Monitoring of the UK’s 2015/16 neonicotinoid derogation for oilseed rape

Dr Sacha White, Senior research entomologist, ADAS
Background

- 24 May 2013: Restriction on the use of three neonicotinoids (NNI) adopted by the European Commission.
- Applied to clothianidin, thiamethoxam and imidacloprid on bee attractive plants and cereals
- Autumn 2014: First WOSR for which NNI seed treatments are unavailable. In 2011 and 2013 NNI seed treatments had been used on 98% and 91% of WOSR respectively\(^2\).
- Winter 2014: Crop losses due to adult CSFB feeding estimated at 5% of national crop (>31,000 ha)\(^1\).
- Spring 2015: NFU apply for a derogation for the use of NNI seed treatments in WOSR.
- 24 July 2015: CRD grant emergency authorisations for the use of Cruiser OSR (thiamethoxam) and Modesto (clothianidin).

---

\(^1\) Nicholls, 2015; \(^2\) Dewar, 2016.
Emergency authorisations

- Modesto and Cruiser OSR to be used for approx. 5% of national crop (31,000 ha).

- Focussed on four high risk counties in East of England (Bedfordshire, Cambridgeshire, Hertfordshire and Suffolk).

- A condition of the approval was “to generate robust, detailed data on both treated and untreated crops” relating to “adult and larval numbers, crop establishment/damage and effects on crop yields, resistance occurrence and management”.

- ADAS asked to design and manage the study undertaken to fulfil this requirement.
Study design

- Farmer drilled
- Minimum size
- Regular shape
- Uniformity
- Same variety and drill date
- Randomly allocated
- No sprays to NNI within 14 days of emergence.

Drilled with non-neonicotinoid treated seed (UTC)

Drilled with neonicotinoid treated seed (NNI)

Assessment area

Direction of drilling
Study design

- Not possible at all sites.
- Approval from CRD 13 August.
- Grower desire to drill before CSFB migration.
- Lack of growers with enough NNI and UTC seed of same variety.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split</td>
<td>13</td>
</tr>
<tr>
<td>Strip</td>
<td>26</td>
</tr>
<tr>
<td>Paired</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
</tr>
</tbody>
</table>
Assessments

• Plant populations
• Foliar damage
• Adult CSFB using yellow water traps
• Larval numbers and damage
• Yield at harvest
• CSFB resistance
• Cross-site analysis included a co-factor analysis to account for between site variation.
Plant populations (cotyledon – two leaf stage)

- Cross-site means: NNI = 51.4 per m². UTC = 40.7 per m².
- Significant increase in NNI (P < 0.001).
Plant populations (three – four leaf stage)

- Cross-site means: NNI = 51.1 per m². UTC = 44.6 per m²
- Significant increase in NNI (P = 0.001).
Foliar damage (cotyledon – two leaf stage)

- Cross-site means: NNI damage = 9%. UTC damage = 19%.
- Significant % reduction in leaf area loss in NNI (P <0.001).
- Co-factor analysis: Reduction in leaf area lost greater in conventional than hybrid varieties, and on clay than lighter soils.
Foliar damage (three – four leaf stage)

• Cross-site means: NNI damage = 23%. UTC damage = 23%.
• No significant difference between treatments.
• Co-factor analysis: Reduction in leaf area lost greater where >1 foliar insecticide applied.
Adult CSFB populations

- Cross-site means: NNI = 40 per week. UTC = 30 per week.
- Significant % increase in adults in NNI (P <0.001). NNI crops more attractive?
- Co-factor analysis: Increase in adults in NNI greater in crops drilled after week 34 (e.g. late August). Timing of migration?
Larval CSFB damage and numbers

- NNI mean = 18 per plant.
- UTC mean = 5 per plant.
- Significant % increase in larvae in NNI (P = 0.022).
- Consequence of more adults in NNI?
Yield at harvest

- NNI mean = 3.4 t/ha.
- UTC mean = 3.5 t/ha.
- No significant difference between treatments.
- No within site replication.
- Co-factor analysis: Yield reductions in NNI greater where migration occurred before cotyledon stage.
- Mean 2016 yield for E and SE England = 3.6 t/ha\(^1\).
- 11 crops lost.

\(^1\)Defra, 2016
Pyrethroid resistance

- Resistance detected at 95% of sites.
- No significant difference between treatments or relationship with number of pyrethroid applications.
Conclusions

- Largest independent study of NNI seed treatment efficacy.
- Provided good protection against early CSFB damage.
- Significant increases in plant population and reductions in foliar damage.
- Protection during crop emergence. No thresholds and difficult to predict/monitor.
- No effect on yield.
- Unexpected increases in adult and larval numbers in NNI crops.
- Growers with highest CSFB pressure have highest incidence of pyrethroid resistance (though with some variation) so no effective control options.
Thank you for listening.

Thanks to:

Alan Dewar (Dewar Crop Protection)
Chris Dyer (ADAS statistician)
ADAS technical staff
Host farmers
Steve Foster (Rothamsted Research)