Cyantraniliprole insecticide seed treatment:
a new and unique tool for integrated pest management in oilseed rape
in Europe

Anita van Nieuwenhoven, September 21, 2017
Cyantraniliprole Seed Treatment
DuPont™ Lumiposa®

- A new mode of action for winter oilseed rape
- Targets early season pests Cabbage Root Fly, Cabbage Stem Flea Beetle, Cabbage Flea Beetle and Turnip Sawfly
- Offers fast-acting protection up to the BBCH 13 or 14 stage
- Strong plant establishment and vigour
- Protecting yield potential
- Safe and convenient pest management tool
- Favorable environmental profile and seed safety

Source: DuPont, Germany (2014)
# Cyantraniliprole Seed Treatment

<table>
<thead>
<tr>
<th>Target crop</th>
<th>Winter oilseed rape</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target pests</strong></td>
<td><em>Psylliodes</em> spp., <em>Phyllotreta</em> spp., <em>Delia radicum</em>, <em>Athalia rosae</em></td>
</tr>
<tr>
<td><strong>Active ingredient</strong></td>
<td>Cyantraniliprole</td>
</tr>
<tr>
<td></td>
<td>Chemical class: anthranilic diamide (IRAC Group 28)</td>
</tr>
<tr>
<td><strong>Dose rate</strong></td>
<td>50 µg active ingredient per seed</td>
</tr>
<tr>
<td></td>
<td>0.080 ml per 1000 seeds</td>
</tr>
<tr>
<td></td>
<td>1.6L/100 kg of seeds with TSW of 5.0</td>
</tr>
<tr>
<td></td>
<td>Maximum 500,000 seeds / ha</td>
</tr>
<tr>
<td><strong>Formulation</strong></td>
<td>625 g/L FS</td>
</tr>
<tr>
<td><strong>Registration status</strong></td>
<td>First regulatory approval in Poland (zRMS) end of April 2017</td>
</tr>
</tbody>
</table>

Cyantraniliprole ST (DuPont™ Lumiderm™) also used in Canada on canola. First launched in 2014, currently used on 24% of the canola acreage. Different use: spring versus winter crop, different pest spectrum, used in conjunction with standard insecticide seed treatment, at lower rate.
New mode of action for seed dressings

Cyantraniliprole impacts insect behaviour by impairing muscle function

A. Cyantraniliprole selectively binds to insect RyRs causing uncontrolled release of calcium and uncoordinated contractions
B. Depletion of internal calcium stores prevents further muscle contractions
C. Normal contraction is triggered by the release of calcium from intracellular stores, regulated by ryanodine receptors
D. Muscles are composed of muscle fibres with bundles of fibrils
New mode of action for seed dressings

1. Untreated

<table>
<thead>
<tr>
<th>Intensive feeding (biting holes)</th>
<th>Cleaning</th>
<th>Immobility 5-10 minutes</th>
<th>Intensive feeding (biting holes)</th>
<th>Phase of Immobility</th>
<th>Intensive feeding (biting holes)</th>
</tr>
</thead>
</table>

2. Treated with Cyantraniliprole Seed Treatment

<table>
<thead>
<tr>
<th>Feeding (no complete holes)</th>
<th>Cleaning</th>
<th>Immobility 20 minutes</th>
<th>Feeding (no complete holes)</th>
<th>Longer phase of immobility</th>
<th>Moves slowly, probing to feed</th>
<th>Drops to ground</th>
<th>Unable to feed, paralysed</th>
</tr>
</thead>
</table>

0hr 2hr 40-60hr
Control of key pests in WOSR

All field trials with sufficient natural infestation of the pest. Timing of infestation varied between trials. No foliar follow up application was applied in any of these trials to control these pests.

*control of damage for Delia, Psylliodes and Phyllotreta and % control of larvae for Athalia
Control of key pests in WOSR

Lumiposa® can provide a new solution for seed treatment control of key pests in winter oilseed rape.

*control of damage for Delia, Psylliodes and Phyllotreta and % control of larvae for Athalia
**Reference: suspended insecticide seed treatment with thiamethoxam
Protection against cabbage root fly (*Delia radicum*)

No insecticide ST

Cyantraniliprole ST

Source: DuPont, France (2013)
Source: DuPont growth chamber trials, France (2015)
Plants artificially infested with Delia radicum eggs (10/plant) at BBCH12

References: suspended IST with thiamethoxam (IST1) or clothianidin + beta-cyfluthrin (IST2)
Protection against cabbage stem flea beetles (*Psylliodes* spp.)

Source: DuPont, Germany (2014)
Protection against flea beetles (*Phyllotreta* spp.), BBCH 11
Protection against flea beetles (*Phyllotreta* spp.), BBCH 13

No insecticide ST

Cyantraniliprole ST

Source: DuPont, Field trial France 2016
Better crop establishment

73% of cases better than untreated

X-axis: trials, all with pest present (including *Psylliodes chrysocephala*)
Y-axis: Plant count versus no IST (100%: same as No IST)

Source: DuPont, 52 trials across countries (2009-2015)

Pictures: trial Germany, 2014, Pest: *Psylliodes chrysocephala*
More vigorous plants for better crop establishment

52% of cases better than untreated

X-axis: trials, all with pest present (including *Psylliodes chrysocephala*)
Y-axis: vigour improvement versus no IST (scale -5 to 5)

Source: DuPont, 44 trials across countries (2009-2015)

Pictures: trial Nithy France, 2015, Pest: *Psylliodes chrysocephala*
A new tool in an Integrated Pest Management program

Cyantraniliprole ST selectively controls pests that feed on plant tissue.

Cyantraniliprole ST is unlikely to pose a risk to pollinators and beneficial arthropods because of the product’s toxicity profile and the low to no exposure levels when following label instructions.

Cyantraniliprole ST protects the seedling up to BBCH 13 or 14 stage.

In case of high infestations, additional foliar applications of insecticides can be needed.
Resistance management Group 28 insecticides

- Avoid using the same mode of action on consecutive generations of insect pests.
- Including the seed treatment, make no more than two applications of cyantraniliprole or other Group 28 products per generation to the same insect species on a crop or within a 30 day period (count planting date as day 1 if using treated seed).
- Application to the next generation of target pest(s) must be with an effective product with a different mode of action (non-Group 28 insecticide).
- Incorporate IPM techniques into the overall pest management program.
- Monitor insect populations for product effectiveness in case of reduced efficacy.
Monitoring/baseline susceptibility *Psylliodes chrysocephala*

- Method set up and validated by BTL in 2015
- Based on IRAC Method #027
  - Glass vials coated
  - 4 replicates of 8 adults
  - Incubation in the dark at 20°C
  - Evaluation 96 hours later

Cyantraniliprole tested side by side with Lambda cyhalothrin

2016: 5 populations tested (2 UK, 3 DE)
2017: ongoing, 8 so far collected (5UK, 3 PL, pending: HU, DE, FR)
Monitoring/baseline susceptibility *Delia radicum*

Based on IRAC Method #026 Version 1 (May 2011)

- Test unit:
  - 1 treated dental wick 2cm
  - in 40ml plastic container
  - Lid perforated with one hole 2mm diameter

- Insecticide solution with 100g/L sucrose

- 8 or 6 reps of 5 *D. radicum* adults, less than 7 days old

- Infestation in cool chamber (5-8°C)
- Incubation at 17°C/20°C +/-1°C, 16/8 D/N, 60% RH, no direct or uneven light.
- Evaluation 96 and 144 hours later

Method robust for adults less than 7 days old.

Method to be validated (ongoing)
Conclusion

- Cyantraniliprole ST is a new insecticide seed treatment product for WOSR
- It provides protection against key pests in WOSR, thus improving crop establishment
- A new Mode of Action for seed treatment: an additional tool for resistance management and IPM
- Based on several studies, Cyantraniliprole ST poses low risk to pollinators and beneficial arthropods if applied according to label recommendations
Questions?

Thank you

DuPont®

The miracles of science™
USE PLANT PROTECTION PRODUCTS SAFELY AND WITH RESPONSIBLE CARE.
PLEASE ALWAYS FOLLOW THE LABEL WHEN USING PLANT PROTECTION PRODUCTS.

All DuPont products marked with ® or ™ may not be registered for sale or use in all countries. No offer for sale, sale or use of these products are permitted prior to issuance of the required country, region or state registrations.

Claims of crop growth enhancement and yield improvements are based on internal trials and data. Actual field results may vary.

Copyright © 2017 DuPont. All rights reserved. The DuPont oval logo, DuPont™, The miracles of science™ and all products denoted with ® or ™ are registered trademarks or trademarks of E.I. du Pont de Nemours and Company or its affiliates.