Cereal Aphid & BYDV Control

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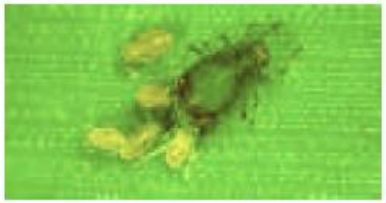
Outline

- 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*)



MAV Mild strain

RPV

Barley Yellow Dwarf Virus (BYDV)

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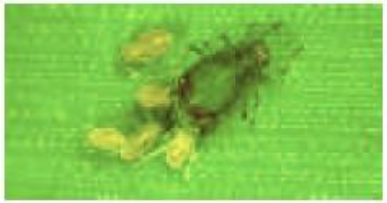


PAV

Grain Aphid & BYDV

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

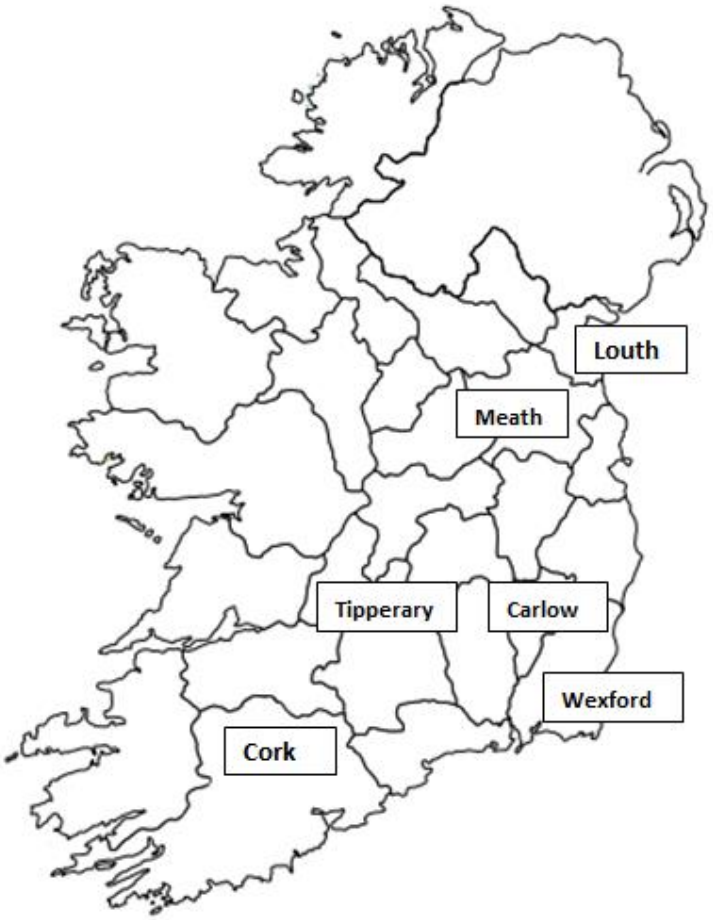
Yield loss due to BYDV	
Crop	Yield Reduction
Winter barley (early Sept)	3.7 t/ha
Spring barley (Late April)	1.99 t/ha
Winter wheat	1.2 t/ha

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

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kdr incidence in Ireland

Fields with spray failure – to confirm kdr

Randomly selected fields

kdr widely present in *S. avenae* populations across arable counties in Ireland

kdr occurs in aphid populations on both barley crops and adjacent grass hosts

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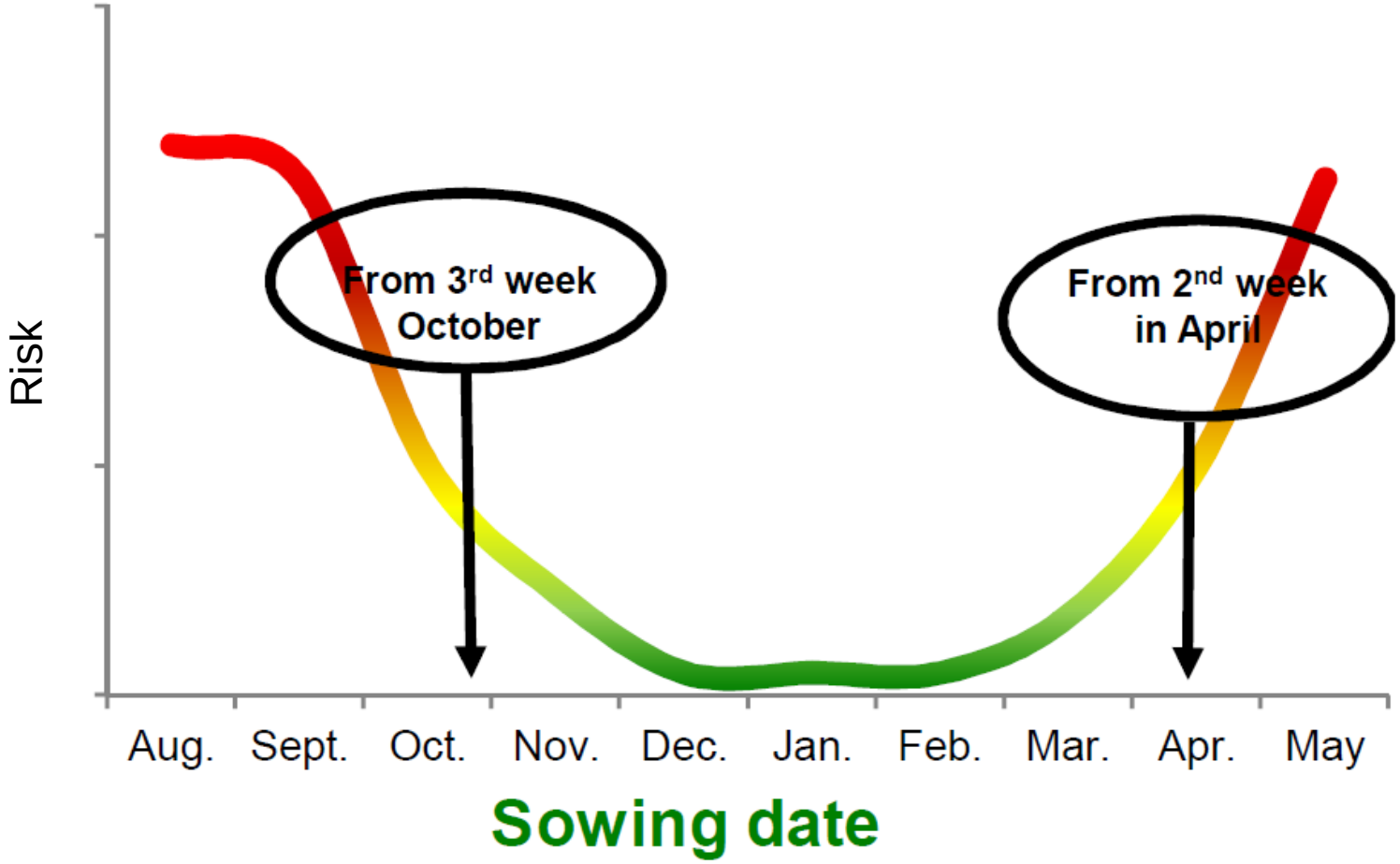
BYDV Infection and sowing date

General representation



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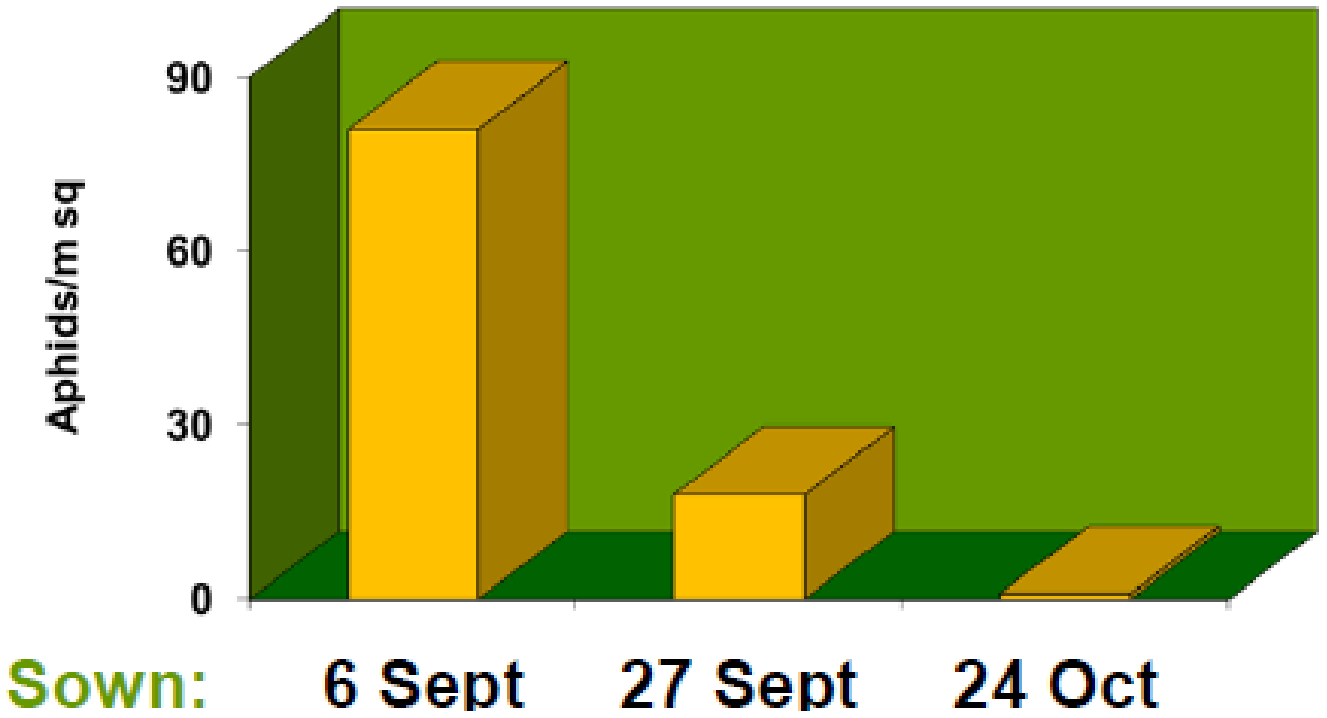
Aphid No/m^2 in barley sown on three dates

Sampled 30 November



Kennedy, 2014

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Autumn BYDV Control

Crop	BYDV Risk	Control Action
Early sown (Sept) cereals	High	Seed treatment & pyrethroid in Nov Or Spray at 2/3 leaf stage & 1st week Nov
Oct sown	Medium to high	Seed Treatment Or Pyrethroid spray 1st week Nov
Emerging after Nov	Low	Control needed in mild winters where aphids are plentiful or in risk areas

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

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BYDV Control – 2017 Cork Trial

Untreated Pyrethroid Seed Treatment

Winter Barley, Cassia, Sown 12th October, Cork

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Insecticide trial Cork 2017

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

One year data only
kdr Grain Aphids identified in plots

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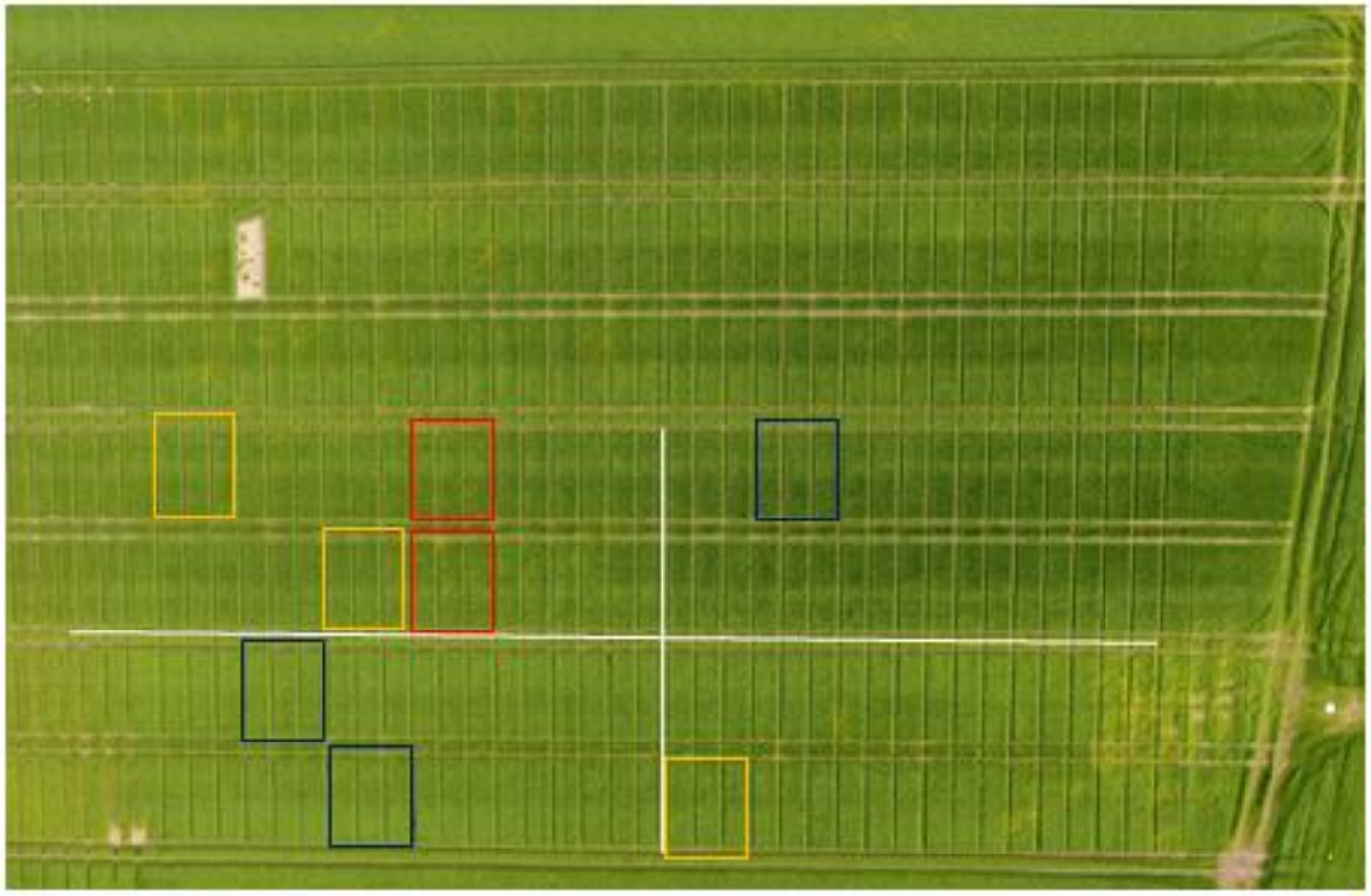
BYDV Control – 2017 Carlow Trial



Winter Barley, Cassia, Sown 3rd October, Carlow

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Insecticide trial Carlow 2017

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

One year data only
kdr Grain Aphids identified in plots

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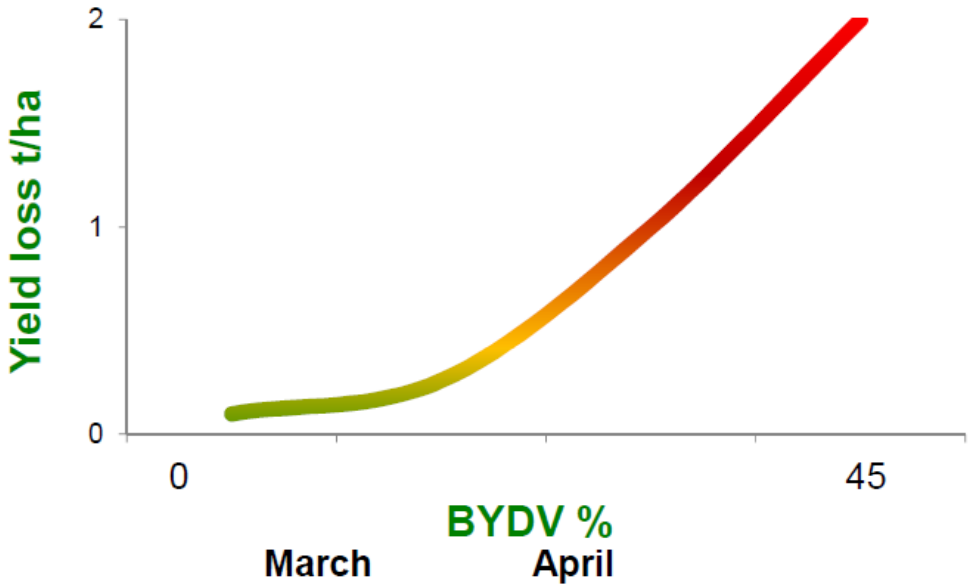
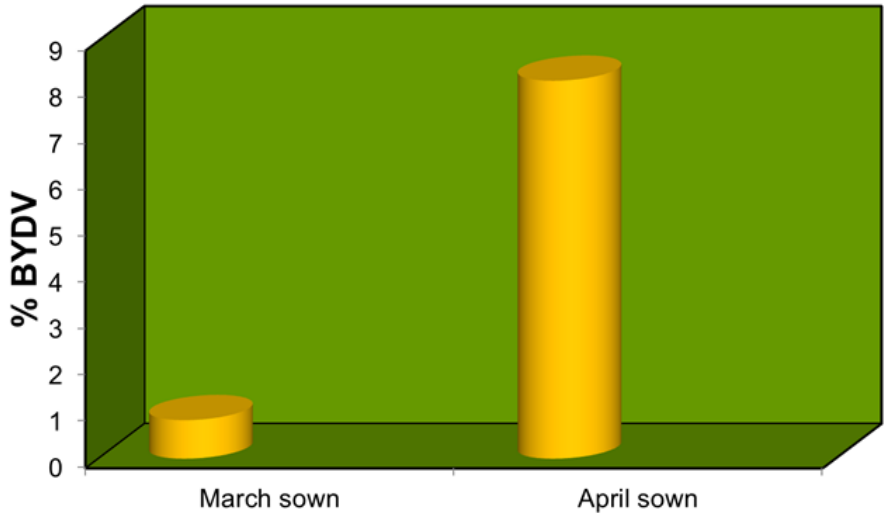
Spring Barley BYDV Control

Yield loss due to BYDV



March v April % BYDV



Mean of 8 seasons

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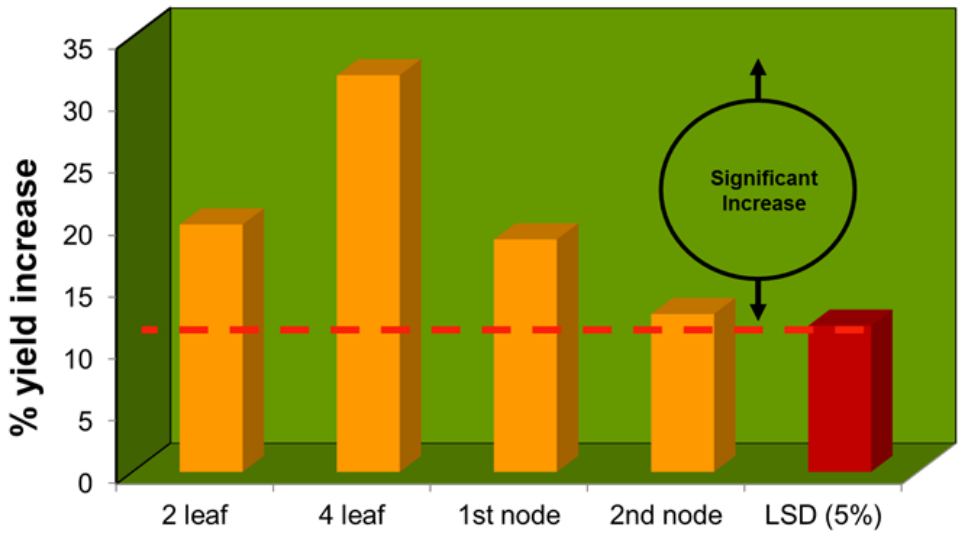
Spring Barley BYDV Control



Sown 26th April

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

Kennedy, 2014

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Spring BYDV Control

Crop	BYDV Risk* *Based on 8 years Teagasc trials	Control Action
March sown spring cereals	V. low	Aphicide spray may not be neccesary
April sown spring cereals	Medium to high	Single pyrethroid spray at G.S.14
		Seed treatments not permitted in spring

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

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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

THE UNIVERSITY of EDINBURGH
School of GeoSciences

SRUC

Establishment & management of Ecological Focus Areas to enhance IPM

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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

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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		
Sowing date	BYDV Risk	Control Action
Early sown (Sept)	High	Seed treatment & Pyrethroid aphicide in Nov Or Aphicide at 2/3 leaf stage & 1st week Nov
Oct sown	Medium to high	Seed treatment Or Pyrethroid aphicide 1st week Nov
Emerging after Nov	Low	Control needed in mild winters where aphids are plentiful or in risk areas

Spring cereals		
Sowing date	BYDV Risk	Control Action
March sown	Low	Aphicide spray may not be necessary
April sown	Medium to high	Pyrethroid aphicide at 4 leaf
		Seed treatments not permitted for Spring sown cereals

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