Formulation Technology
Innovation and Improvements

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AGENDA

1. History of Seed Treatment Development
2. The quality of treated seeds
3. Formulation assessment methods
4. Simulation of dust emission from planters during formulation development
5. Summary and conclusions
History

- Pests are always adapting to new environments and growing conditions change constantly.
- Before seed treatments were available, growers were soaking their seeds in chlorine or manure in large amounts. Sometimes growers would turn to arsenic- and mercury-based compounds due to a lack of options.
- Seed treatments represent extremely efficient and targeted delivery systems for pesticides; only a small amount of a pesticide is applied to the seed before planting, which allows for reduced applications and exposure potential.
Seed Treatment - Dose Reduction per Area (Bayer CropScience)

Spray Application

Furrow Application (e.g. granulates)

Seed Treatment

Treated Area (m²/ha)

10,000  →  500  →  58
Quality of Treated Seeds
Seed treatment quality

...is the result of a multi-step process

**Raw Seed Quality**

- Seed production
- Seed processing

**Seed Treatment Process**

- Seed treatment formulation and recipes
- Seed treatment equipment and operator training

**Quality of Treated Seed**

- Visual appearance
- Bulk loading
- Loading uniformity
- Flowability
- Plantability
- Dust and Abrasion
Quality and safety of treated seed

...is a shared responsibility along the supply chain

1. Seed processing
2. Product formulation
3. Recipes & application
4. Supply chain & on farm
5. Planting

...is continuously on the agenda of improvement of seed applied technologies

Stepwise Improvements

- Improvement of formulations and recipes
- Implementation of approved recipes
- Implementation of stewardship programs
- Initiating research on novel polymers
- Research in improvements of application technologies

- Continued improvement and education of seed handling from harvest to planting
- Continued research and development on novel polymers
- Research in improvements of application technologies

- New delivery systems for Seed Applied Technologies
- Continued research and collaboration with industry partners – equipment manufactures, seed trade, and polymer technology providers
Formulation Assessment Methods
Standard quality assessment tests/tools employed by Syngenta Seed Care

- Funnel: Flowability
- CornCounter: Plantability
- HPLC: Seed Loading
- HEUBACH: Dust Assessment
- QUEST Pro: Seed-to-Seed Distribution
Formulation assessment in the laboratory

**Heubach test**

Apparatus with pump, drum and filter case

Control panel

Dust Assessment
- according to SOP of ESTA

Standardized filter case and filter
Dust assessment on simulated planter level

Digitel Technology

Principle
- Collection of dust at exit of planting unit on filter
- Assessment of total dust-off on filter
- Calculation of dust-off per seed unit or acre/ha

PICTOS Technology

Principle
- Particle count with high-speed camera
- Size range from 10 microns to 2000 microns
- Classification into distinct ranges
- Particle number, size and shape information
- Total mass of dust captured
Simulation of dust emission from planters during formulation development
Polymers and recipes (products + polymers) screening

Heubach Assessment

Recipes with different polymers and rates

Polymers play a key role in dust reduction and recipe development

Example: P21 was rejected due to outright unacceptable dust levels
Selection of the appropriate polymer is critical; weak polymers do not stick to the seed (TRT 1-6; 10-11); strong polymers reduce the dust-off impressively while maintaining germination.
Influence of dedusting raw seed and formulation technology on treated seed quality (2)

1. Non-dedusted and untreated
2. Dedusted and untreated
3. Non-dedusted and treated
4. Dedusted and treated

Treatment (3 and 4)
Formel M technology for cereals

Dust reduction
Influence of dedusting raw seed and formulation technology on treated seed quality

- Dedusting: spouted bed cleaning assessment technology
- Application: Rotostat
- Formel M: dust reducing formulation

Heubach: dust assessment

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<th>Barley</th>
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<tr>
<td>dedusted and treated</td>
<td>0.45</td>
<td>1.45</td>
<td>0.75</td>
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Gram of dust for 100 kg seeds

Cereals: wheat, rye, barley
Summary and conclusions

• The quality of treated seed is a multifactorial result

• Seed cleaning is a first crucial step in ensuring quality seed treatment

• Great improvements have been made on polymers and recipes (products + polymers)

• Polymers and recipes are critical in managing potential dust-off and abrasion

• Effective quality management and stewardship along supply chain is a must

• Research and development on-going into novel polymers and application processes
Syngenta activities for Best Management Practices in Seedcare

- Seed to seed distribution
- Seed loading analysis
- Mixtures & Recipe development
- Seed quality/safety
- Technical Service
- Training
- Heubach dust analysis
- Reports & documentation
- Workers exposure
- Facility check

Seed treatment Quality
Global Network of Seed Care Institutes and Territories

NA
- Canada
- USA

LATAM
- Brazil / Brazil SC
- LAN
- LAS

EAME
- AME
- CIS
- EU Central
- EU North
- EU SE
- France
- Iberia
- Italy

APAC
- Australasia
- China
- NE Asia
- SE Asia
- South Asia

Major
- Stein / CH
  - 2008
- Stanton / US
  - 2001
- Holambra / BR
  - 2009

Local
- Canada
  - 2000
- Germany
  - 2000
- France
  - 2000
- China
  - 2007
- Ukraine
  - 2011
Critical Steps
Quality and safety of treated seed

...is a shared responsibility along the supply chain

1. Seed processing
2. Product formulation
3. Recipes & application
4. Supply chain & on farm
5. Planting

Best practices for commercial seed treatment

BMP for handling/planting

Other Technologies

Seed cleaning
Formulations & Polymers
Optimized recipes