Cereal Aphid & BYDV Control

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Outline

♦ Cereal Aphids & BYDV

♦ Kdr resistance

♦ Control Options

♦ Looking forward
Barley Yellow Dwarf Virus (BYDV)

Aphids:

♦ Grain Aphid
   (*Sitobion avenae*)

♦ Rose-grain aphid
   (*Metopolophium dirhodum*)

♦ Bird-cherry aphid
   (*Rhopalosiphum padi*)
Barley Yellow Dwarf Virus (BYDV)

Aphids:

- Grain Aphid 
  \( (Sitobion avenae) \)
- Rose-grain aphid 
  \( (Metopolophium dirhodum) \)
- Bird-cherry aphid 
  \( (Rhopalosiphum padi) \)

PAV
Grain Aphid & BYDV

- *Sitobion avenae* (Grain Aphid)
- Reduces grain yield & quality
- Transmits BYDV
- *Kdr* confers partial pyrethroid resistance

### Yield loss due to BYDV

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter barley (early Sept)</td>
<td>3.7 t/ha</td>
</tr>
<tr>
<td>Spring barley (Late April)</td>
<td>1.99 t/ha</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>1.2 t/ha</td>
</tr>
</tbody>
</table>

Kennedy, 2014
‘Knock Down Resistance’ or ‘kdr’ was first identified in the UK in 2012 and in Ireland 2013

- Aphids with ‘kdr’ gene are less susceptible to pyrethroids
- To date, ‘kdr’ has only been identified in *Sitobion avenae* (Grain Aphid), an important vector of Barley Yellow Dwarfing Virus (BYDV)
- In UK & Ireland a single clone (SA3) is most often associated with the kdr mutation that confers partial pyrethroid resistance
- Research indicates aphids carrying the resistance gene occur in all major grain growing regions
Field Collection sites

Field collections have been focused in major barley growing counties based on Teagasc acreage data.
$kdr$ incidence in Ireland

$kdr$ widely present in $S. \textit{avenae}$ populations across arable counties in Ireland

$kdr$ occurs in aphid populations on both barley crops and adjacent grass hosts
BYDV Infection and sowing date

*General representation*

- From 3rd week in October
- From 2nd week in April

Kennedy, 2014
Aphid No/m² in barley sown on three dates
Sampled 30 November

Kennedy, 2014
### Autumn BYDV Control

<table>
<thead>
<tr>
<th>Crop</th>
<th>BYDV Risk</th>
<th>Control Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early sown (Sept) cereals</td>
<td>High</td>
<td>Seed treatment &amp; pyrethroid in Nov Or Spray at 2/3 leaf stage &amp; 1(^{st}) week Nov</td>
</tr>
<tr>
<td>Oct sown</td>
<td>Medium to high</td>
<td>Seed Treatment Or Pyrethroid spray 1(^{st}) week Nov</td>
</tr>
<tr>
<td>Emerging after Nov</td>
<td>Low</td>
<td>Control needed in mild winters where aphids are plentiful or in risk areas</td>
</tr>
</tbody>
</table>

Monitor for control failure – do not reapply the same treatment.
Late spraying of previously unsprayed crops – beneficial when aphids/virus is widespread
BYDV Control – 2017 Cork Trial

Evidence of high BYDV pressure

Untreated  Pyrethroid  Seed Treatment

Winter Barley, Cassia, Sown 12th October, Cork
## Insecticide trial Cork 2017

<table>
<thead>
<tr>
<th>Redigo deter Seed Treatment</th>
<th>Pyrethroid foliar application</th>
<th>% BYDV</th>
<th>Yield</th>
<th>No. live aphids/m² @GS31</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>39</td>
<td>4.6</td>
<td>30.9</td>
</tr>
<tr>
<td>No</td>
<td>Nov (2/3 leaf stage)</td>
<td>11.4</td>
<td>6.1</td>
<td>7.7</td>
</tr>
<tr>
<td>No</td>
<td>Jan</td>
<td>4.5</td>
<td>7</td>
<td>3.9</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>7</td>
<td>4.4</td>
</tr>
<tr>
<td>Yes</td>
<td>Nov (6 weeks from planting)</td>
<td>2.6</td>
<td>7</td>
<td>3.3</td>
</tr>
<tr>
<td>Yes</td>
<td>Jan</td>
<td>2</td>
<td>7</td>
<td>1.65</td>
</tr>
</tbody>
</table>

One year data only
kdr Grain Aphids identified in plots
BYDV Control – 2017 Carlow Trial

Winter Barley, Cassia, Sown 3rd October, Carlow
# Insecticide trial Carlow 2017

<table>
<thead>
<tr>
<th>Redigo deter Seed Treatment</th>
<th>Pyrethroid foliar application</th>
<th>% BYDV</th>
<th>Yield</th>
<th>No. live aphids/m2 @GS31</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>3.7</td>
<td>7.2</td>
<td>12.7</td>
</tr>
<tr>
<td>No</td>
<td>Nov (2/3 leaf stage)</td>
<td>2.3</td>
<td>8.8</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>Jan</td>
<td>2.6</td>
<td>8.6</td>
<td>1.65</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>8.8</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>Nov (6 weeks from planting)</td>
<td>1.9</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>Jan</td>
<td>0.9</td>
<td>9.2</td>
<td>0</td>
</tr>
</tbody>
</table>

One year data only
kdr Grain Aphids identified in plots
Spring Barley BYDV Control

Yield loss due to BYDV

March v April % BYDV

Mean of 8 seasons
Kennedy, 2014
Spring Barley BYDV Control

Sown 26\textsuperscript{th} April

<table>
<thead>
<tr>
<th>G.S. Spraying</th>
<th>%BYDV</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-leaf</td>
<td>17.2</td>
<td>5.1</td>
</tr>
<tr>
<td>4-leaf</td>
<td>8.6</td>
<td>5.6</td>
</tr>
<tr>
<td>2-leaf + 4-leaf</td>
<td>8.0</td>
<td>5.5</td>
</tr>
<tr>
<td>4-leaf + first node</td>
<td>6.7</td>
<td>5.5</td>
</tr>
<tr>
<td>First node</td>
<td>24.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Second node</td>
<td>27.5</td>
<td>4.8</td>
</tr>
<tr>
<td>G.S. 12 + 14 + 24 + 31</td>
<td>5.7</td>
<td>5.5</td>
</tr>
<tr>
<td>Untreated</td>
<td>36.4</td>
<td>4.3</td>
</tr>
<tr>
<td><strong>LSD (5%)</strong></td>
<td>5.986</td>
<td>0.506</td>
</tr>
</tbody>
</table>

Kennedy, 2014
# Spring BYDV Control

<table>
<thead>
<tr>
<th>Crop</th>
<th>BYDV Risk*</th>
<th>Control Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>March sown spring cereals</td>
<td>V. low</td>
<td>Aphicide spray may not be neccesary</td>
</tr>
<tr>
<td>April sown spring cereals</td>
<td>Medium to high</td>
<td>Single pyrethroid spray at G.S.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seed treatments not permitted in spring</td>
</tr>
</tbody>
</table>

**Spring wheat and oats:**
- Normal sowing dates (pre-April) – negligible risk
- Jan & Feb sown: No treatment needed
- IF sown in April: spray pyrethroid @ 3-4 leaf
Looking Forward

Risk Factors
♦ Early sown autumn crops / late sown spring crops
♦ Mild winters (Aphids overwintering)
♦ Mild Autumns (Aphid migration period lengthened)

Challenges
♦ No Redigo deter?
♦ Further resistance development
♦ Diminishing products – increased resistance
♦ Climate change

Future Avenues
♦ Importance of cultural control
♦ Alternative insecticides?
♦ Variety selection
♦ Biocontrol: Encouraging natural enemies
♦ Improved monitoring
Establishment & management of Ecological Focus Areas to enhance IPM

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Contact: Louise.McNamara@Teagasc.ie Daire.OHuallachain@teagasc.ie, Robyn.Earl@Teagasc.ie
Objectives

- Assess how establishment & management of EFA’s can be utilised within IPM
- Determine the impact of selected EFA’s on crop yields.
- Relate differences in yield to pest/disease levels in those areas
- Are pest/disease levels correlated with the EFA?
- Do EFA’s encourage beneficial organisms and enhance natural pest control?
- Can management of EFA’s be a tool in IPM programs?
- Determine arable farmers attitudes to measures to enhance ecosystem services.
Background

♦ Arable margins provide habitats, enhance pollination services, improve water quality & can enhance productivity

♦ Increases in crop yield (wheat, oilseed rape or beans) due to sown arable margins, can match/exceed yield associated with the land removed for the margin - up to 8% of field (Pywell et al. 2015).

♦ This project will assess benefits of arable margins for biodiversity, IPM, yield improvement and virus suppression.
Methology

♦ **Experimental margins** sown with a variety of treatments

♦ **Observational margins:** Existing GLAS margins will be monitored

♦ Margins monitored for vegetative composition and establishment.

♦ Margins and adjacent crop monitored for pests and natural enemies to evaluate the margins’ impacts on pest management.

♦ Crop measured for yield and virus levels to assess the impacts of arable margins on the adjacent crops.

Established wildflower margin
Kildalton Agricultural College
Experimental Margins

♦ Control A- Crop to the edge
♦ 1 - 100% Cocksfoot (25-30kg/ha)
♦ 2 - 50% Cocksfoot + 50% Timothy sown (25-30kg/ha)
♦ 3 - 60% Timothy / Cocksfoot + 40% Crested Dogstail and smooth stalked meadow grass (20kg/ha)
♦ 4 - As plot 4 sown at 16Kg + 4kg of – 18% Ox-eye Daisy, 15% knapweed, 10% wild carrot, 5% yarrow, 12% red campion, 7% red clover, 8% sorrel, 2% tufted vetch, 15% birdsfoot trefoil, Ladys Bedstraw 8%
♦ Control B- Natural regeneration
# Summary

## Autumn cereals

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<th>BYDV Risk</th>
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<td>Pyrethroid aphicide at 4 leaf</td>
</tr>
</tbody>
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Seed treatments not permitted for Spring sown cereals
Acknowledgments

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Fiona Hutton

UCD
Dr Gordon Purvis

Rothamsted Research
Dr Steve Foster
Dr Martin Williamson
National Tillage Conference 2018

Wednesday 31st Jan.
Lyrath Estate Hotel, Kilkenny