Experience and Perspectives with CLEARFIELD® Herbicide Systems

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Objectives

- History of Clearfield Crops
- Commercialization of Clearfield crops
- Benefits of Clearfield crops (examples)
- Risks and watch outs (Stewardship)
- Perspectives
**History of Clearfield crops**

- *Imidazolinone herbicides – basis for Clearfield crops*
  - Extremely versatile
  - Broad-spectrum – grass and broadleaf's
  - Systemic and residual
  - Different AI’s available with different characteristics
  - PRE and **POST**
  - Easy to mix and match to fit for different needs
  - Natural tolerance only in leguminous crops
  - AHAS – MOA – subgroup
  - Single target-site mutation may confer tolerance
  - Technical possibility to develop imidazolinone tolerance in other crops
HT – crops a win-win situation for farmers and industry?

Better weed control possibilities (farmer)

Broader utilization of herbicide active ingredient(s) with limited natural use profile

but

broad availability of high agronomical value varieties / hybrids is prerequisite.

- 1992 launch of Clearfield corn (before AHAS graminicides and RR)
- 1995 launch of Clearfield canola (control of closely related weeds)
- 2001 launch of Clearfield wheat (control of closely related weeds)
- 2002 launch of Clearfield rice (control of closely related weeds)
- 2003 launch of Clearfield sunflower (control of closely related & parasitic weeds)
- 2006 launch of Clearfield lentils (lack of weed control options)
- 2011 launch of Clearfield winter OSR (control of closely related weeds)
Benefits related to:

- **The system per se**
  - Low to moderate soil moisture dependency
  - Independent of soil and seedbed preparation (conventional, minimum and no-till)
  - Reliable and adjustable residual
  - Postemergence instead of pre-emergence
  - Systemic and residual activity
  - Mutagenesis / conventional plant breeding techniques

- **Biology**
  - Broadleaf weeds including difficult to control weeds
  - Parasitic weeds (Orobanche, Striga) and SMOA with genetic tolerance
  - Grass weeds (suppression of perennial grasses)
  - Control of closely related weeds possible
Benefits related to:

- **Convenience**
  - More flexibility on when to apply
  - Application weed stage dependent – not crop stage dependent
  - Grass and broadleaf at one application
  - Can prevent crop injury caused by herbicide carryover and herbicide–insecticide interaction.

- **Market**
  - Non-GMO – no market restriction
  - Enables the full hybrid potential
  - Less debris in the commodity
  - Possibility to grow certain oil qualities
Benefits related to:

- **Breeders**
  - Hybrids only
  - Market enlargement
  - SMOA for Orobanche
  - Differentiation tool

- **Regulatory & Environment**
  - Fits into Integrated Pest Management (IPM) programs
  - Quantitative reduction of herbicides (Acetochlor 2000 g ai/ha / Imazamox 50 g ai/ha)
  - Post-herbicides prerequisite for Minimum / No-till production systems
  - Control of specific weed problems (Ambrosia)
  - Low mammalian toxicity with a favorable environmental profile
Value Pyramid of Clearfield Sunflower

Yield, Quality

Post-emergence

Simplification of weed control, timing flexibility, conservation tillage

Difficult weeds, e.g. Xanthium, Orobanche, Ambrosia, Cirsium, Convolvulus,
Control of difficult weeds – example *Ambrosia spp.*

- **Untreated**
- **PULSAR 1.2L**
- **Conventional**

**CLEARFIELD®** reliable weed control
Orobanche treatment

PULSAR®40 1,25 l/ha

Untreated
Control of difficult weeds – example

*Oryza sativa L. var. sylvatica*}

Untreated

PULSAR®40  2x0,9 l/ha
# Risks and watch-out’s – Stewardship

## Resistant Management
- Herbicide Rotation
- Combinations
- Integrated Management
- Resistance Monitoring

## System related
- Claim management
- Webpage
- Education and training

## Information flow
- Call center
- Hotline
- Webpage
- Education and training
- Best management guides

## Volunteer management
- Chemically
- Non chemically
- Seed dispersal
- Sec. dormancy

## Out-crossing
- To non CL OSR
- Wild relatives
- Impact at non Users fields

## Product related
- Resistance monitoring
- Application timing
- Dose recommendation

## Proactive Communication
- Users
- Non-Users
- Multipliers
- Distribution and Seed co’s

## Seed Co’s
- Communication alignment
- Trainings
- Hybrid qualification
- Seed purity
No foreseeable GMO acceptance in Europe
- Drastically reduced number of active ingredients
- No new AI’s on the horizon
- Research concentrating on “large crops”
- Smaller crops are depending mid / long term on HT developments
- Success strongly related to the direct value for the farmer
- Requests increasing for special crops (e.g. vegetables)
- High level of extra supervision and stewardship are preventative for small acreages crops.
- New / SMOA for 2nd generation of HT crops needed.
Thank you!