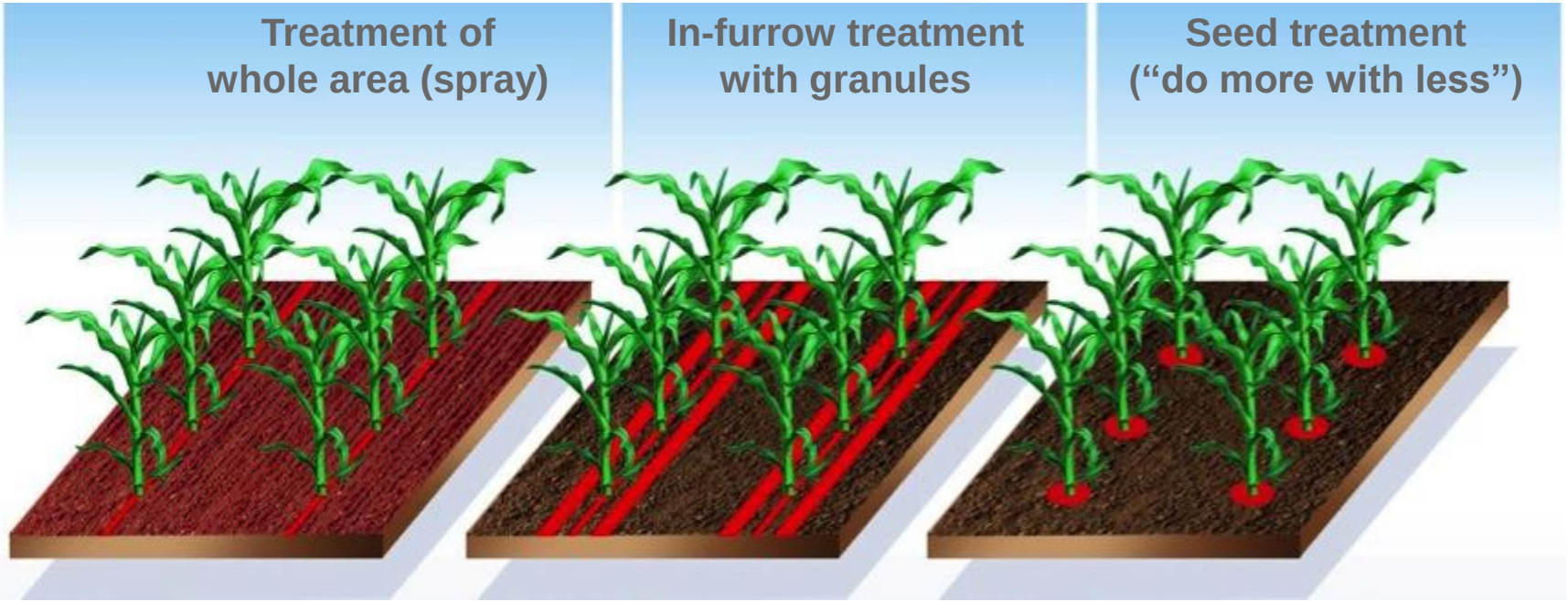
Seed treatment is the application to seed of products considered beneficial or necessary in maintaining or enhancing the genetic yield potential of a crop.

Examples are fungicides, insecticides, nematicides, PGPR, herbicide safeners, micronutrients, plant growth regulators, etc.

Reasons for Significant Growth In Seed Treatment Market Segment

- Innovative new products that are highly efficacious
  - Fungicides
  - Insecticides
  - Nematode Protection
  - Others (Rhizobia, Micronutrients, PGR, PGPR)
- Desire to protect high value seed (Traditional and GMO)
- Growers value seed treatment:
  - Convenience (no mixing or spraying required)
  - Reduced exposure

Seed Treatment Advantages - Reduction in Rates and Treated Area



Average application rate g active ingredient / ha:

10x — 5x — 1x

Percent treated:

100% — 5 - 20% — < 1%

The Three Pillars of Seed Treatment Development

Ensuring That Bayer Seed Treatment Does Not Negatively Impact Germination Is Critical!

- Seed safety is critical.
- Seed companies can easily treat in a single day seed valued in excess of $1,000,000.
- Each formulation of active ingredient, colorant, coating, and combination thereof must be tested.
- Seed safety takes precedence over formulation characteristics and efficacy!

Soil-Borne Seedling Disease Control

Untreated

Seed Treatment
Fungicide

Soil Insect Control

Fungicide Only

Seed Treat Fungicide + Poncho®

Seed Treatment Development

- Equipment – New advances based on market needs.
- Formulations
- Coatings
- Seed Treatment Application Centers

Application Advancements

- Active ingredients can be applied without dilution…mixing/dilution occurs during the application process.
- New technology has brought a new level of flexibility and accuracy to high volume facilities.
- Seed coatings play a critical role as a result of heavier loadings.
  - Hold the active ingredient on the seed.
  - Facilitate handling of seed during the treating process.
  - Facilitate uniform planting.
- Application monitored and controlled by a computerized unit.

High Volume Batch Treater

High precision Downstream Technology

Coatings Have Become a Critical Component of Seed Treatment Systems!

- Keep the product on the seed
- Help ensure uniform coverage
- Improve the handling of the seed (during application and planting)

Coatings Are A Critical Component Of Successful Seed Treatment Systems

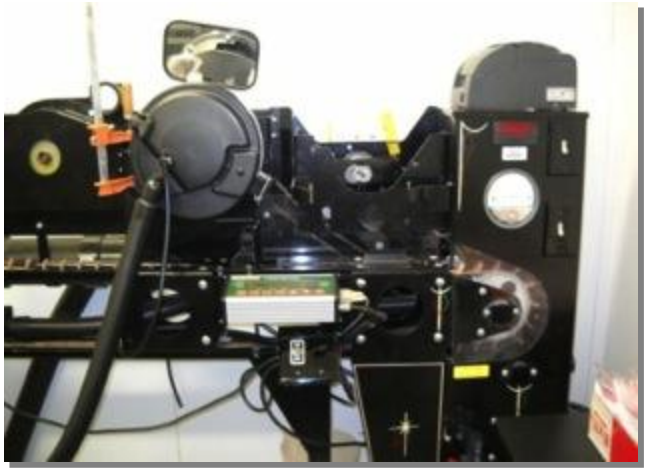
- Requires very specific formulations.
  - Applying “adhesives” to seed during a high volume application process.
- Coating must be compatible with other formulations and seed type.
- Cannot impact customer’s commercial treating capacity.
- Must control dust abrasion in the commercial treating environment and at the grower level.
- Facilitate uniform seed flow and planting through precision air planters.
- Must be seed safe.

Established Equipment and Protocol for Standard Comparison of Dust-Abrasion

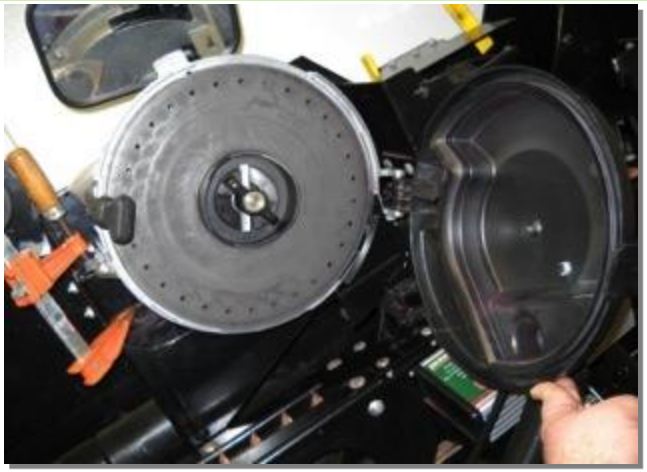
A: Good ST quality sample

B: Bad ST quality sample

Work Closely with Planter Manufacturers to Ensure Performance at Planting Time



JD Vac Meter on Stand

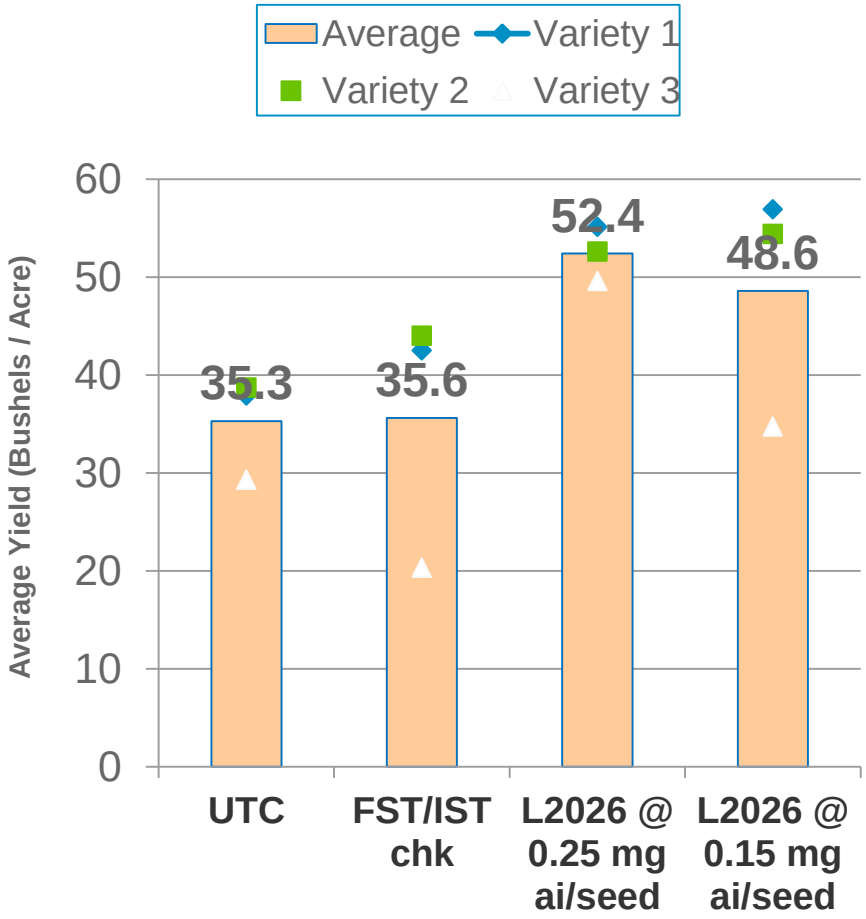


Vacuum Chamber and Back of Disk

Front of Disk and Seed Chamber

Standard Corn Disk

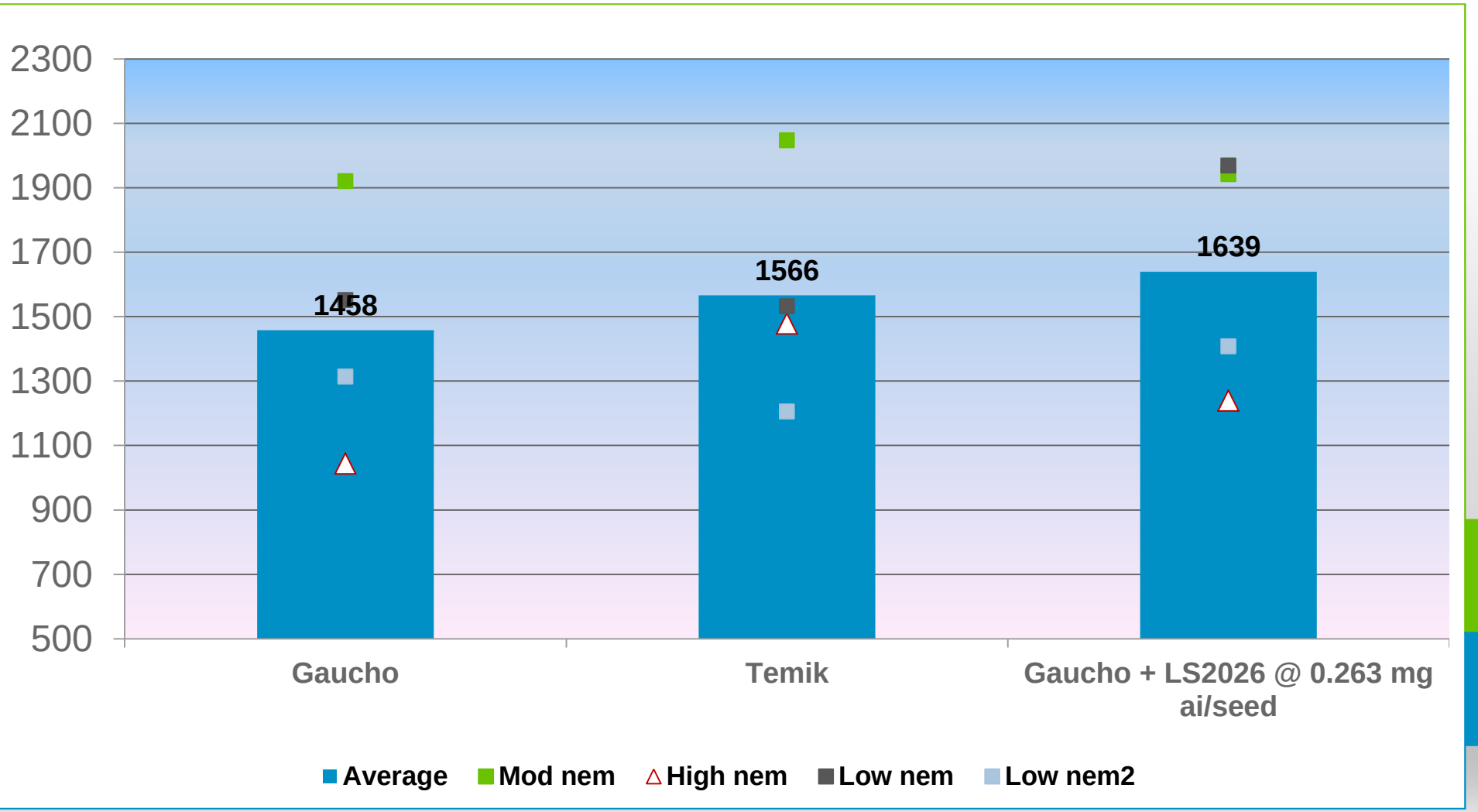
The Future
SDS Control in Soybean



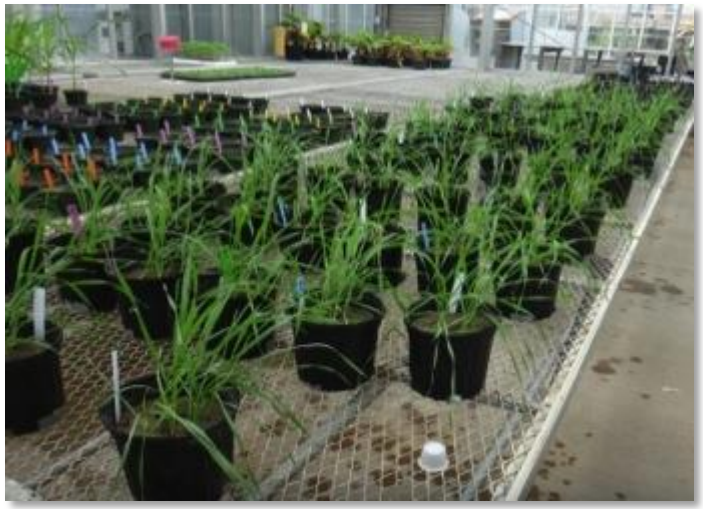
Trial conducted at the Kansas River Valley Station near Topeka
Irrigated site with heavy SDS pressure

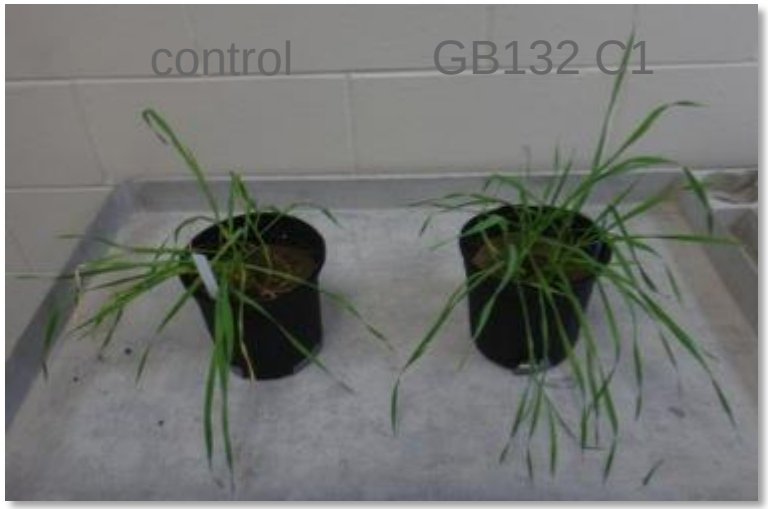
Cotton Nematode Trial - Yield Summary

Average of 4 locations



Advancements in Biologicals
Wheat evaluation at 5 weeks after planting





Potential of Seed Treatment Technology

- We have barely touched the potential of the benefits that are available from seed treatment technology!
- We can expect continued development of new chemistry.
  - New products that will provide improved protection and tailor-made solutions for growers to address disease and insect problems.
  - Example – Sudden Death Syndrome in soybean.
- Capitalize on the potential of biological organisms and plant growth regulating compounds as seed treatments to improve plant health, provide tolerance to abiotic stress, nutrient uptake, and improve disease and pest control, and increase yield.
- As new solutions are developed, advancements in application technology will be necessary, e.g. equipment, coatings.

Science For A Better Life

Thank you for your attention

Questions?

BAYER

PONCHO®

VOTiVO®

SURE, WE COULD TELL YOU ABOUT THE POSITIVE EFFECTS OF TREATING YOUR SEEDS. BUT IT REALLY BOILS DOWN TO TWO WORDS:

PONCHO®/VOTiVO®

Applied on more than 14 million acres of corn already, Poncho®/VOTiVO® seed treatment from Bayer CropScience helps farmers achieve higher levels of production by using a systemic agent that helps protect the whole plant against insect pests. Poncho/VOTiVO also uses a biological component that protects against nematodes during early development, leading to healthier stands and larger yields. So get treated and get growing. For more information, contact your Seed Dealer or Bayer CropScience Representative, or visit ponchovotivo.us.

NOW AVAILABLE FOR CORN, COTTON AND SOYBEANS.

SEED PROTECTION

INOVATE® Seed Protectant

NipsIt INSIDE® Insecticide

NipsIt® SUITE CEREALS SEED PROTECTANT

NipsIt® SUITE[1] SUGAR BEETS SYSTEM

RIZOLEX™ FUNGICIDE

WE PROTECT MORE THAN SEED. WE PROTECT YOUR INVESTMENT.

Maximize yield and profit with Valent U.S.A. Corporation's growing portfolio of innovative seed protection products. Our commitment and passion have led to game-changing technologies such as Lock Tight™ Technology, which delivers unmatched retention, handling and performance. Our latest innovation, Rizolex™ Fungicide, offers unrivaled protection against Rhizoctonia. Plus, we're constantly working on new technologies, with more in the pipeline. To learn more about our state-of-the-art seed protection products, visit **www.valent.com**.

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Products That Work, From People Who Care® | **www.valent.com** | 800-6-VALENT (682-5368)

Always read and follow label instructions.

[1]*NipsIt SUITE* Sugar Beets System is a promotional combination of NipsIt INSIDE® Insecticide (EPA reg. #59639-151) and Metlock® Fungicide (EPA reg. #59639-171) from Valent U.S.A. Corporation and Sebring® 318 FS Fungicide (EPA reg. #55146-107) from Nufarm.

Exceed the Seed:

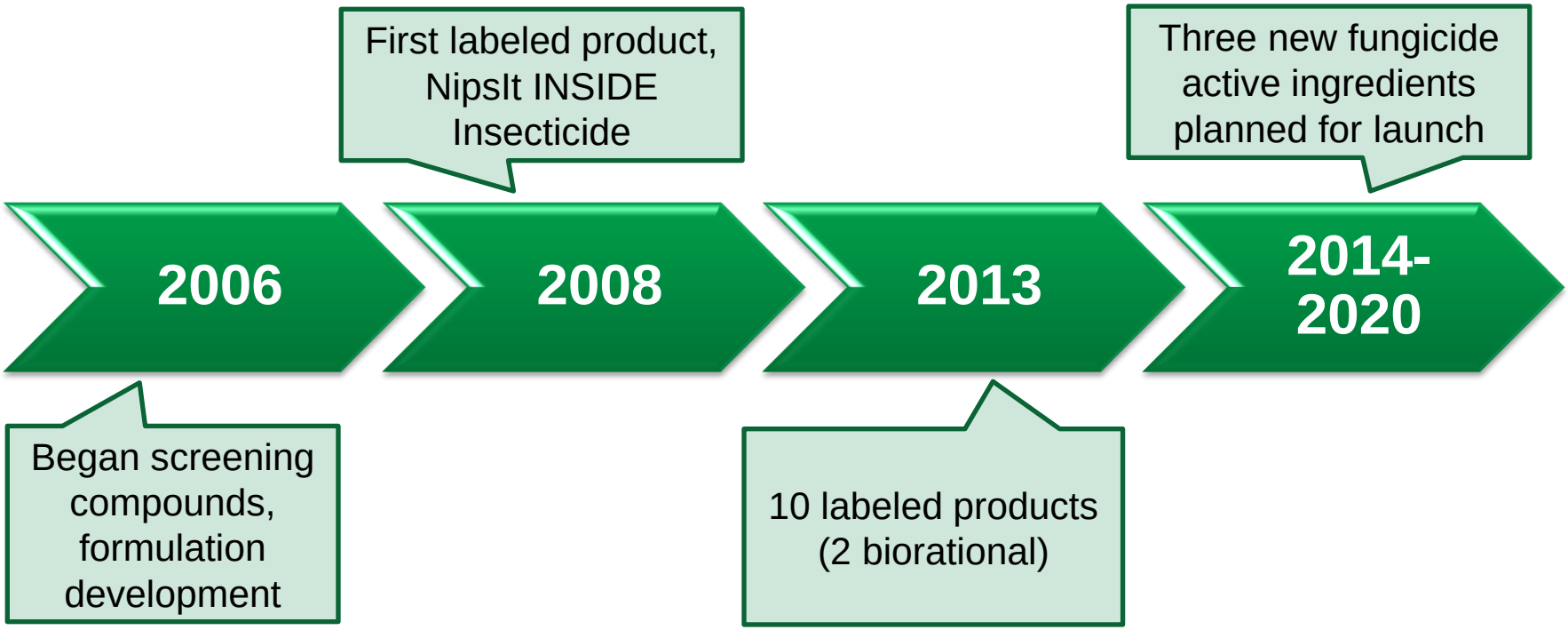
Exploring our role at Valent USA developing technologies for growers to maximize their investment

Dair McDuffee
Seed Treatment Specialist
December 9, 2013
ASTA CSS 2013 & Seed Expo

Products That Work, From People Who Care®

Valent Seed Protection Timeline

- Valent USA is a wholly owned subsidiary of Sumitomo Chemical Company
- Access active ingredients from:
  - SCC, Valent Biosciences, 3rd party licensing, partnerships



Protecting the seed and seedling

- Planting to population
- Uniformity across the field

- Current development strategy is to create a single system capable of working across “most” locations

Untreated and treated soybean: July 15

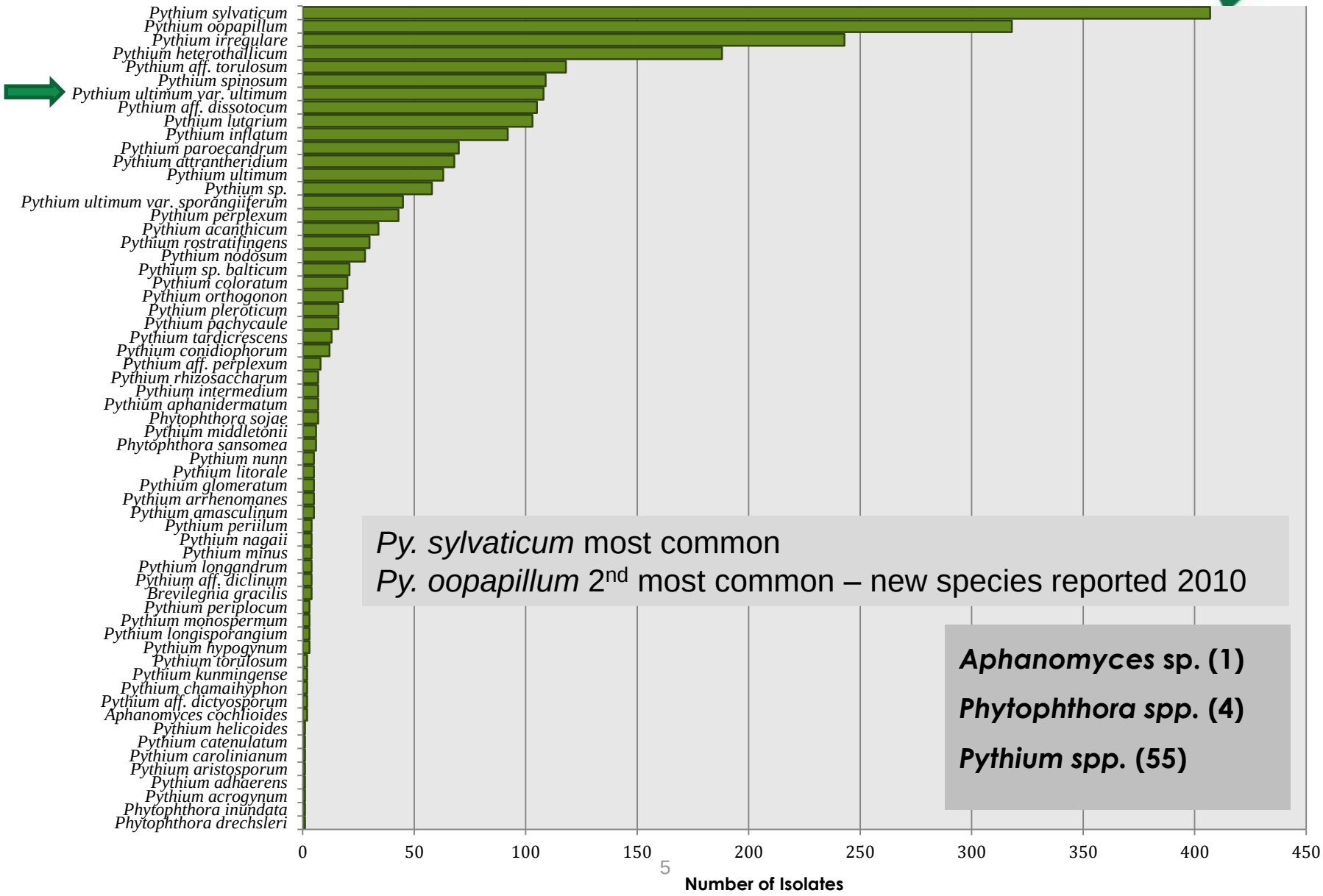
Same plots: August 26

Current Research increasing understanding

- Midwestern disease surveys
- USDA-NIFA Oomycete survey
  - 12 States
- NCSRP-USB Seedling Pathogen Survey
  - 11 States
- Characterizing isolates, distribution, prevalence, pathogenicity

Emerged seedlings sufferings from Pythium Root Rot

2011 Oomycete sampling results



Py. sylvaticum most common

Py. oopapillum 2nd most common – new species reported 2010

***Aphanomyces* sp. (1)**

***Phytophthora* spp. (4)**

***Pythium* spp. (55)**

Combining Ethaboxam and Metalaxyl

Most prevalent

Oomycete	Metalaxyl	Ethaboxam + Metalaxyl
Phytophthora sojae	○	●
Pythium irregulare	○	●
Pythium sylvaticum	○	●
Pythium dissoticum	○	●
Pythium torulosum	○	●
Pythium ultimum var. sporangiiferum	=	●
Pythium ultimum var. ultimum	=	●
Pythium G7 Isolate	●	●
Pythium aphanidermatum	●	●
Phytophthora sansomeana	●	●

● superior performance

= statistically equal performance between metalaxyl & ethaboxam

○ partially controlled

How to use results…

- Currently
  - Development decisions
  - Region/State recommendations
- Future
  - Custom applications
  - County down to the field recommendations
  - New university research

Soil Test Report

ABC Ag Testing

Indianapolis, IN

Nutrients	Levels	Scale (VL L M H)
Nitrogen	50 lbs/a	
Phosphorus	4 ppm	
Potassium	300 ppm	
Sulfur	60 lbs/a	
Zinc	0.8 ppm	
Chloride	24 lbs/a	
OM	4.10%	
Soluble Salts		

Soil pH	CEC
7.1	11

Pathogen Survey Results

Rhizoctonia solani	98 CFU/g	
Phytophthora sojae	150 CFU/g	
Fusarium species identified *F. graminearum, F. virguliforme, F. solani*		
Pythium species identified *P. ultimum, P. torulosum, P. irregulare*		

Valent USA and Valent Biosciences

VALENT BIOSCIENCES CORPORATION

Release® Plant Growth Regulator

MASSIVO™ BioNik™ PLANT GROWTH REGULATOR

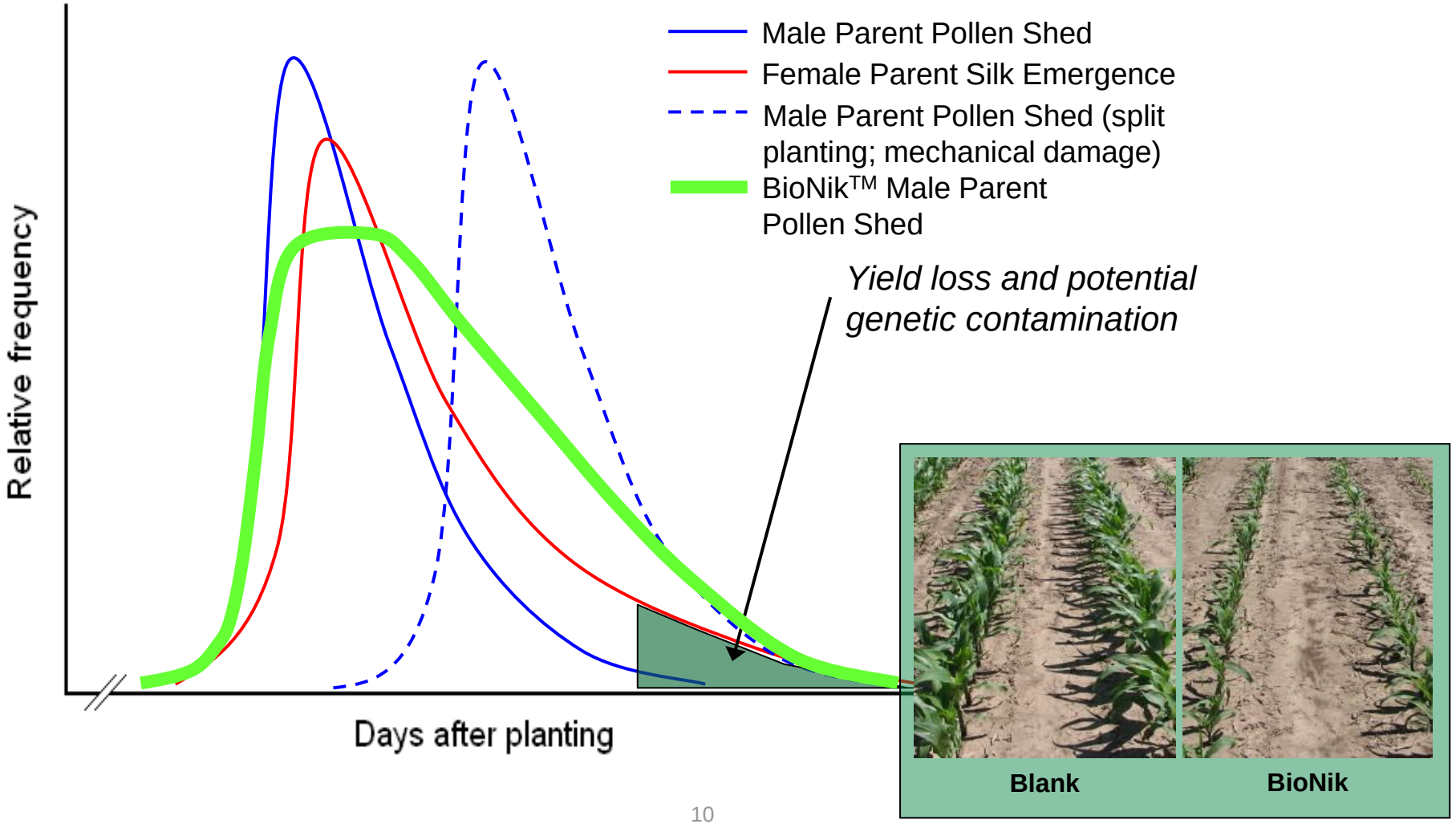
Biorational Seed treatments

- Release
  - Plant growth regulator
- Uniform emergence
- Increased Vigor, plants at a later stage
- Partner with conventional seed treatments

Winter wheat treated with Release PGR (right)

BioNik™
Delay Germination to Extend Pollination

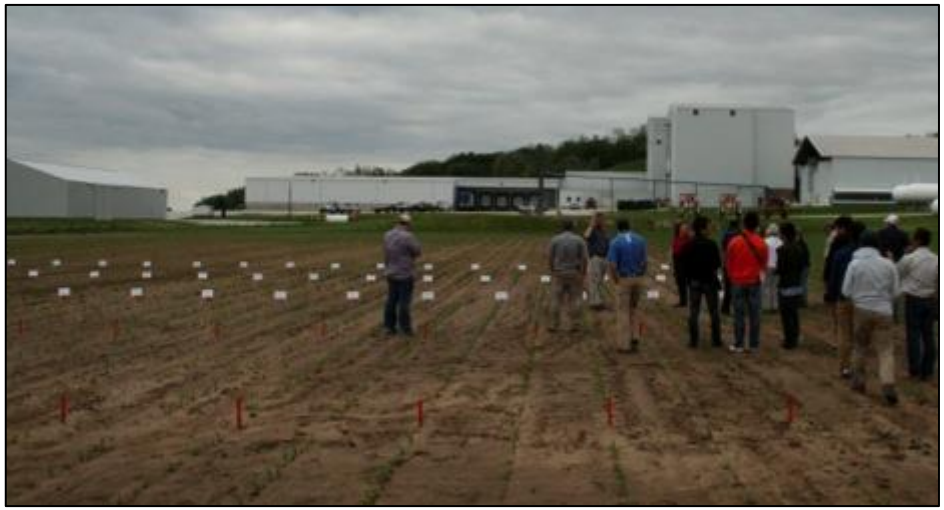
Silk and pollen shed dynamics affect yield and quality in corn seed production



Conclusions

- Understanding of soil microbiological community
- Merging of conventional and biorational a.i.'s
- Solving problems with seed treatment beyond vigor, stand, disease or insects

- Traditional development methods



- Thanks to Dr. Martin Chilvers, Valent Biosciences

I used to wear a seed protectant, but it came off.

What? No Lock Tight™ Technology?

Proprietary Lock Tight™ Technology. Unmatched protection.

There's nothing else quite like the all-in-one convenience of INOVATE® Seed Protectant. Its proprietary Lock Tight™ Technology assures the coating stays on well after planting. And it's the first soybean seed protectant with both contact and super-systemic protection. With *INOVATE*, your seed will have the most advanced protection against the broadest spectrum of diseases and insects—increasing yield and giving your customers a higher return on investment.

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Seed Protectant

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