# AHDB Agronomy 2020

## East Anglia

12th February 2020, Rowley Mile Racecourse, Newmarket

# Before we start…


**@AHDB_Cereals**
**@CerealsEA**

# Agenda

| | | |
|---|---|---|
| **09:45** | **Chair's welcome and AHDB Update** | Teresa Meadows |
| **10:00** | **Aphid and CSFB Research and Management** | Dr Daniel Leybourne, ADAS |
| **10:35** | **Bio-pesticides and the opportunity** | Dr Dave Chandler, University of Warwick |
| **11:10** | **Panel discussion** | Daniel Leybourne and Dave Chandler |
| **11:30** | **REFRESHMENT BREAK** | |
| **11:45** | **Disease management in 2020** | Stuart Knight, NIAB TAG |
| **12:15** | **Panel discussion** | Stuart Knight and Sean Burns, AHDB |
| **12:30** | **Livestock and the arable rotation** | Shirley Macmillan, AHDB |
| **12:45** | **Monitor Farmer's closing comments** | Richard Ling, Diss Monitor Farm |
| **13:00** | **LUNCH AND EVENT CLOSE** | |

# Slides available…


Home > Agronomy 2020

## Agronomy 2020

AHDB's Agronomy series will bring the learnings from the Agronomists' Conference to your region, giving you the opportunity to discuss the latest research with experts from across the cereals, oilseeds and potato industries.

These events will provide information, thought-provoking conversations and opportunities to feedback. You will be joined by a range of speakers from research, industry and farming to provide expertise from all areas of agriculture.

The events in Scotland have been organised in partnership with SRUC and FAS.

### Agronomy: South East

14 January 2020

Mercure Tunbridge Wells, Tonbridge Road, Tunbridge Wells, Kent TN2 4QL

View the presentations

### Agronomy: Perth

In partnership with SRUC & FAS

14 January 2020

Murrayshall Country House Hotel and Golf Club, Murrayshall Road, Perth, PH2 7PH

### Related Videos



**https://ahdb.org.uk/agronomy-2020**

# In the breaks…

AHDB RECOMMENDEDLISTS

WHEAT VARIETY SELECTION

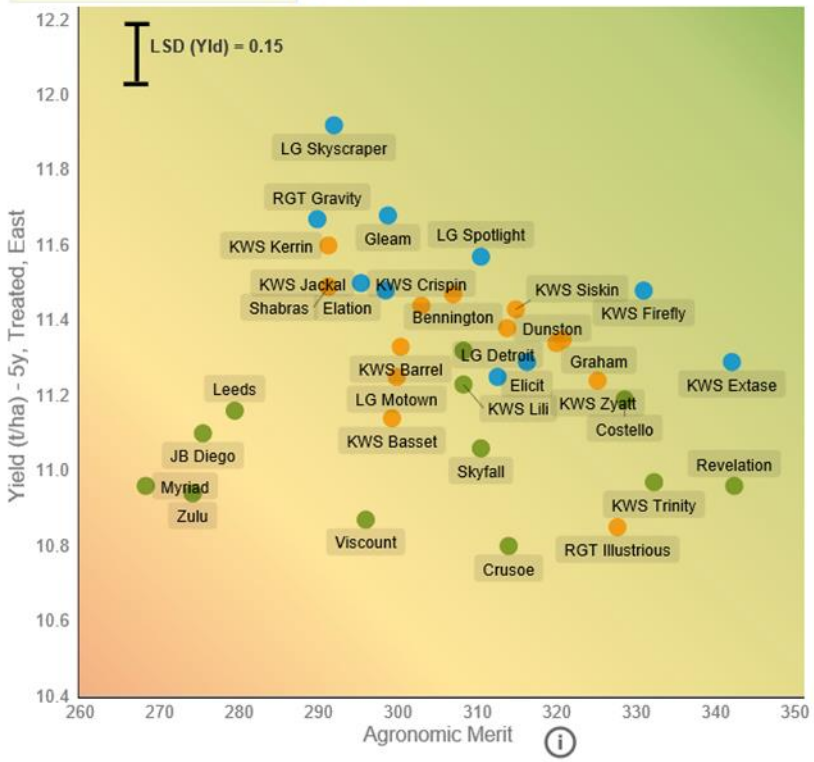
Select regional yield measure on Y-axis

5 year data: UK (T) | East (T) | North (T) | West (T) | UK (U) | UK (TB)

Last year data: UK (U) | UK (TB)

Distinguish variety points in graph by:

Years on RL ● 1-2 ● 3-4 ● 5 or more




## Agronomic Merit calculation

| | | | | | |
|---|---|---|---|---|---|
| Lodging (+PGR) | Very high | RL rating | Lodging (-PGR) | Medium | RL rating |
| Septoria tr. | Very high | RL rating | Yellow rust | High | RL rating |
| Mildew | Medium | RL rating | Fusarium | Medium | RL rating |

## Variety filters

| | | | | |
|---|---|---|---|---|
| End-use group: All | Variety: All | | | |
| Yield (early drilled): 95 – 104 | Yield (late drille: 94 – | | | |
| Yield (light soils): 94 – 105 | Yield (he: 97 – | | | |
| HFN: 150 – 343 | Specific weight: 74.4 – 80.9 | Pro: 11.6 – | | |
| UK distilling suitability: All | Export suitability: All | | | |
| Ripening days: All | Sprouting resist.: All | OWBM resistance: All | | |
| Height (-PGR): 78 – 90 | Latest safe sowing date: All | Clear all filters | | |

# AHDB Update

Teresa Meadows, Knowledge Exchange Manager, AHDB

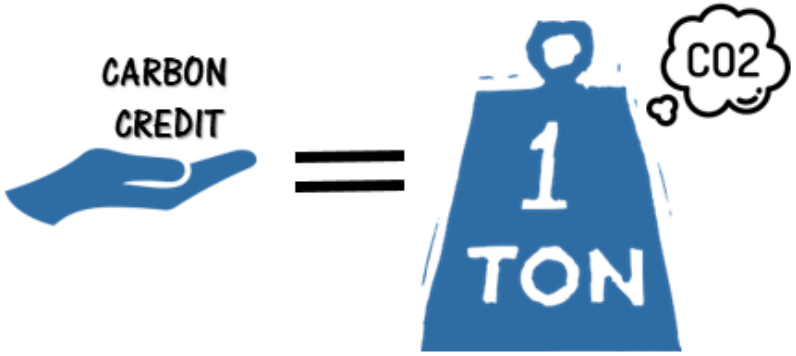
CEREALS & OILSEEDS

# Our industry outlook

parliament in 2024.

In the first year of BPS cuts (2021), the biggest reductions will be applied to the higher payment bands, as follows:

| Payment band | Maximum reduction |
|---|---|
| Up to £30,000 | 5% |
| £30,000-£50,000 | 10% |
| £50,000-£150,000 | 20% |
| £150,000 or more | 25% |




# AHDB

AHDB

- We are a statutory levy board funded by farmers, growers and processors in the supply chain.
- Our purpose is to equip levy payers with evidence-based information and tools to grow, become more competitive and sustainable.

INDEPENDENT

BEEF & LAMB

CEREALS & OILSEEDS

DAIRY

HORTICULTURE

PORK

POTATOES

# Knowledge gaps


CEREALS & OILSEEDS

# AHDB Corporate Strategy 2020-2025

CEREALS & OILSEEDS

# Timeline

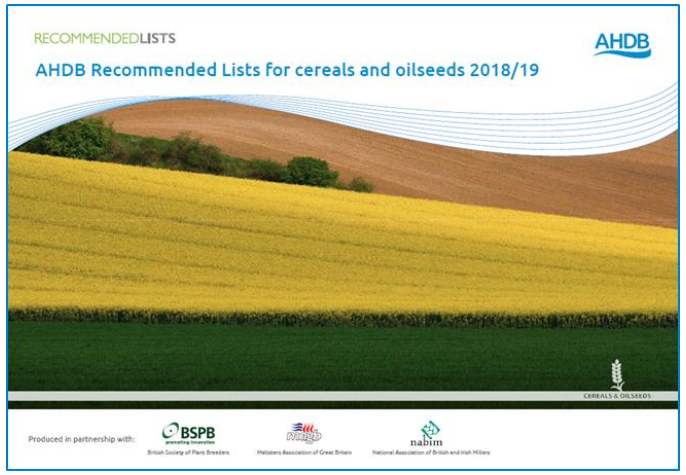
Until March 2020

New Chair

# AHDB Proposed Strategy – Strategic Pillars

# Research

# Research




Pests

Soil

Diseases

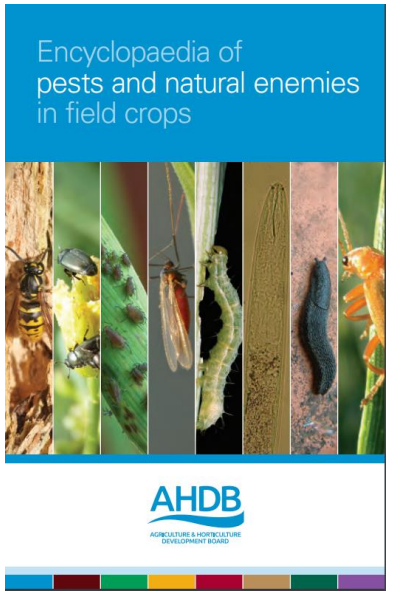
Weeds

Quality

Nutrient management

Varieties

Business Planning




**For all research, visit: ahdb.org.uk**

# Research

## For all research, visit: ahdb.org.uk

AHDB

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## Knowledge library

Filter by..

Sector | Topic | Keywords | Search | Reset


### Driving productivity growth together

The UK undoubtedly has some of the most productive, dynamic and inspirational farming and growing businesses in the world.


### The WTO and its implications for UK agriculture

AHDB's series of Horizon reports has previously looked at some of the issues that will be critical in shaping the agri-food sector following Brexit.


### Brexit prospects for UK agri-food trade

Understand how agri-food trade could be affected once the UK leaves the EU, under both an agreed withdrawal and under a 'no deal' scenario.


### Consumer Focus: Buying British

Within this report, we investigate whether the EU referendum is likely to deliver a boost for domestic growers and producers on the back of

### Drought

### Retail Insights: The

### Soil Health and Water


### The characteristics of

AHDB

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Home > Research reports

## Research reports

### Research and knowledge exchange strategy

AHDB is the major funder of applied agricultural and horticultural research and knowledge exchange in the UK.

### PhD studentships

Delivering new experts and science with practical benefits across agriculture and horticulture

### Search our research archive

Keywords

Sector | Topic | Search | Reset

# Research Managers

# Wheat and barley disease management guide

# Coming later this year…

## Oilseed rape disease management guide

GREATSOILS

**Download AHDB's new guide on the principles of soil management**

*Learn more about:*

- *Soil health*
- *Soil texture and structure*
- *Cation exchange capacity*
- *Soil organic matter*
- *Soil biology*

***www.ahdb.org.uk/greatsoils***

# Coming very soon…

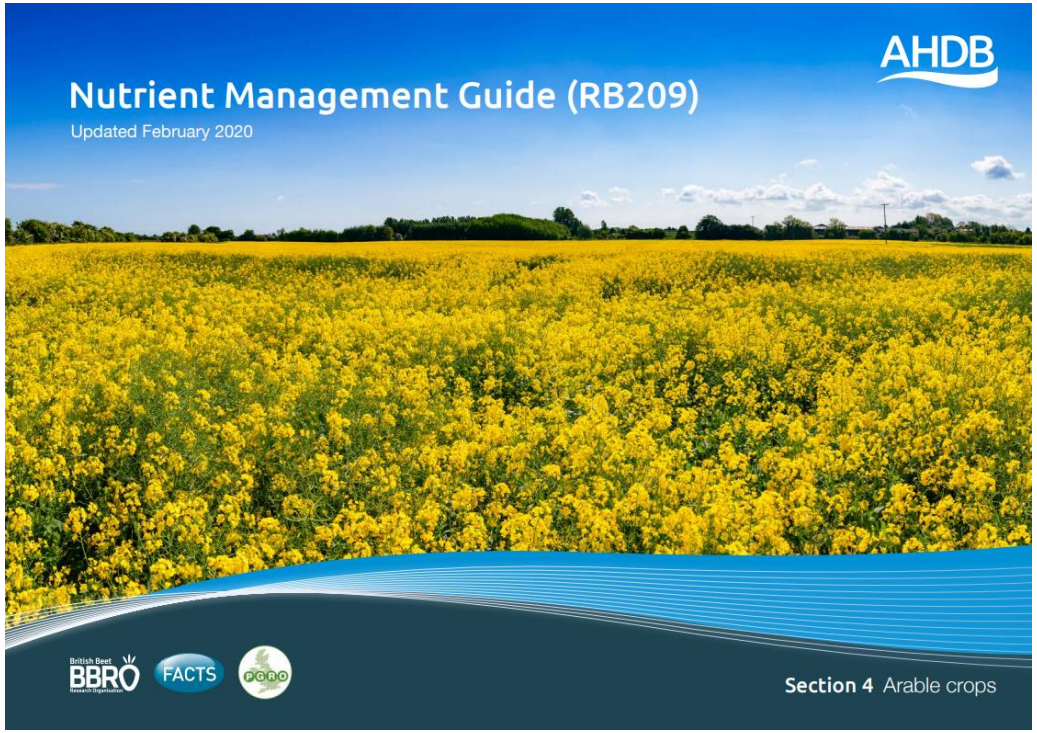
# Arable soil management guide

# RB209 – Key changes

- Greater emphasis on soil and grain analysis
- Guidance on grain sampling
- Alignment of standard yields for N and P/K recommendations

# RB209 – Key changes

- Reduction in P offtake in winter wheat
- Grain P offtake updated
- P and K recommendation tables revised
- Download the RB209 app



# New publications


FACTSHEET

AHDB

Cereal straw – incorporate or sell?

Cereal straw has become an increasingly versatile and valuable commodity. Today, straw markets include renewable energy systems, for both domestic heating and power generation, overwinter carrot production and mushroom production. This is in addition to its traditional use as livestock bedding. At the same time, the incentives to chop straw have increased. Soil health is one of the main drivers, with many aiming to reap the longer-term benefits associated with straw incorporation. Another key reason cited for incorporating straw is that it is an 'easier' option, for some.

The increase in demand for straw has seen prices respond. In the last decade, big bale straw prices in excess of £40/t have become more frequent. Volatile demand (e.g. spikes in consumption for animal bedding during long, cold winters) and supply also result in significant short-term price fluctuations.

This publication looks at the pros and cons associated with the decision to either incorporate or sell straw. It provides examples of how to value straw, especially its nutrient value, and looks at the implications to other farm operations. Armed with a better understanding of the monetary and non-monetary implications, this publication will help you decide on the best option for your farm business.

£/tonne

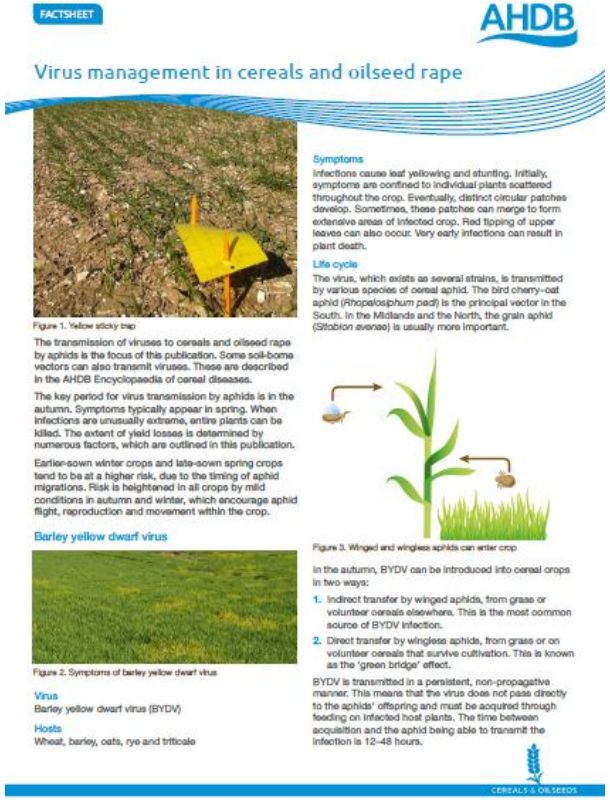
Big square baled barley straw

Big square baled wheat straw

Big bale straw prices

Source: British Hay & Straw Merchants' Association/Defra, British Hay & Straw Merchants' Association/Farmers Weekly

CEREALS & OILSEEDS


FACTSHEET

AHDB

Virus management in cereals and oilseed rape

Figure 1. Yellow sticky trap

The transmission of viruses to cereals and oilseed rape by aphids is the focus of this publication. Some soil-borne vectors can also transmit viruses. These are described in the AHDB Encyclopaedia of cereal diseases.

The key period for virus transmission by aphids is in the autumn. Symptoms typically appear in spring. When infections are unusually extreme, entire plants can be killed. The extent of yield losses is determined by numerous factors, which are outlined in this publication.

Earlier-sown winter crops and late-sown spring crops tend to be at a higher risk, due to the timing of aphid migrations. Risk is heightened in all crops by mild conditions in autumn and winter, which encourage aphid flight, reproduction and movement within the crop.

## Barley yellow dwarf virus

Figure 2. Symptoms of barley yellow dwarf virus

**Virus**
Barley yellow dwarf virus (BYDV)

**Hosts**
Wheat, barley, oats, rye and triticale

**Symptoms**
Infections cause leaf yellowing and stunting. Initially, symptoms are confined to individual plants scattered throughout the crop. Eventually, distinct circular patches develop. Sometimes, these patches can merge to form extensive areas of infected crop. Red tipping of upper leaves can also occur. Very early infections can result in plant death.

**Life cycle**
The virus, which exists as several strains, is transmitted by various species of cereal aphid. The bird cherry–oat aphid (*Rhopalosiphum padi*) is the principal vector in the South. In the Midlands and the North, the grain aphid (*Sitobion avenae*) is usually more important.

Figure 3. Winged and wingless aphids can enter crop

In the autumn, BYDV can be introduced into cereal crops in two ways:

1. Indirect transfer by winged aphids, from grass or volunteer cereals elsewhere. This is the most common source of BYDV infection.
2. Direct transfer by wingless aphids, from grass or on volunteer cereals that survive cultivation. This is known as the 'green bridge' effect.

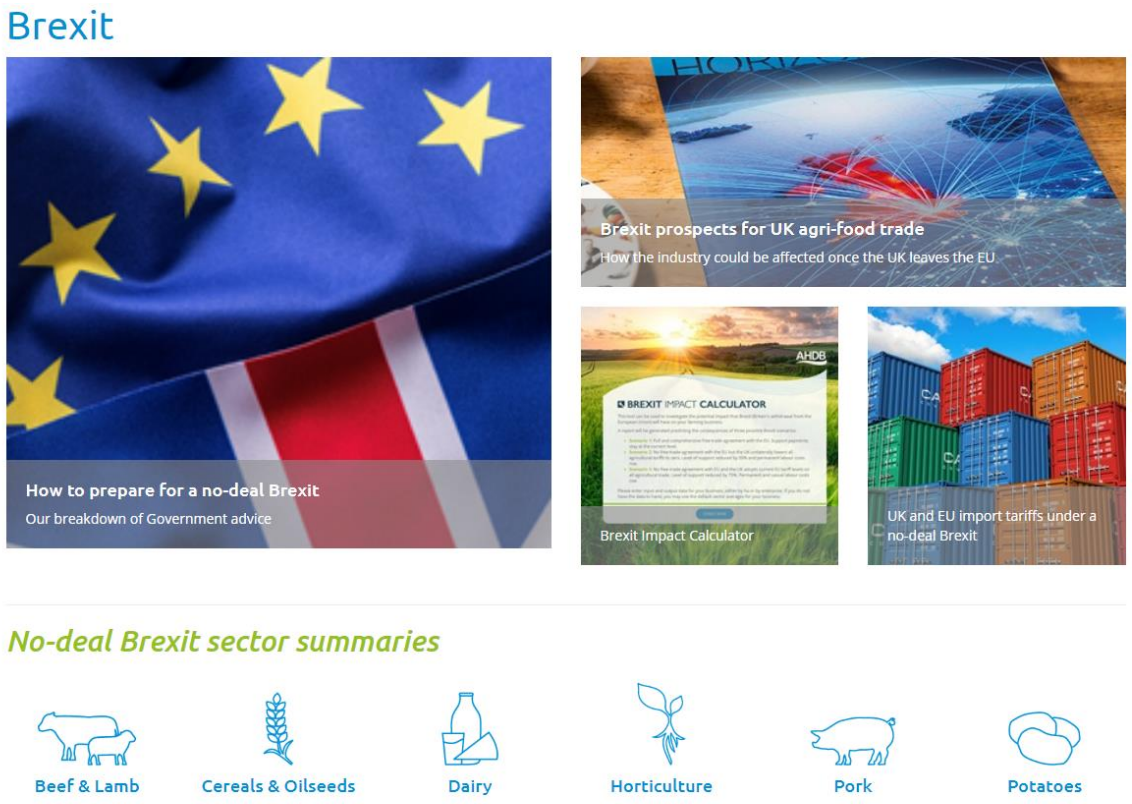
BYDV is transmitted in a persistent, non-propagative manner. This means that the virus does not pass directly to the aphids' offspring and must be acquired through feeding on infected host plants. The time between acquisition and the aphid being able to transmit the infection is 12–48 hours.

CEREALS & OILSEEDS

# Horizon Reports

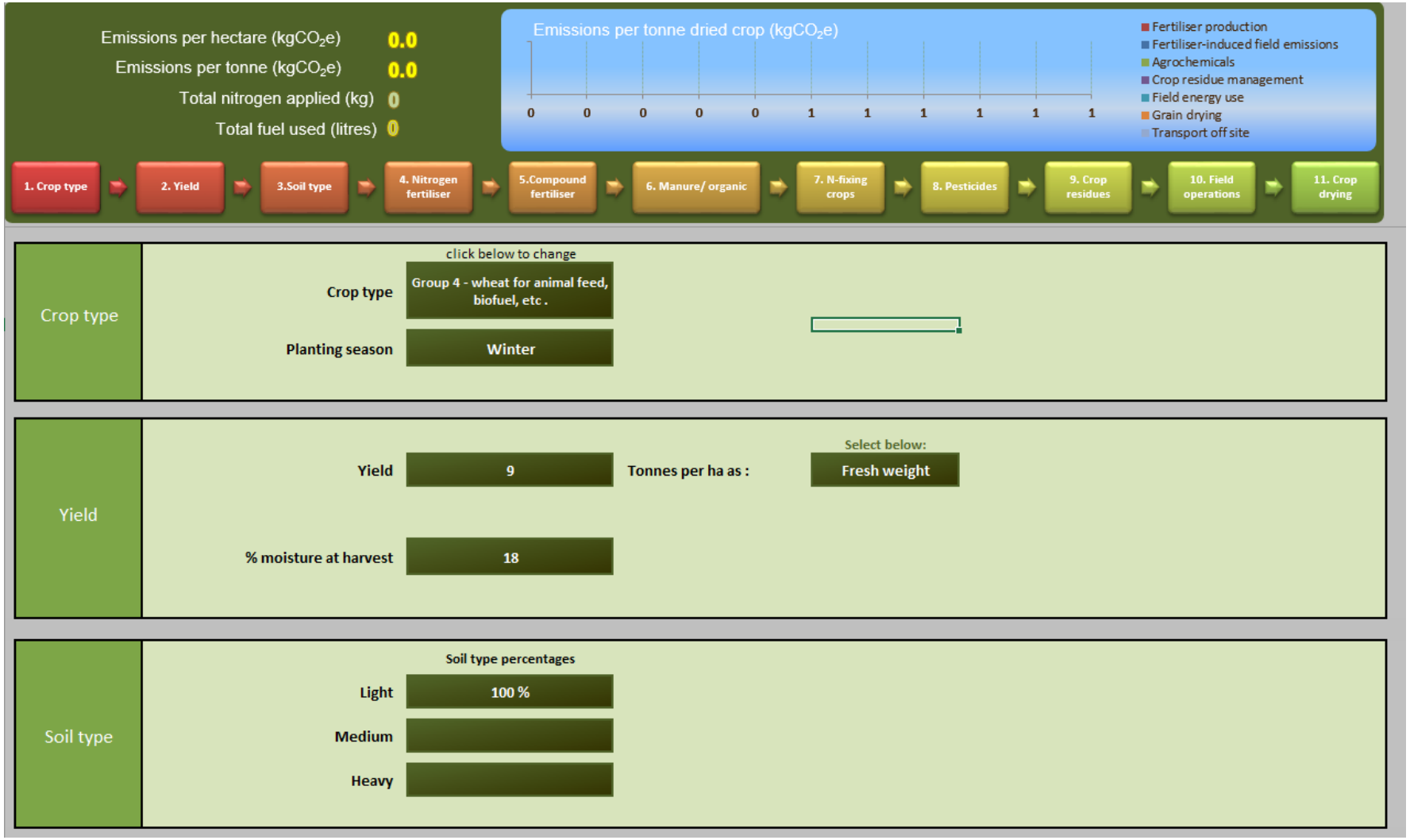
# Wider tools

- Business management
- Markets
- Brexit (ahdb.org.uk/Brexit)




Tools available at **ahdb.org.uk**

# Carbon




Farm Carbon Toolkit

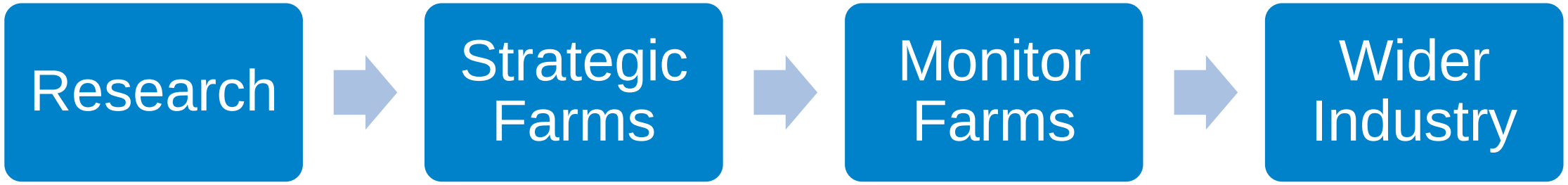
**AHDB Carbon Workshop - Autumn 2020**

# Knowledge Exchange

CEREALS & OILSEEDS

# Farm Excellence

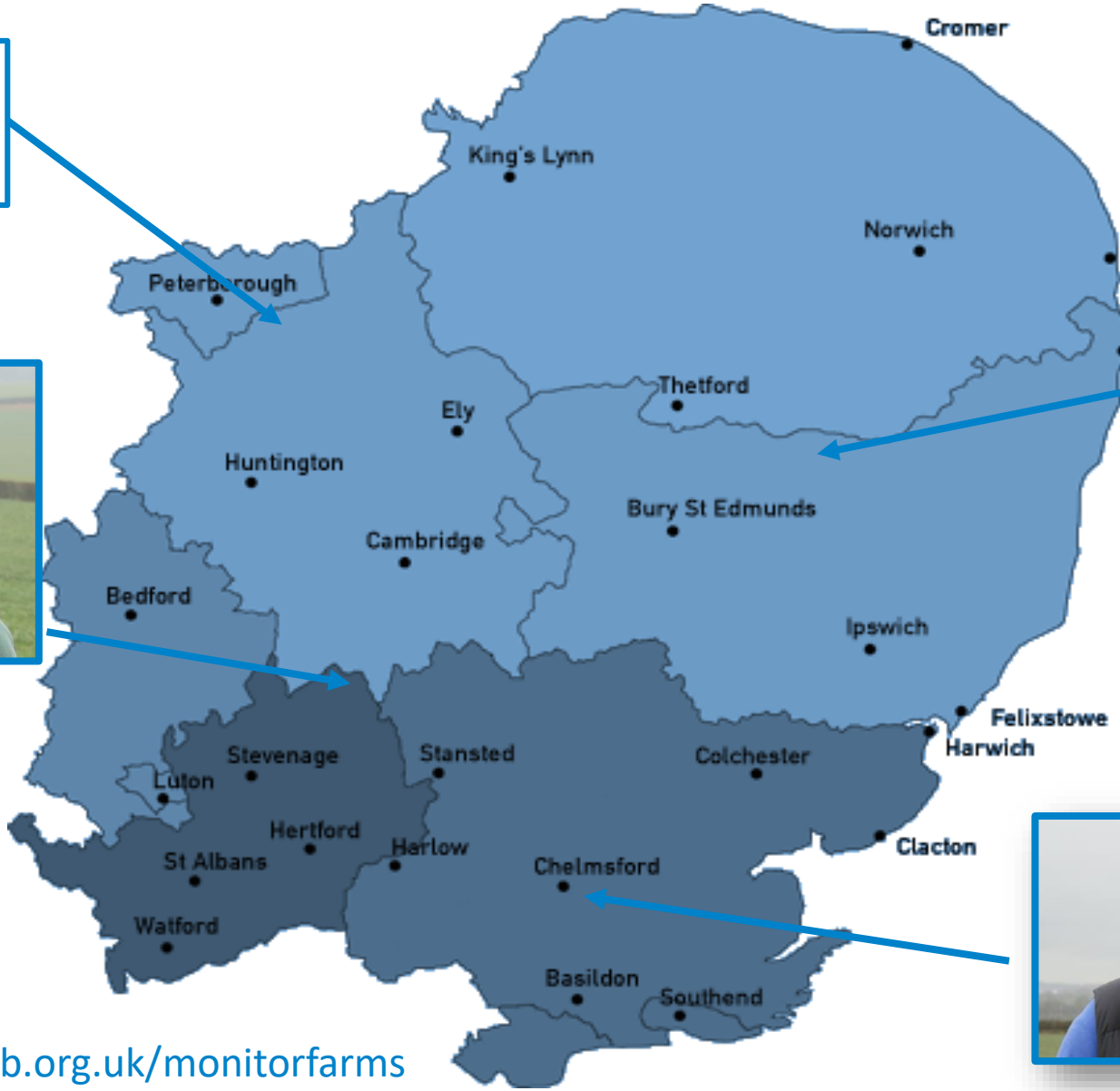
- **Strategic Farms – Putting research into practice**
  - Focus on improving arable productivity through the formal testing and demonstrating of innovative practices on a field or farm scale. They aim to drive the adoption of innovation.
  - 3 open meetings per year over 6 years, plus closed group visits
- **Monitor Farms – Farmer Led, Farmer Driven**
  - Cover a wide range of activity aimed at business, technical and personal development. They aim to address current issues identified on the host farm.
  - 4 to 6 open meetings per year over 3 years, plus closed benchmarking sessions



# Cereals and Oilseeds – Monitor Farms

?
New Monitor Farm







For all details, visit: cereals.ahdb.org.uk/monitorfarms

# Cereals and Oilseeds – Monitor Farms

## DUXFORD MONITOR FARM – TOM MEAD AND DAVID HURST

5th June 2020

## DISS MONITOR FARM – RICHARD LING

9th June 2020

## NEW MONITOR FARM

Summer Launch

# Cereals and Oilseeds – Strategic Farm East


- East Host = Brian Barker, EJ Barker & Sons, Westhorpe, Suffolk
- **Open Day Day = Thursday 4th June**
- Harvest 2020 Demonstrations:
    - Managed lower inputs
    - Boosting early crop biomass
    - Using cover crops to improve water quality
    - Monitoring pests and natural enemies
    - Very low input field scale demonstration
    - Variable rate nitrogen
    - Repeat monitoring

**For all details, visit: https://ahdb.org.uk/farm-excellence/strategic_cereal_farm_east**

# Farmbench and benchmarking

FARMBENCH

What was your cost of production for harvest 2019?

Log on and find out.  Join us to discuss.

**Visit:**

**ahdb.org.uk/farmbench**

# Farmbench and benchmarking

FARMBENCH

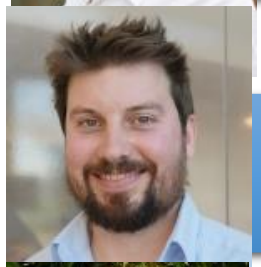
Oilseed Rape Benchmark (Per Hectare) Report
Ranked by: Full economic cost of production

| | Top 25% | Middle 50% | Bottom 25% |
|---|---|---|---|
| **Key Performance Indicators** | | | |
| Overheads as a percentage of income (%) | 52.23 | 58.31 | 69.96 |
| Seed costs (£/t) | 15.44 | 15.88 | 18.83 |
| Inorganic fertiliser costs (£/t) | 52.82 | 55.18 | 59.45 |
| Crop protection costs (£/t) | 44.80 | 52.61 | 54.48 |
| Hectares per labour full time equivalent | 285.59 | 262.44 | 189.94 |
| | | | |
| **Performance Indicators** | | | |
| Total area grown (ha) | 79.71 | 65.05 | 63.37 |
| Total production (t) | 252 | 228 | 236 |
| Yield (t/ha) | 3.17 | 3.50 | 3.72 |
| Price (£/t) | 344.92 | 348.15 | 345.43 |
| Inorganic N (kg/ha) | 177 | 202 | 213 |
| | | | |

**Visit: ahdb.org.uk/farmbench**

Nerys Wright, AHDB Beef & Lamb

Shirley Macmillan, AHDB Dairy



David Wilson, AHDB Potatoes

Andrew Palmer, AHDB Pork

AHDB Horticulture

Holly Shaw, AHDB Benchmarking

# AHDB Cross-Sector Contacts

**For contact details, visit: ahdb.org.uk/meet-the-team**

# Subscriptions and Publications

## ahdb.org.uk/keeping-in-touch

- Crop Research News
- Market Analysis
- Aphid News
- Grain Outlook
- New publications alerts
- Recommended List

## Webinars and AHDB Podcasts

# Thank you, any questions?

@CerealsEA

07387 015465 – teresa.meadows@ahdb.org.uk

# Aphid and cabbage stem flea beetle research and management

Dr Daniel Leybourne, Research Entomologist, ADAS

Agronomy 2020

# Today's talk

Cabbage stem flea beetle

- Life-cycle
- Causes of increased pressures
- Control strategies

BYDV

- Vectors
- Monitoring and decision making
- New project

# Life cycle

Aug-Sept
Adults move to new crop, mate and feed on leaves causing ‘shot holing’

Sept-Oct
Eggs laid at base of plants if mild

Oct-Feb
Eggs hatch when mild and larvae feed in leaf petioles

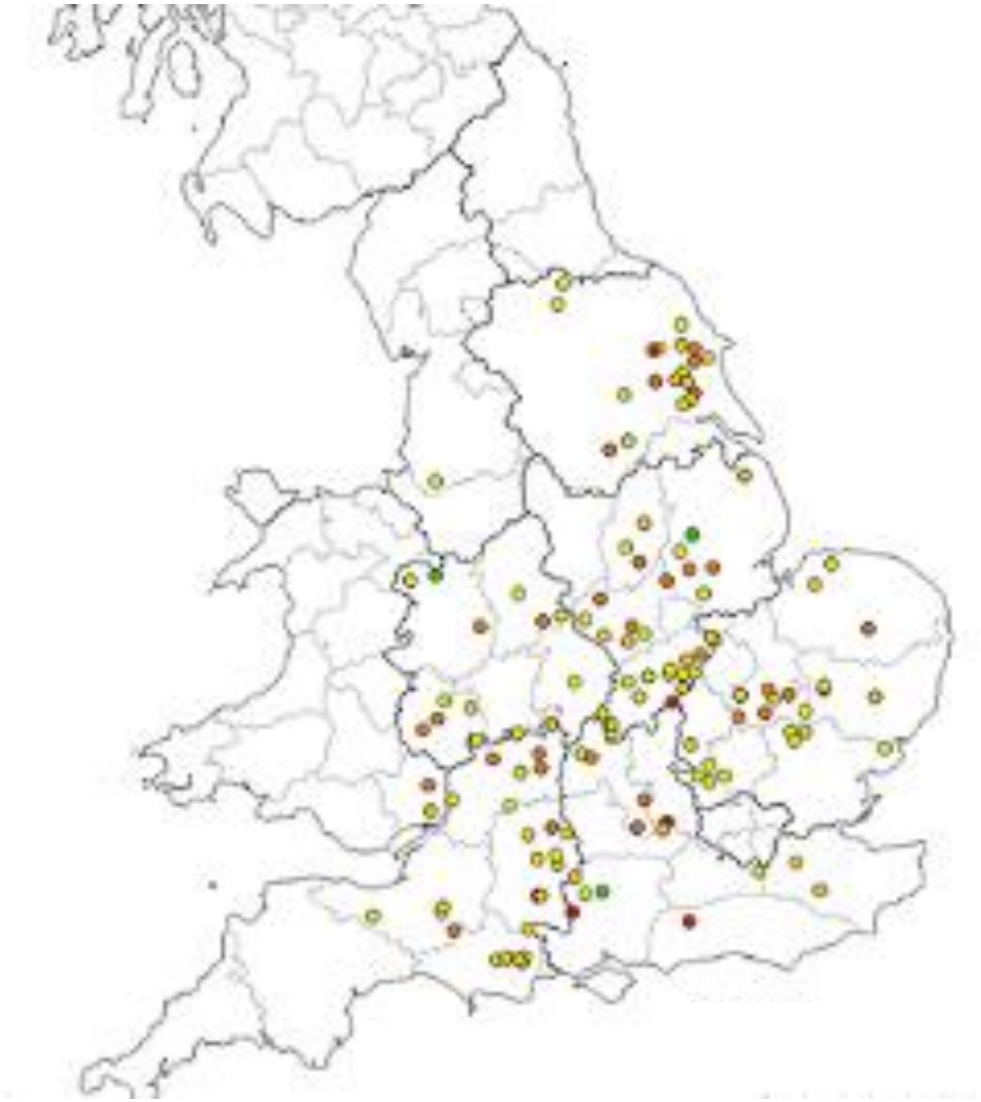
March-April
Larvae feed on main stem behind growing point

May
Larvae pupate in soil

June-July
Adults emerge and feed on foliage

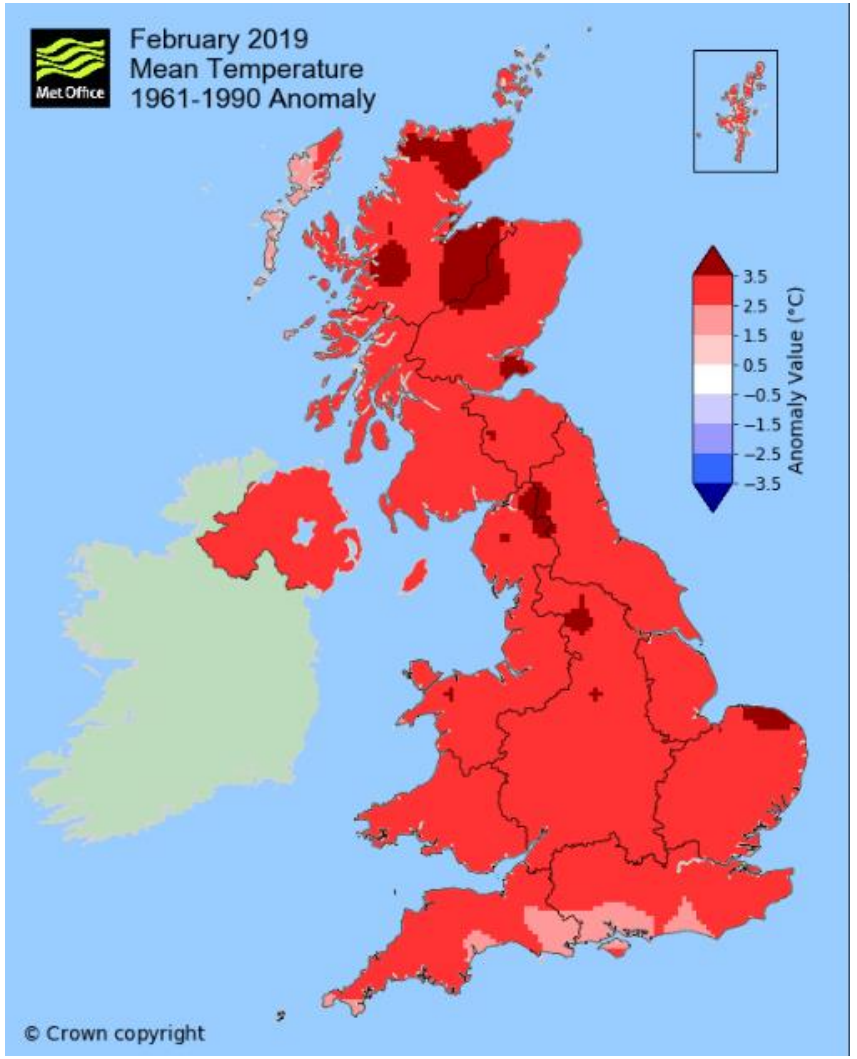
# Pyrethroid resistance in CSFB

Response to
100% lambda-cyhalothrin
(7.5 g ai/ha) in 2019



# The weather factor

- Modelling work shows that:
- Autumn larval population greater if:
  - Warm September
  - Low rainfall in March, April, June and July
- Spring larval population greater if:
  - Warm November
  - Warm January
- Damage from adult CSFB worse if:
  - Hot June and July
  - Dry August

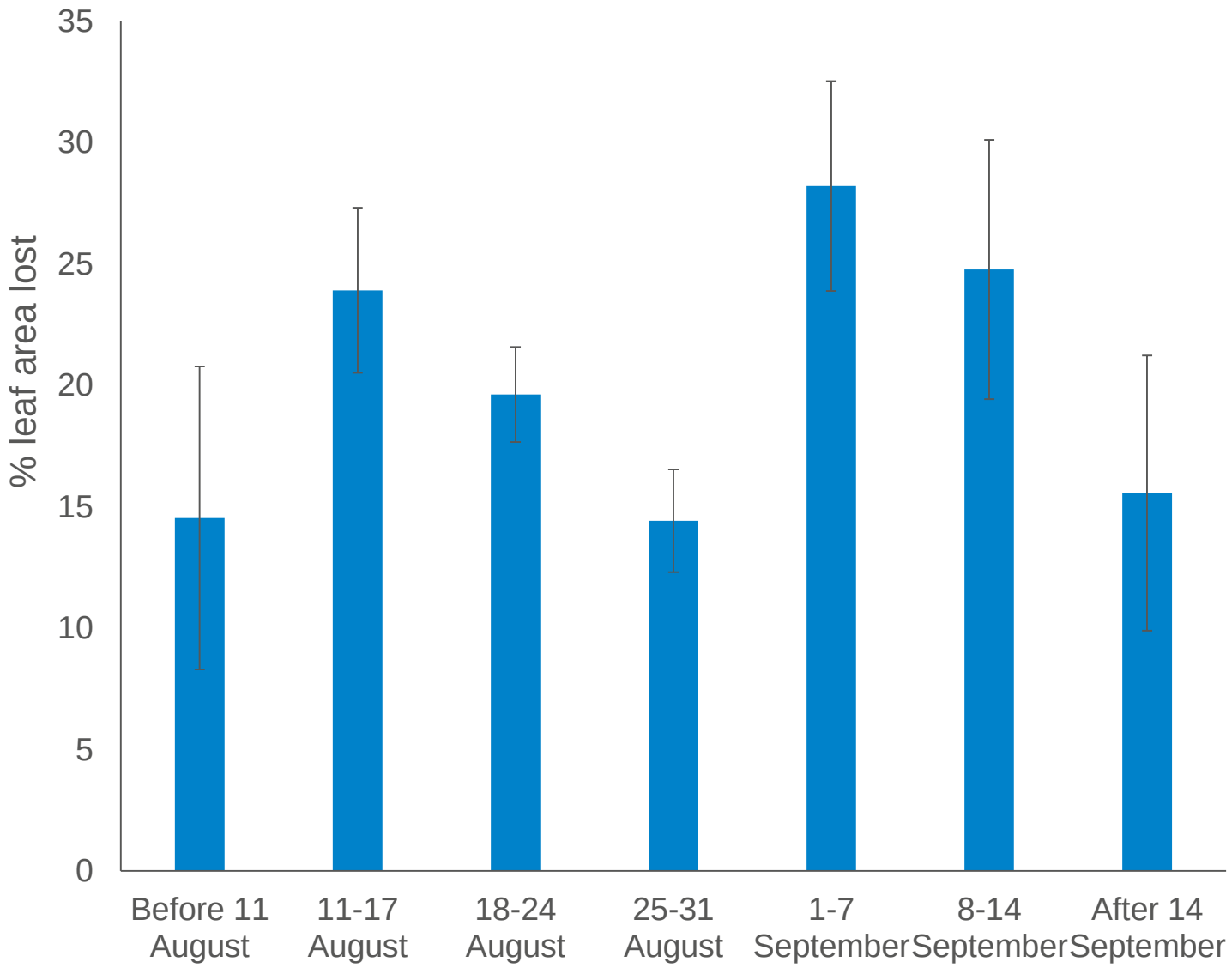


# The challenge

How can we manage CSFB more effectively?

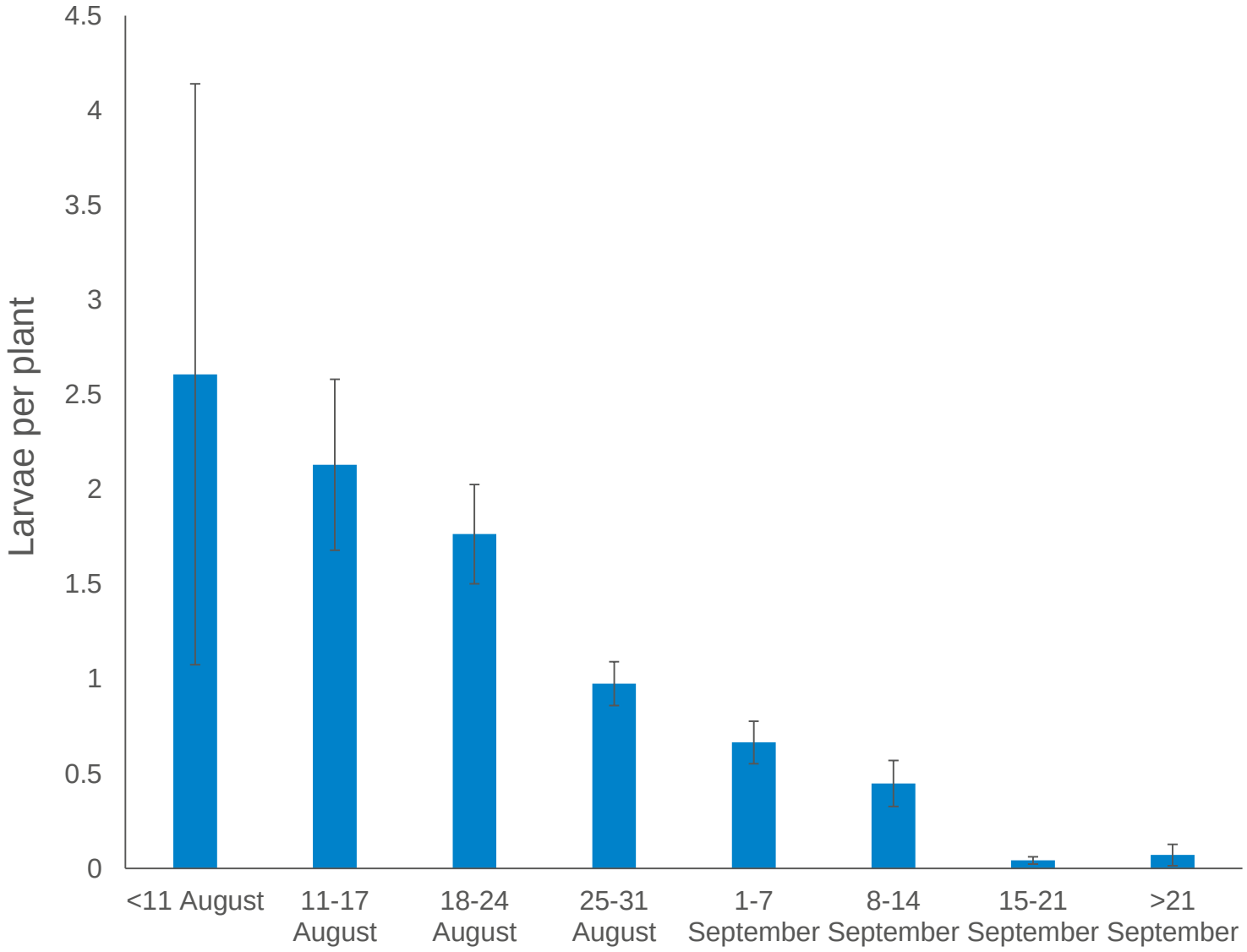
# Drill date – minimising adult damage

- Survey work indicates trends in adult and larval damage
- Modelling found August drilling results in less damage
- Robust crops and pest avoidance



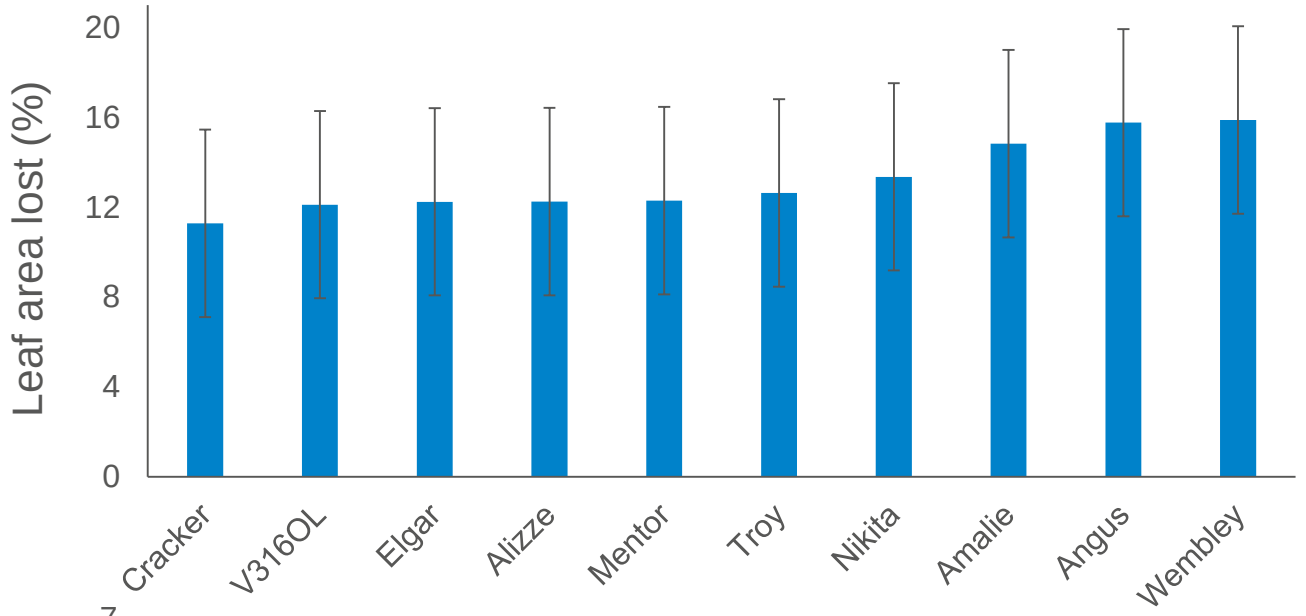
# Drill date – minimising larval damage

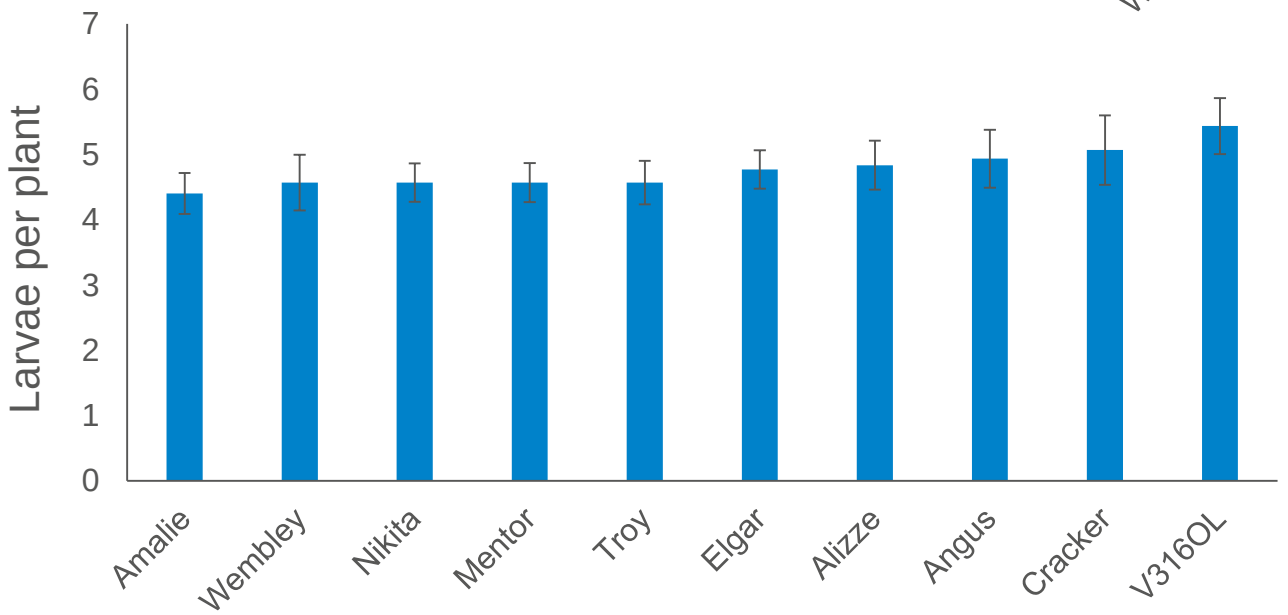
- Modelling work found September drilled crops have fewer larvae
- Difficult decision to make.
- Either early August or late September



# Varietal selection

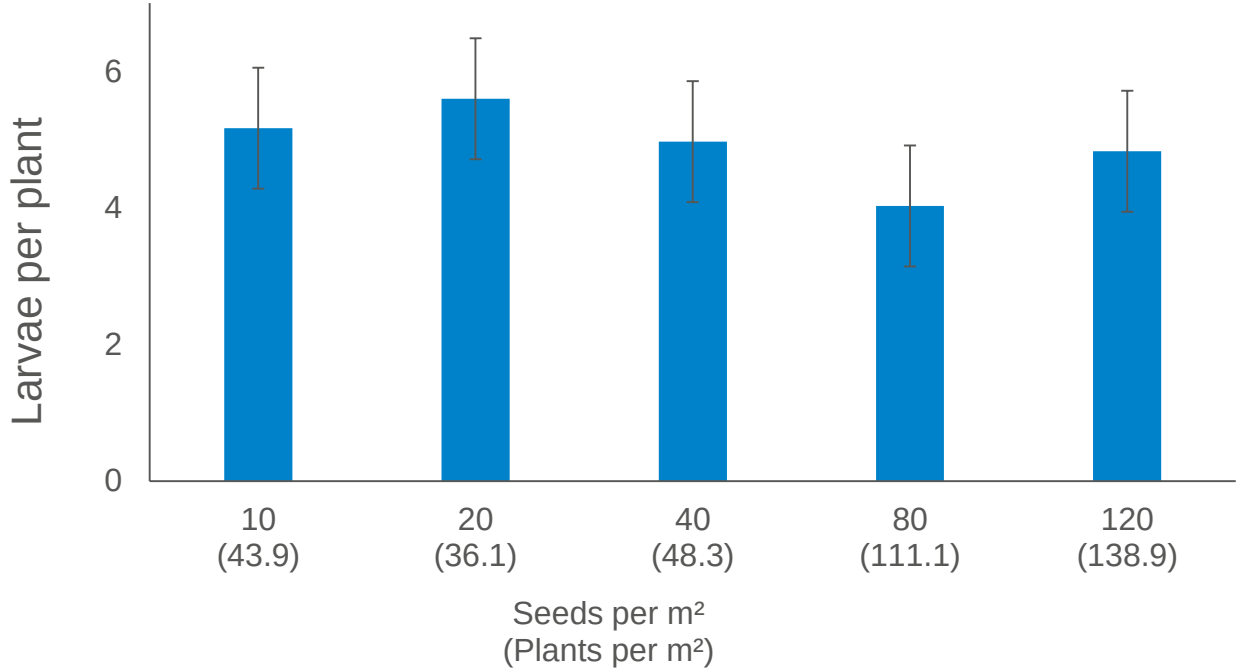
- No significant differences in adult damage or larval load between varieties
- Few differences in attractiveness or palatability
- Varietal characteristics and tolerance may be important.
- Breeding lines

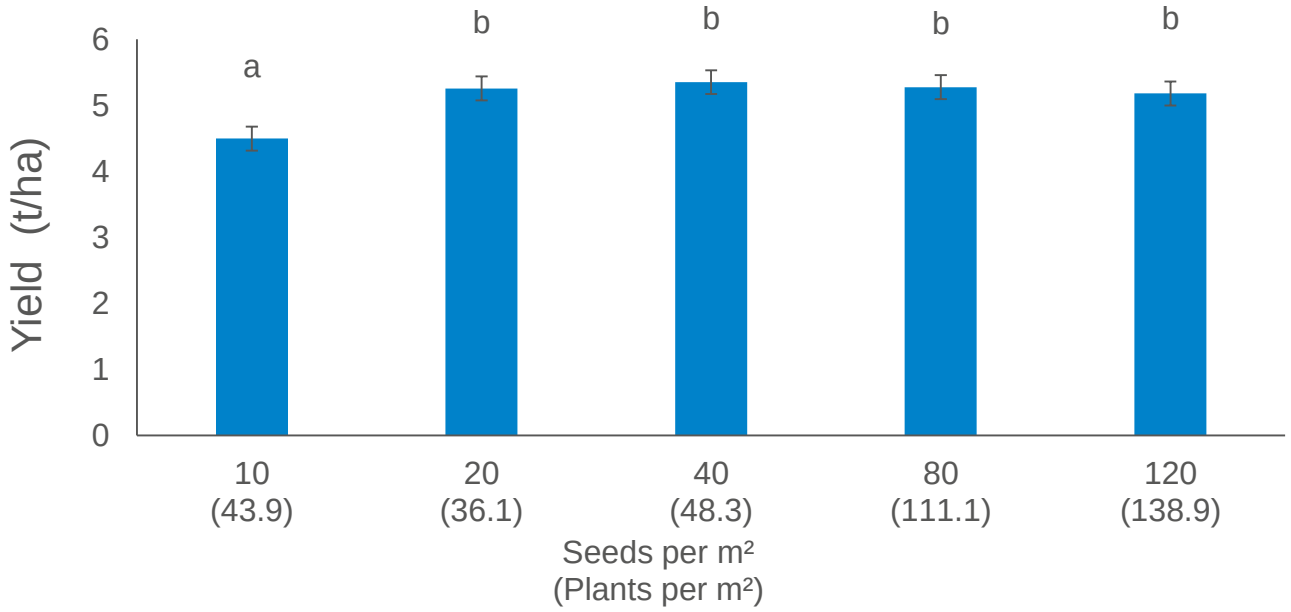


# Seed rate selection

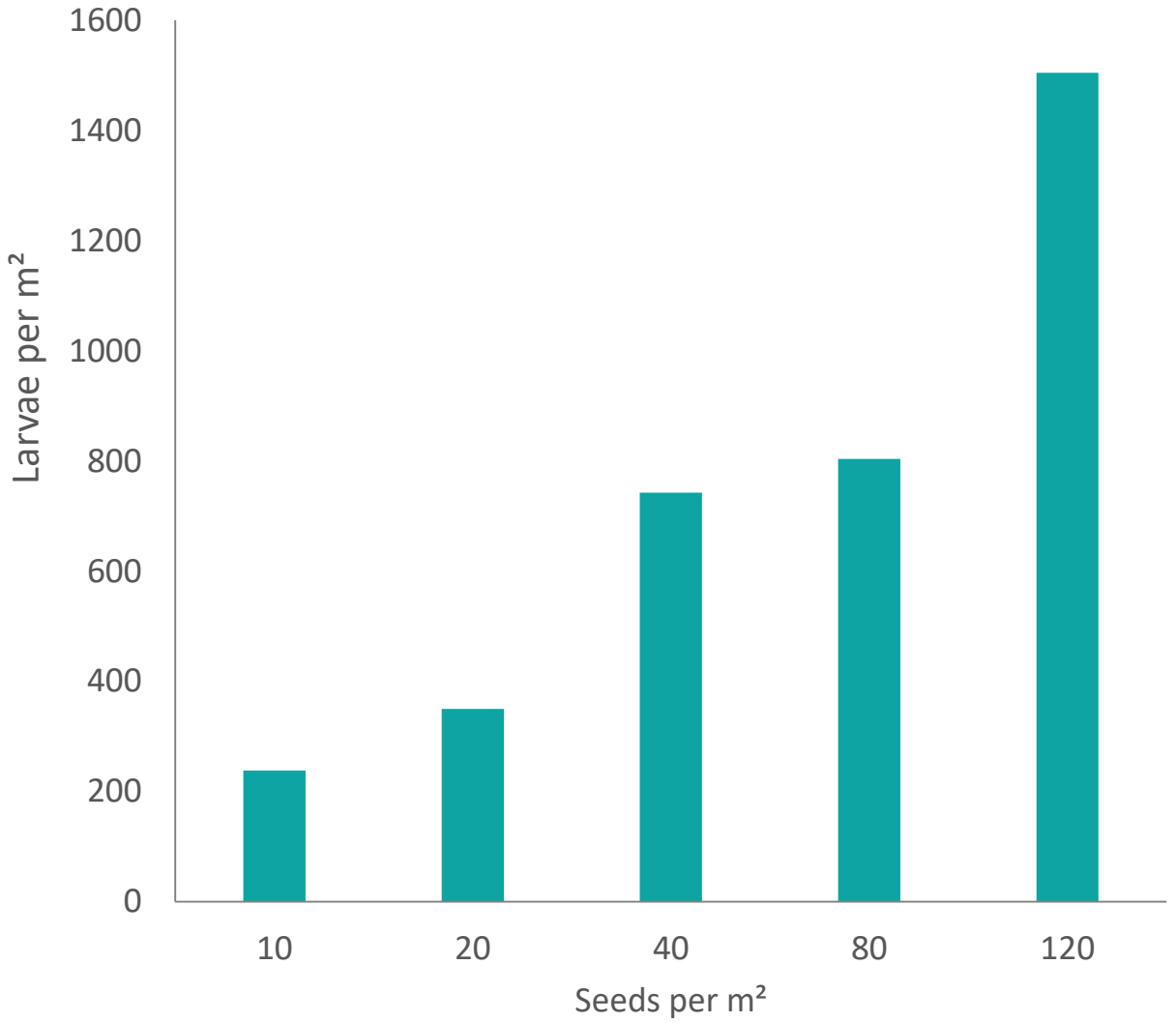
- Few differences in CSFB damage or larval load
- Some significant yield reductions at lowest seed rates
- Few benefits of increasing seed rate beyond approx. 40 per m²



# Seed rate conclusions

- Increasing seed rate may result in higher pest return
- Trials found no clear benefit of increasing seed rate for CSFB
- Increasing seed rate for farm-saved seed may increase crop survival
- But may decrease yield in situations where CSFB pressure isn't very high
- Increased pest carry over



# Volunteer OSR (vOSR) as a trap crop

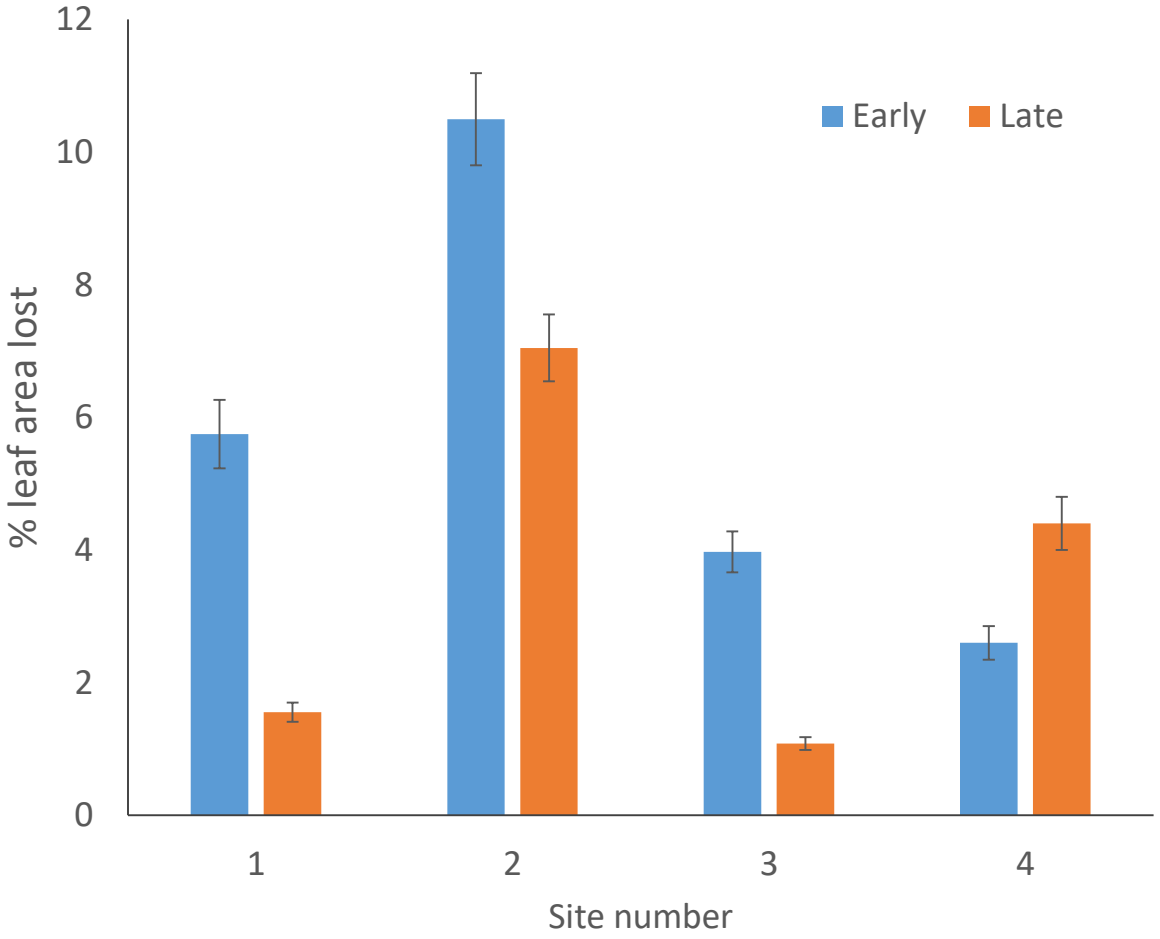
- In August, adult CSFB emerge from aestivation and migrate to OSR
- Detect glucosinolate breakdown products (isothiocyanates) to locate crops
- CSFB don’t discern between an OSR crop and a field of vOSR
- vOSR normally appears before drilled OSR and controlled by mid-August

# Delaying control of vOSR

- If vOSR control is simply delayed will this be more attractive than drilled OSR?
- Exploits CSFB biological quirk
- Investigated in 6 trials over 2 years
- Compared CSFB pressure in crops next to fields in which vOSR controlled
  a) Early August
  b) Late September

# vOSR trap crop results

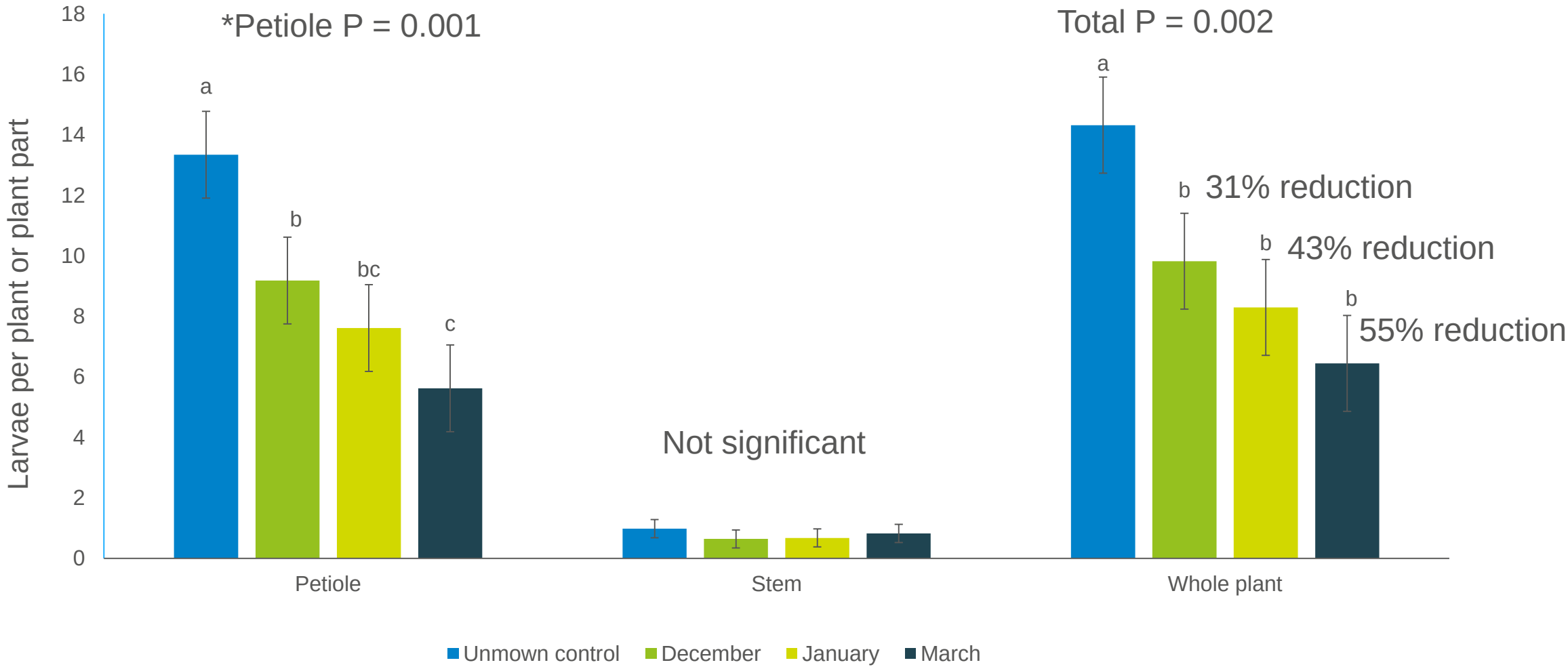
- Delaying vOSR destruction resulted in:
  - sig. reductions in CSFB adults and damage.
  - sig. increases in plant population.
  - reductions in larval populations (stats tbc)
- Any eggs or larvae laid in vOSR would die so breaks pest life-cycle
- Benefits not seen at two sites. vOSR area?



# Controlling larvae

- Resistance means pyrethroids provide little control
- Defoliating OSR in winter can have negligible yield impact provided occurs before stem extension
- Can winter defoliation control CSFB larvae?
- Physical control (e.g. livestock ingesting larvae) or exposing larvae to cold and natural enemies
- Plot trials using a mower to defoliate

# Impact of defoliation on larval populations (late March) (2016/17)



# Defoliation Field Lab

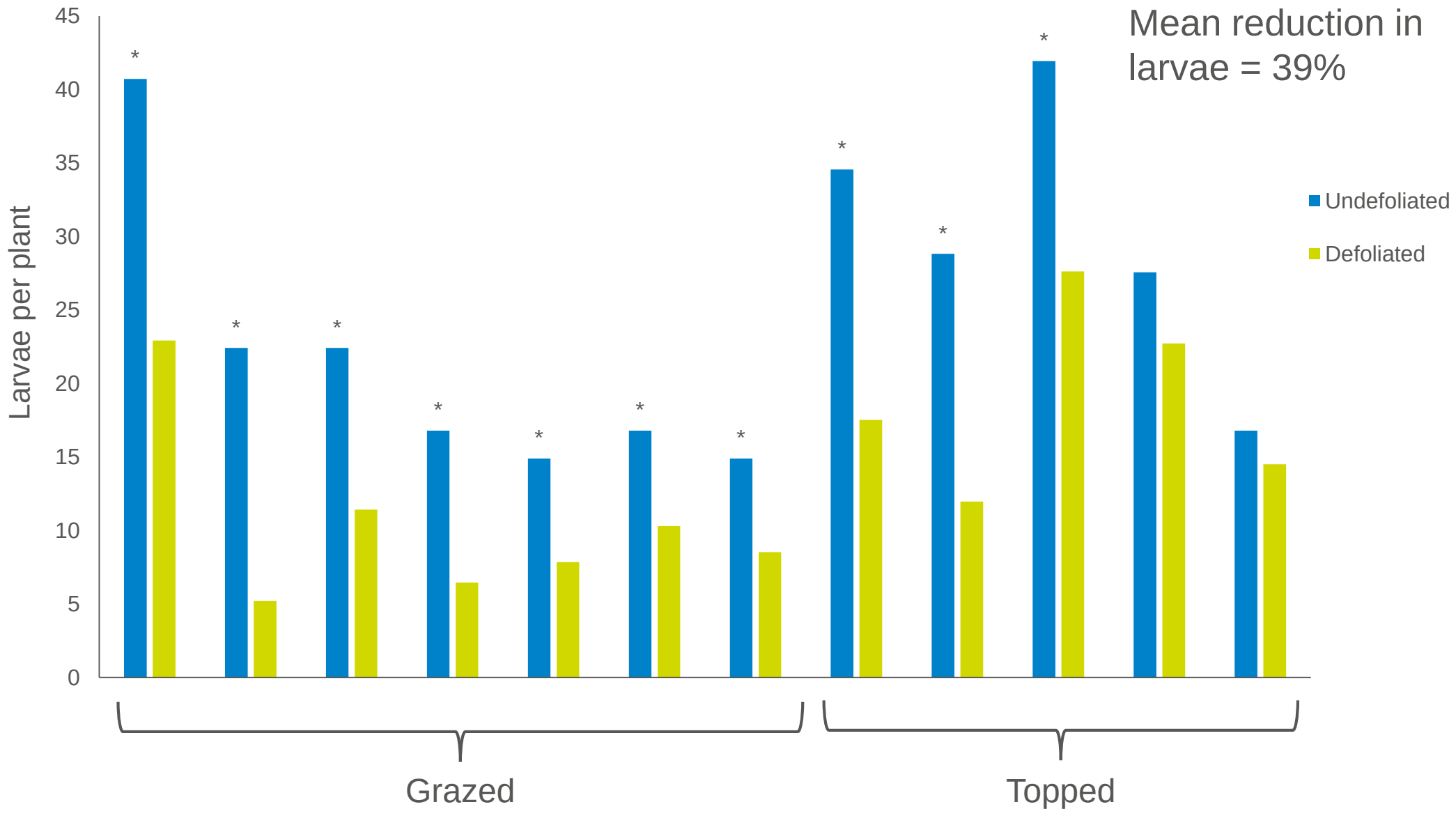
- Farmer-led project
- Network of farmers taking part in an Innovative Farmer ‘Field Lab’ last winter
- 8 farms (Hertfordshire, Norfolk and West Sussex)
- 12 fields across 8 farms
- Defoliated using topper or sheep
- Late December to March

INNOVATIVE FARMERS
PART OF THE DUCHY FUTURE FARMING PROGRAMME

AHDB CEREALS & OILSEEDS

syngenta

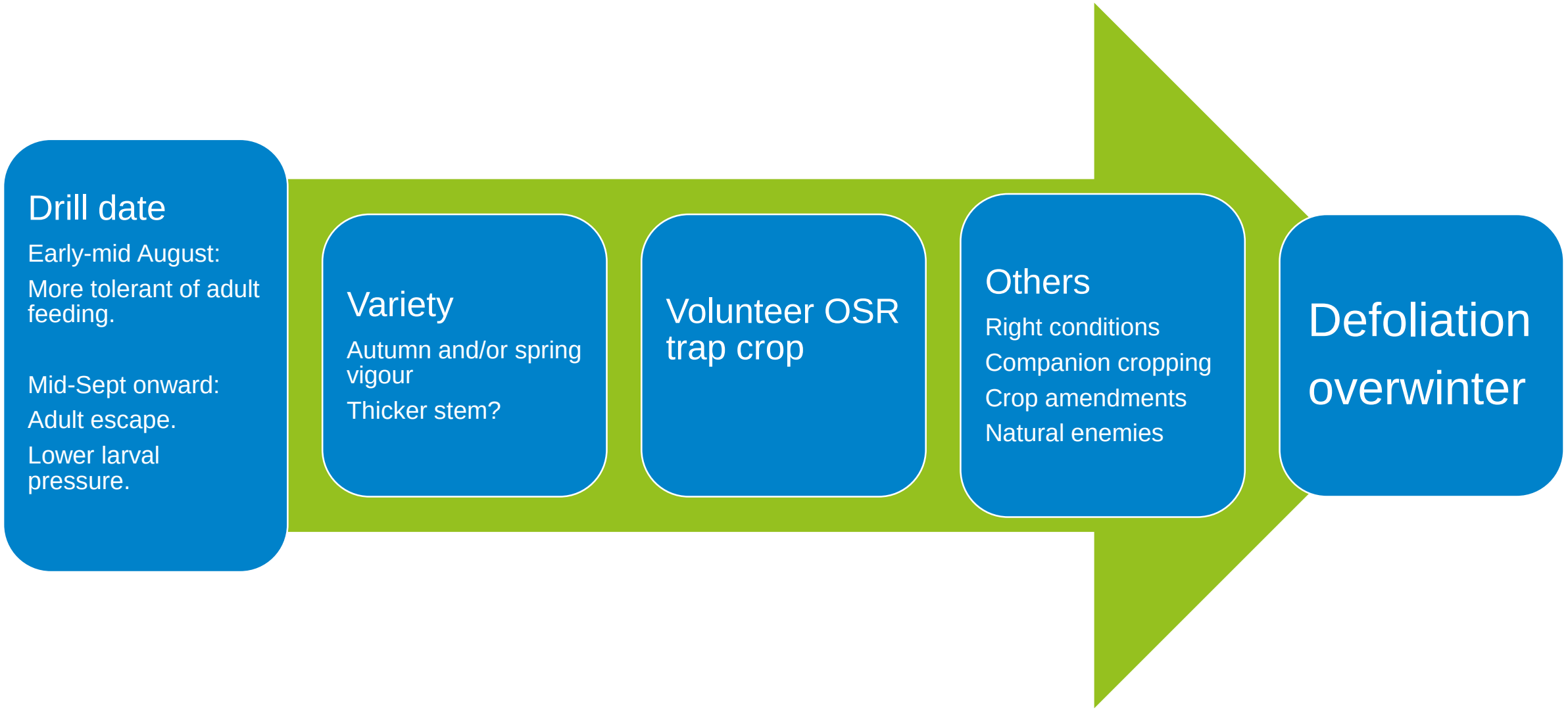
# Field Lab results – larval populations



# Defoliation conclusions

- Can reduce larval populations. Innovative Farmer field lab showed grazing or topping to be effective
- Yield effect unclear. Yield reductions in 2018/19 but not 2016/17. Likely due to poor spring conditions, e.g. dry spring, cool May
- Choose good crop with damage
- Defoliate prior to stem extension
- Further Field Lab this winter. Would you like to take part? Email sacha.white@adas.co.uk

# IPM components



# Take home messages from current CSFB work

- Managing CSFB extremely challenging
- No silver bullet
- Suite of non-chemical control options needed to tackle pyrethroid resistance
  - Drill date
  - Trap crops
  - Defoliation
- Consider natural enemies

© Trevor and Dilys Pendleton

© Khaleim & Sheng

# What is BYDV?

Barley yellow dwarf virus (BYDV) is the main virus of cereals in the UK

- Transmitted by aphid vectors
- 82% of winter wheat and 81% of winter barley crops (Clarke *et al.,* 2009)
- Causes yield reductions

| Crop | Yield reduction |
|---|---|
| Winter Wheat | 2.1 t/ha (McKirdy *et al.,* 2002) |
| Oats | 2.7 t/ha (McKirdy *et al*., 2002) |
| Winter Barley | 80% (Dedryver *et al*., 2010) |

# Bird cherry-oat aphid
## *Rhopalosiphum padi*

# Grain aphid

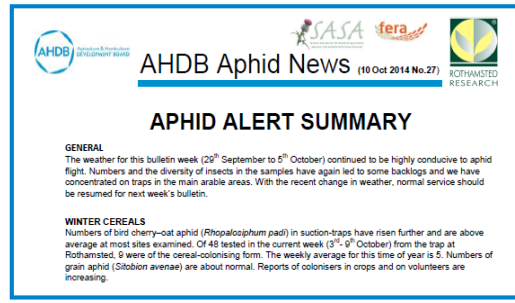
## *Sitobion avenae*

# Current advice

| Date | Advice |
| --- | --- |
| September 1986 | Spray if you find aphids |
| September 2018 | Spray if you find aphids |

Check plants or use sticky/water traps

Look at the aphid alerts



AHDB Aphid News (10 Oct 2014 No.27)

APHID ALERT SUMMARY

GENERAL

The weather for this bulletin week (29th September to 5th October) continued to be highly conducive to aphid flight. Numbers and the diversity of insects in the samples have again led to some backlogs and we have concentrated on traps in the main arable areas. With the recent change in weather, normal service should be resumed for next week's bulletin.

WINTER CEREALS

Numbers of bird cherry–oat aphid (*Rhopalosiphum padi*) in suction-traps have risen further and are above average at most sites examined. Of 48 tested in the current week (3rd - 9th October) from the trap at Rothamsted, 9 were of the cereal-colonising form. The weekly average for this time of year is 5. Numbers of grain aphid (*Sitobion avenae*) are about normal. Reports of colonisers in crops and on volunteers are increasing.

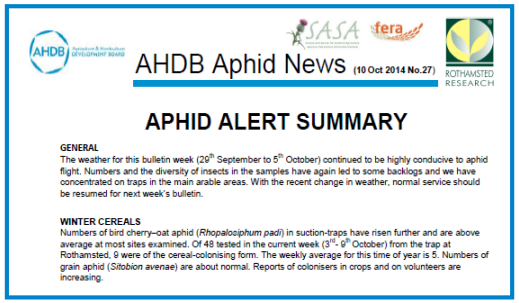
- Aphids are hard to spot (and monitoring is time consuming)
- Emerging pyrethroid resistance within populations: not sustainable practice

# Aphid monitoring network

Rothamsted Insect Survey;
www.insectsurvey.com

Rothamsted suction trap network

- 16 traps
- Frequent bulletin on aphid populations (Mar – Nov)
- Can be examined by region
- Can be examined by specific crop
- Subset of traps inform on virus presence in the population (from 2019)



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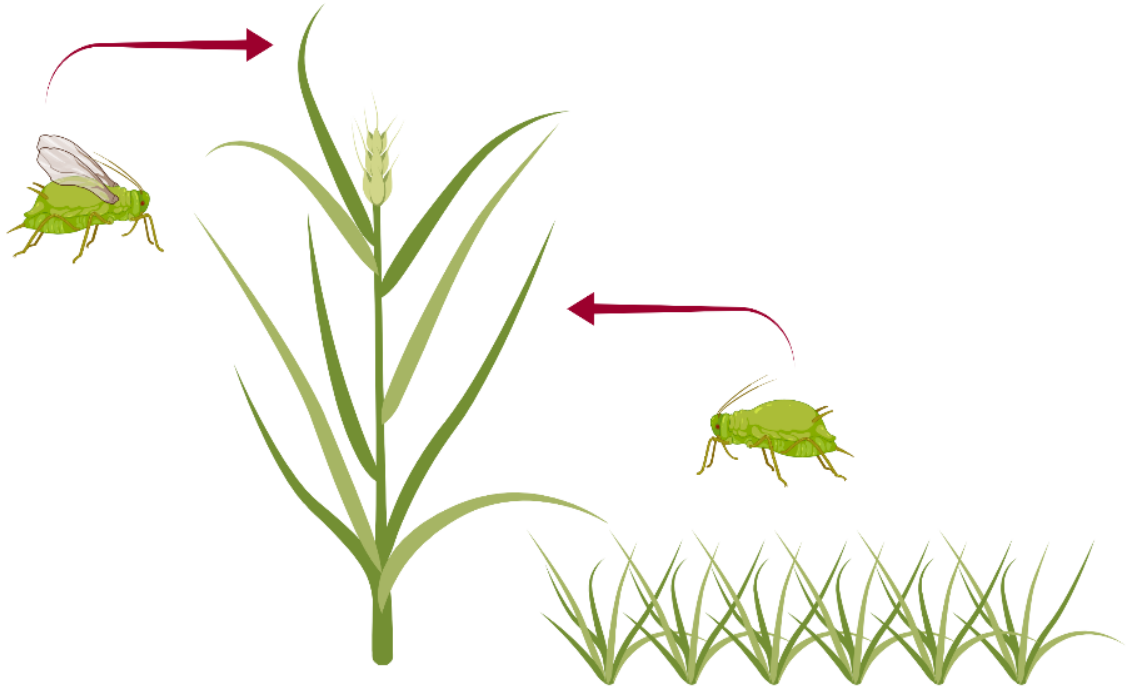
# Optimal spray timing

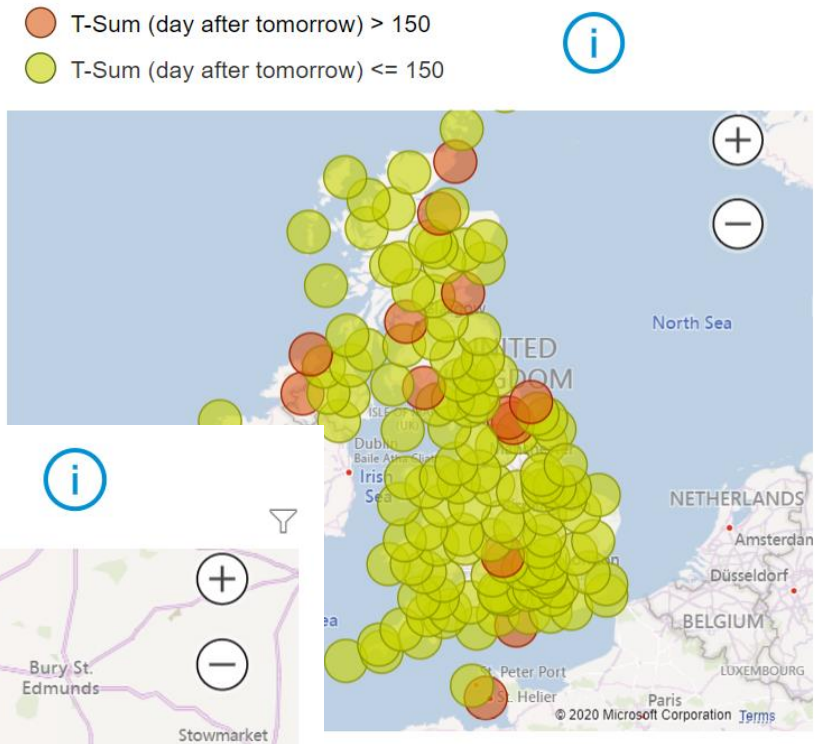
- Initial winged aphid infestation colonises few plants
- Movement between plants starts with 2nd wingless generation
- BYDV infection increases rapidly
- Sprays most effective targeting 2nd wingless generation

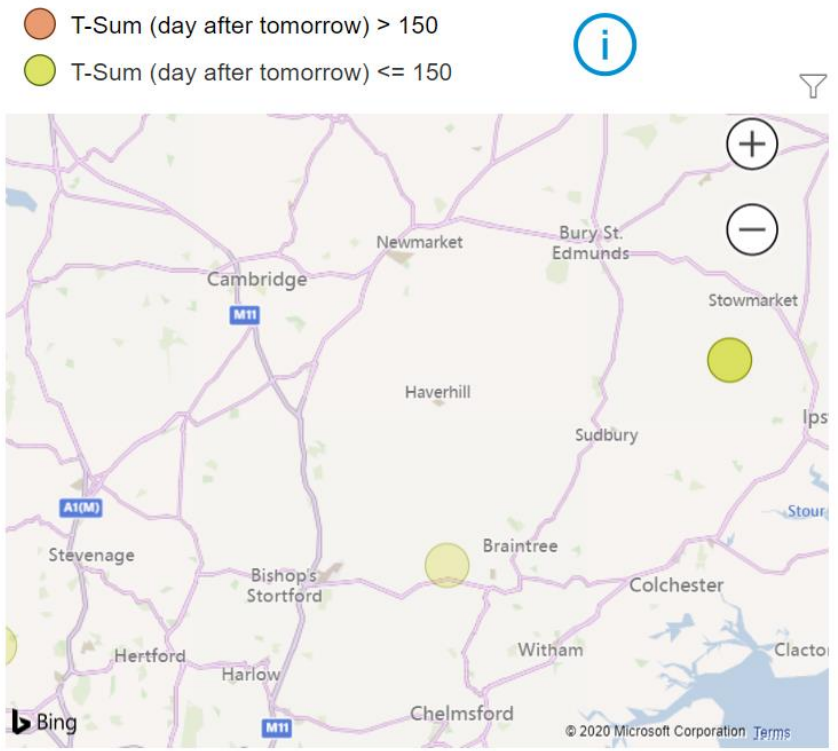


This image was made in © BioRender – biorender.com

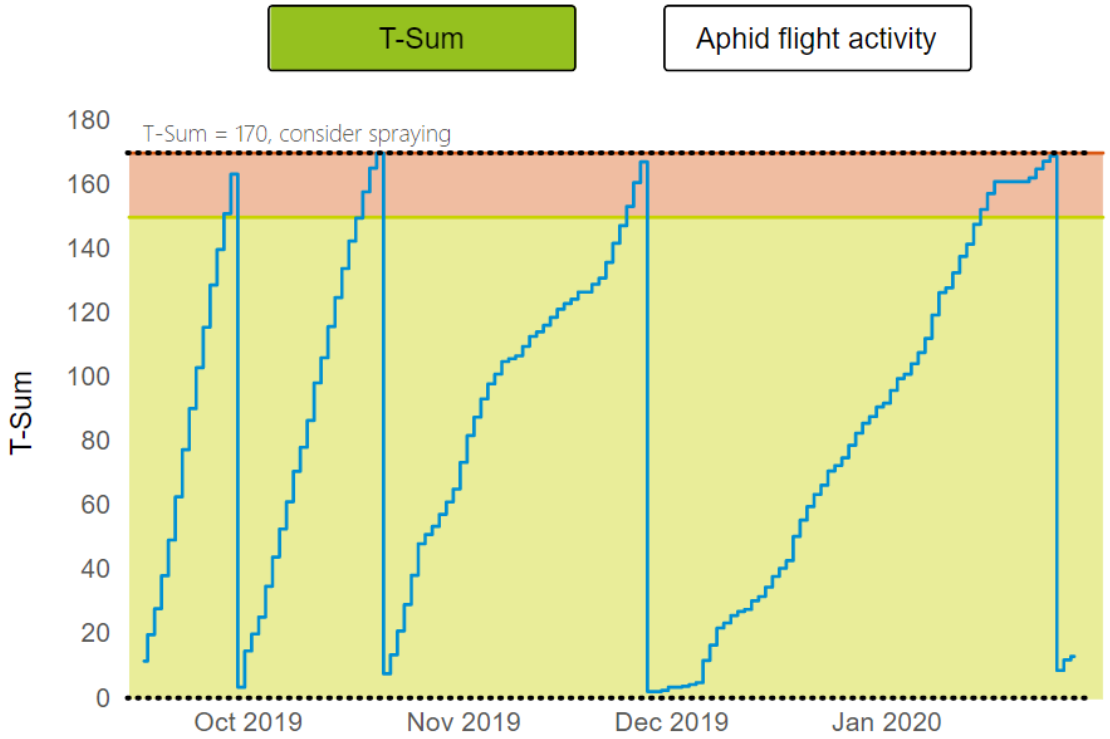
# AHDB BYDV decision support tool

- 2nd wingless generation appears when accumulated daily air temperatures, above a baseline temperature of 3°C, reaches T-Sum 170
- AHDB tool to calculate when T-sum 170 reached
- https://ahdb.org.uk/bydv
- Select region
- T-sum start date.  Either:
  - Crop emergence
  - Last pyrethroid spray



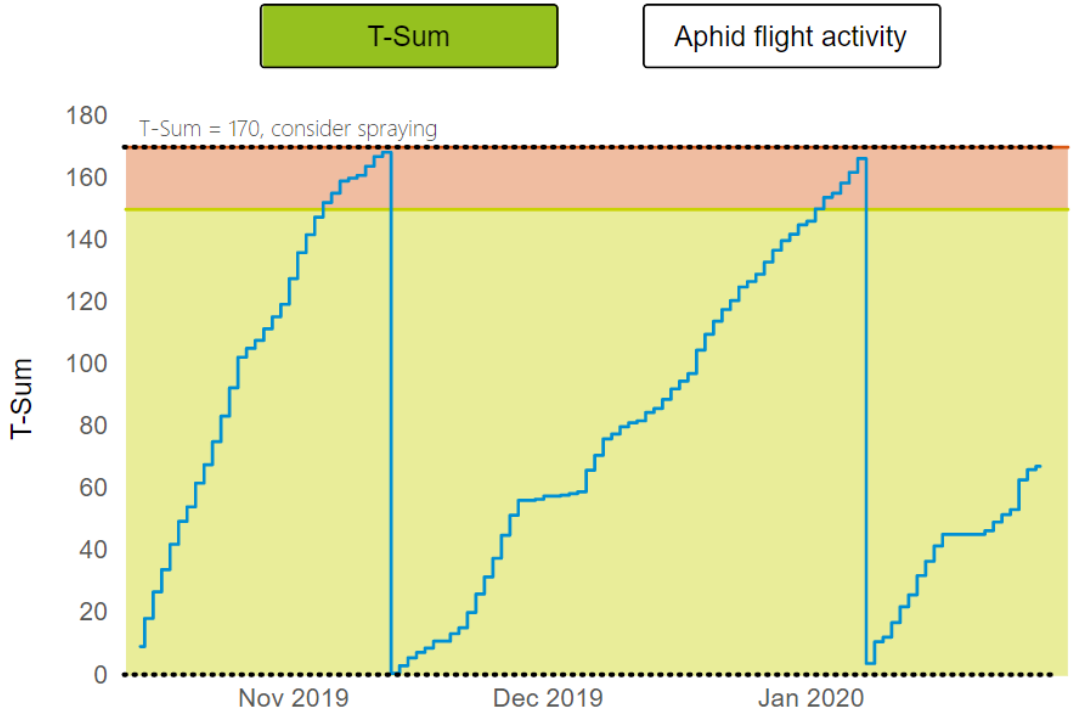



# AHDB BYDV decision support tool



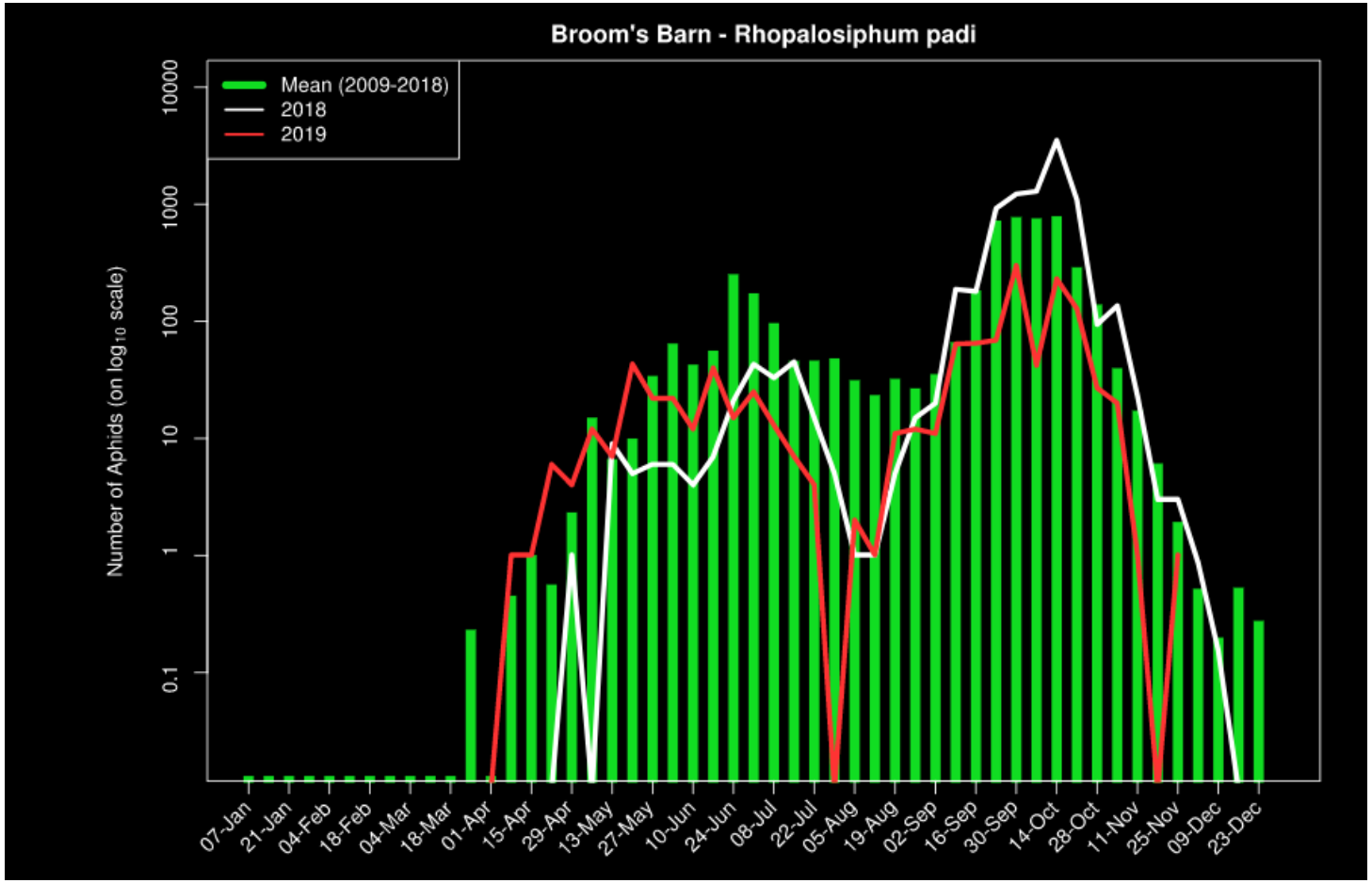

Not urgent: Spray threshold not met and/or not forecast to be met in next four days

Urgent: Spray threshold met. Check crop and consider treatment



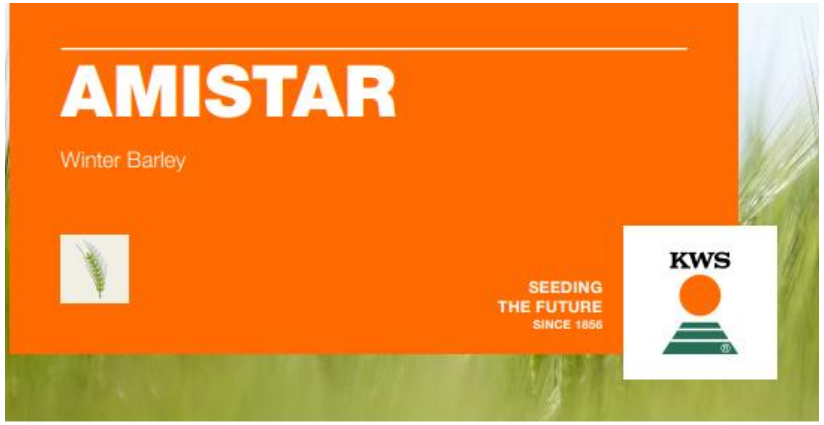
# Drill date

- Aphid migration drops < 11°C
- Minimal aphid activity < 3°C
- BYDV risk greatest when crop young, passes at GS31
- Late drilled crops at much lower risk



# Other control options

- Tolerant/resistant varieties e.g. Amistar + Rafaela (barley), Wolverine (wheat)
- Green bridge – controlling infected volunteers and weeds
- Natural enemies – ground beetles
- Cultivation – min till
- Companion cropping – reduce green to soil contrast




BYDV tolerant winter barley

# New BYDV project

**Title: Management of aphid and BYDV risk in winter cereals (or Managing BYDV in winter cereals)**

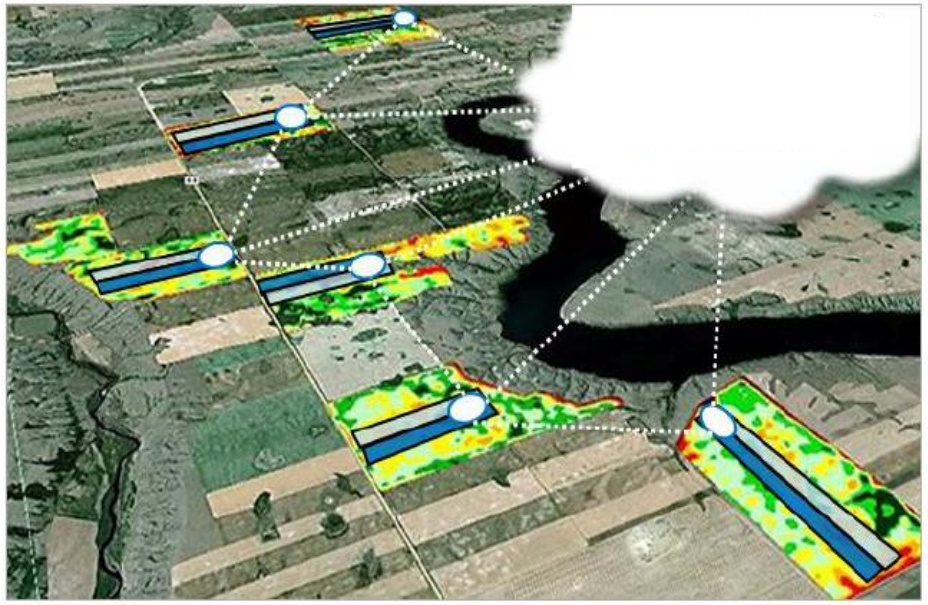
- Three year project. Commenced September 2019
- Funders:
  - AHDB Cereals and Oilseeds
  - Syngenta UK Limited
  - BASF Digital Farming GmbH
  - KWS UK Ltd
  - Limagrain UK
- Project team:
  - ADAS
  - Rothamsted Research

# Objective 1 – improving monitoring


- How reliable are suction trap data?
- What is is the best trapping method in the field?
- Can images of in-field traps be analysed to identify vectors?

# Objective 2 – improving decision making

- Update models into decision support systems (e.g. % aphids carrying the virus)
- Risk DSS
  - Predicts general risk for early season decisions e.g. variety, drill date, etc.
- Spray DSS
  - Advises on economics of sprays decisions
- Validate using tramline trials



# Conclusions

- BYDV is a major problem in UK grown cereals
- Its transmitted by aphids
- Advice on control has not changed in many years
- Effective control is reliant on monitoring
  - Monitoring alerts
  - AHDB spray model
- There are cultural controls which can be used
- ADAS and Rothamsted have a new project to improve monitoring and DSS.
  - Watch this space!

# Thank you for listening. Any questions?


Thanks to:

Charlotte Rowley

Emma Hurrell

Helen Aldis

Fiona Geary

Max Newbert

Luke Cotton Host farmers & agronomists

ADAS technical staff

Sacha White

Steve Ellis

Sarah Kendall

# Potential for biopesticides / bioprotectants in field crops

**Dave Chandler**
Warwick Crop Centre

**AMBER team**
University of Warwick.
ADAS Boxworth
Silsoe Spray Applications Unit
Rationale Biopesticides Strategists
Rob Jacobson Consultancy

# Radical change needed to global agriculture.

- Global agriculture: homogenous & highly connected.
- A major producer of greenhouse gases. Vulnerable to climate heating.
- Loss of natural habitats to monocultures.
- Loss of ecosystem services, replaced by artificial inputs.
- Shift in power & agency from farmers to corporations.

Not UK btw!

Nystrom et al., *Nature* (575), 7 November 2019;
Bahadur et al. (2018), PLOS ONE 0205683

# A new farming revolution?

# The EAT Lancet strategies

- **From quantity to quality.**
- **Sustainable intensification**:
  - Reduce yield gaps, fertilizer & water use efficiency, enhance biodiversity in ag. systems.
  - Make agriculture a net carbon sink.
  - **Halve food losses and waste**.

# Sustainability: agriculture is the solution, not the problem

**UK can lead the way**

# Where does crop protection fit in?

- Pests (invertebrates, pathogens, weeds): a major constraint on quality production.
- Climate heating will make things more challenging.
- Over-reliance on synthetic chemical pesticides.
- Need a more sustainable system.

# Unsustainable use of synthetic chemical pesticides

**The 1960s Green Revolution:**
**'Top down' use of synthetic chemical pesticides – industrialised farming**

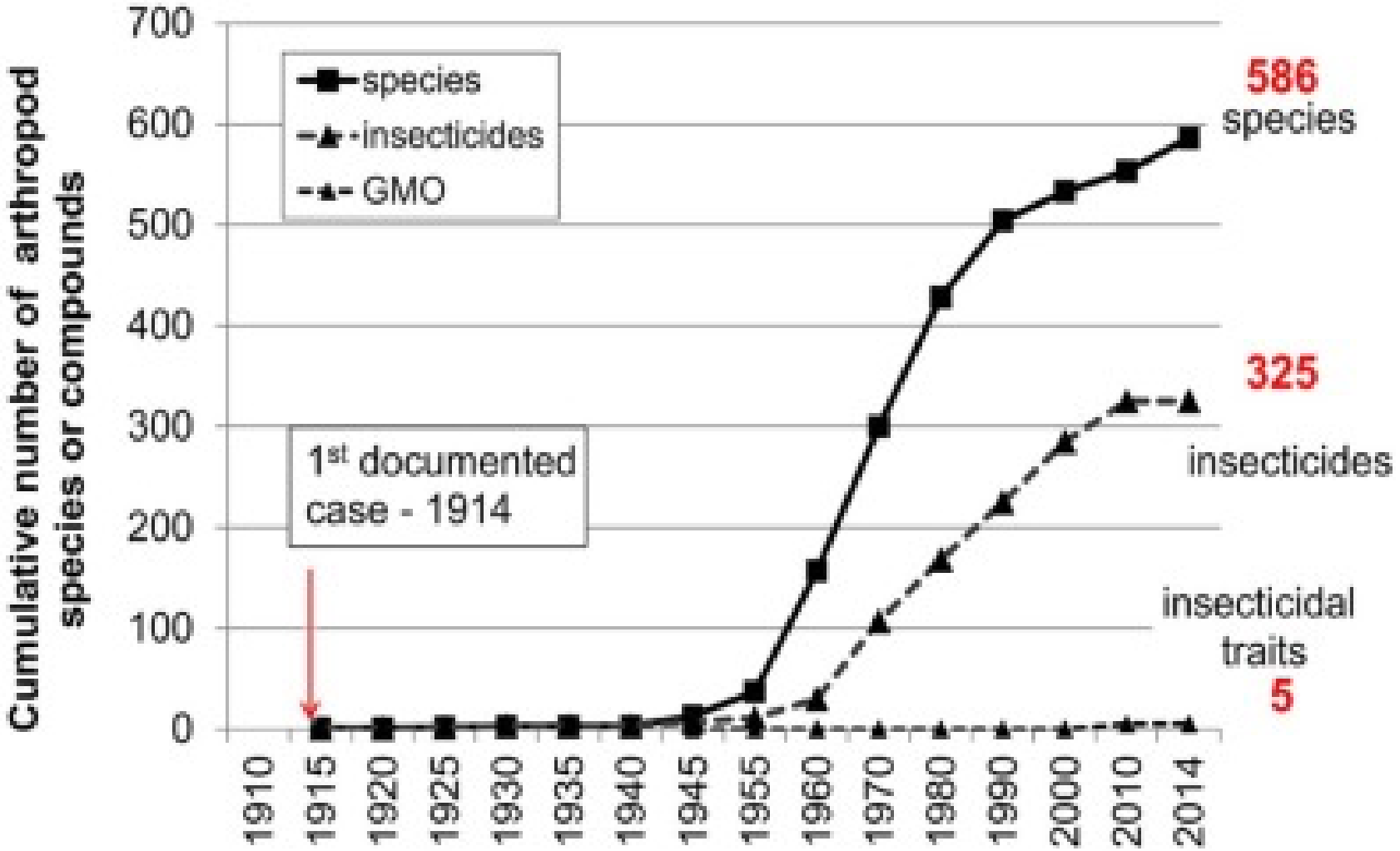
↓

- **Evolution of resistance**
- **Environmental damage**
- **Health concerns**

↓

**Reduction in availability:**

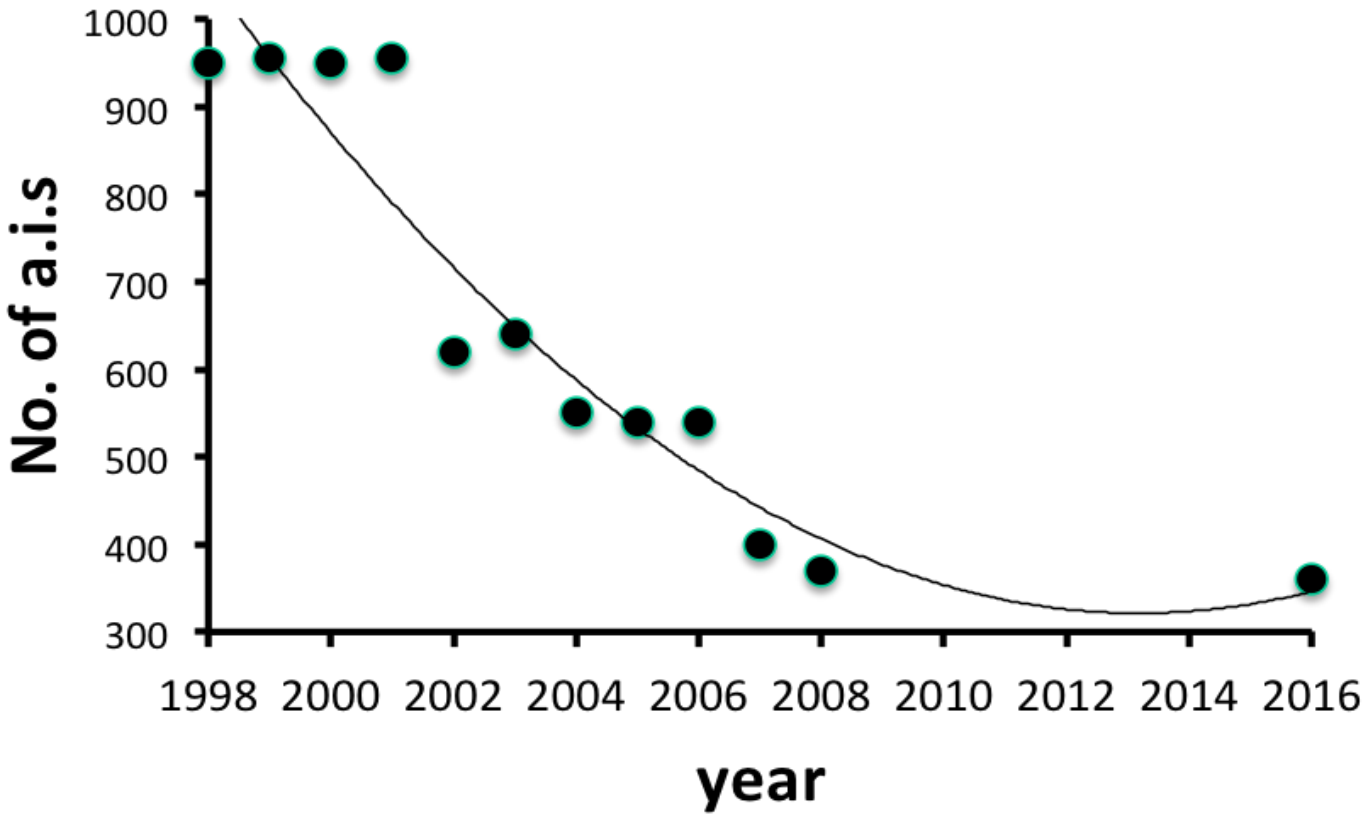
- **Products stop working.**
- **Government restrictions.**
- **Retailer restrictions.**
- **Pesticides – precious resource.**




Cumulative increase in (a) the number of species resistant to one or more insecticides, (b) number of insecticides for which one or more species has shown resistance, and (c) number of GMO traits for which resistance has been reported.

Sparks & Nauen (2015). IRAC: Mode of action classification and insecticide resistance management. Pesticide Biochemistry and Physiology, 121, 122-128.

# The number of synthetic chemical pesticides available is declining.




**Conventional pesticides approved in EU**

- Costs c. £200M & 10 years to develop a new conventional pesticide. Few new actives in the pipeline.
- European Parliament calls for mandatory reduction targets for the revised Pesticides Directive (resolution passed 18.12.19).

# Field crops: P&D becoming ‘more challenging’

aphids

weeds

slugs

flea beetle

septoria

powdery mildew

moth pests

Soil borne pathogens

# Netherlands ‘2030 plant protection vision’ strategy document


Ministry of Agriculture, Nature and Food Quality of the Netherlands

**Agriculture, nature and food: valuable and connected**

The Netherlands as a leader in circular agriculture

We need this too!

# Integrated Pest Management (IPM): the way forward for all growers

- Integrated Pest Management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides (UN FAO).

# IPM – the Sustainable Use Directive

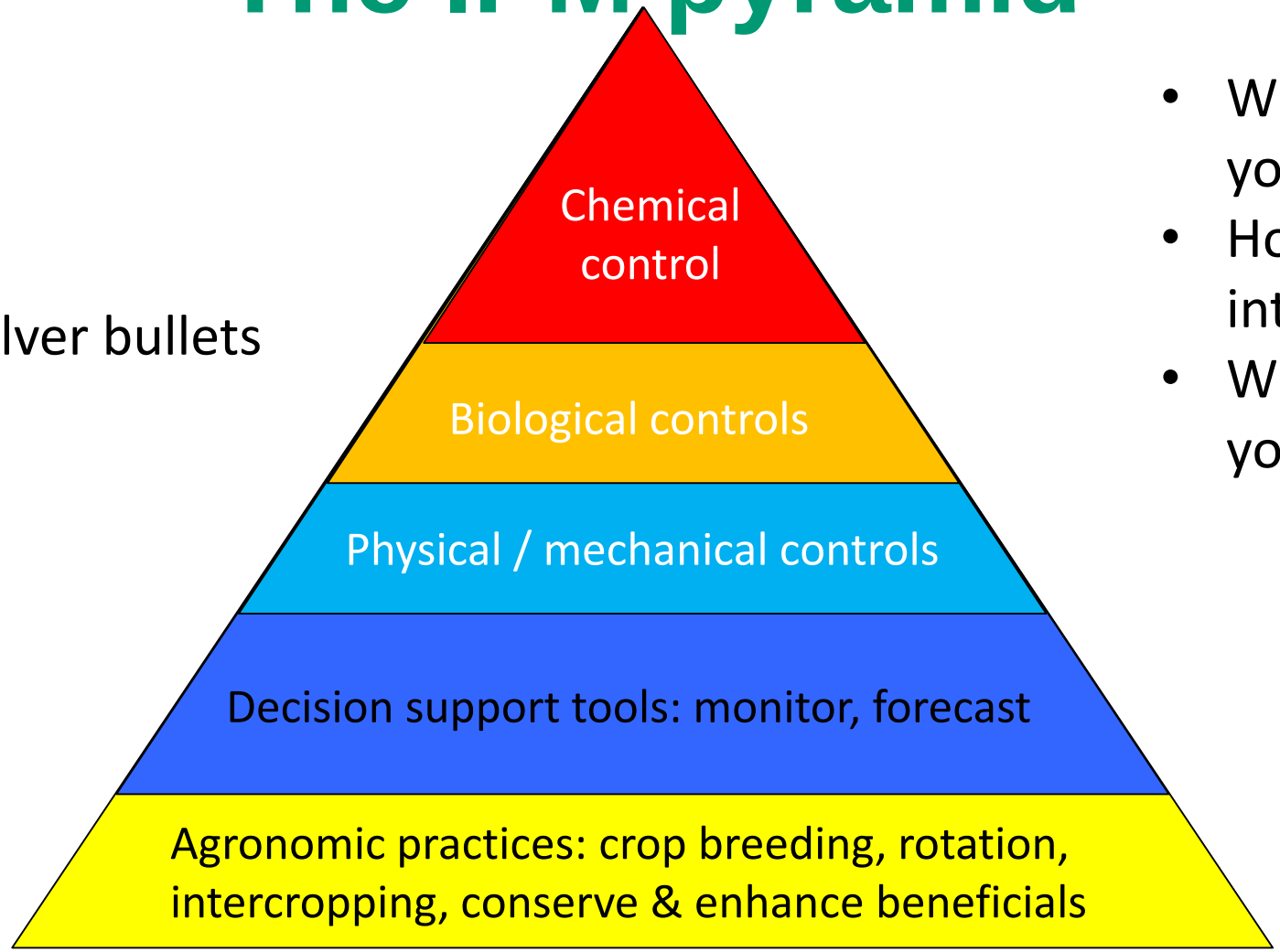
- IPM is mandatory under EU law
- Growers should adhere to core principles set out in the Directive (prevention, monitoring, treatment, checking effectiveness).
- Each country has a National Action Plan.

# The SUD: sustainable pest management

- Sustainable **biological, physical and other non-chemical methods** must be preferred to chemical methods if they provide satisfactory pest control.
- Pesticides applied shall be as **specific as possible** … and shall have the least side effects on human health, non-target organisms and the environment.
- Where the risk of resistance against a plant protection measure is known … **anti-resistance strategies** should be applied to maintain the effectiveness of the products.

# The IPM pyramid

Few silver bullets




- Which of these are you already using?
- How well are they integrated?
- What new tools do you need?

# Biopesticides / Bioprotectants

- Biological plant protection tools to help manage pests*.
- Living microbes, semiochemicals, plant extracts & other natural products.
- Originate from nature, or are nature-identical when synthesized. Formulated & packaged.
- Low impact on human health & environment.
- Varied modes of action.
  - Some may not directly kill the target (e.g. preventative biofungicides).
  - Hence term "**bioprotectant**" is now preferred by EU, IBMA.

# New substances coming on stream

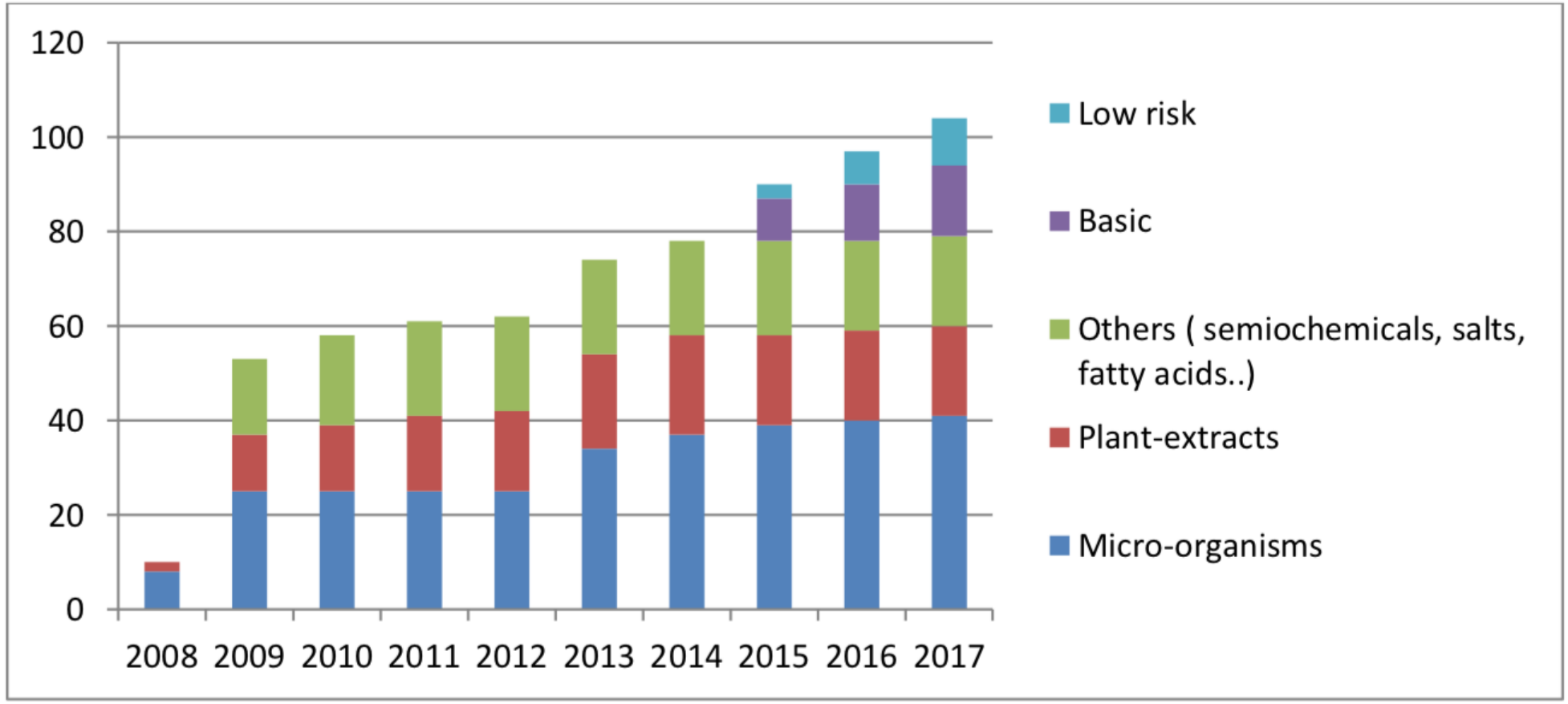
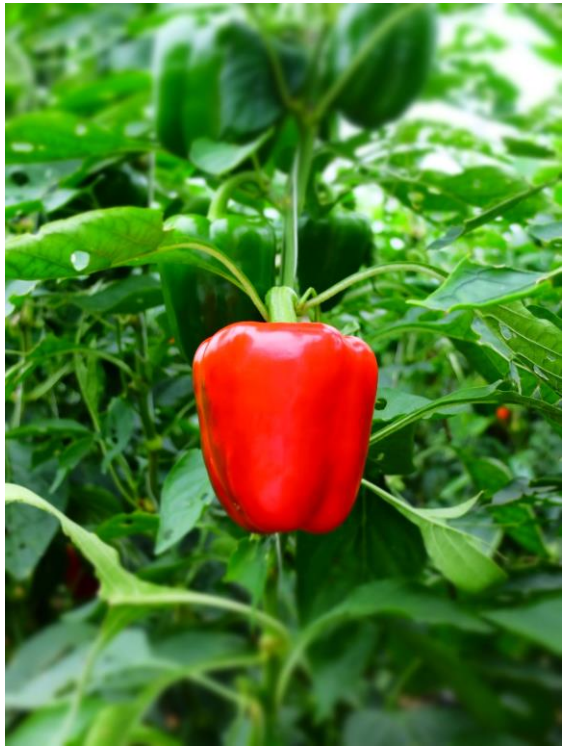



Figure 2: Increase in numbers of alternative substances approved by the EU

European Commission 2017

# Protected crops & orchards



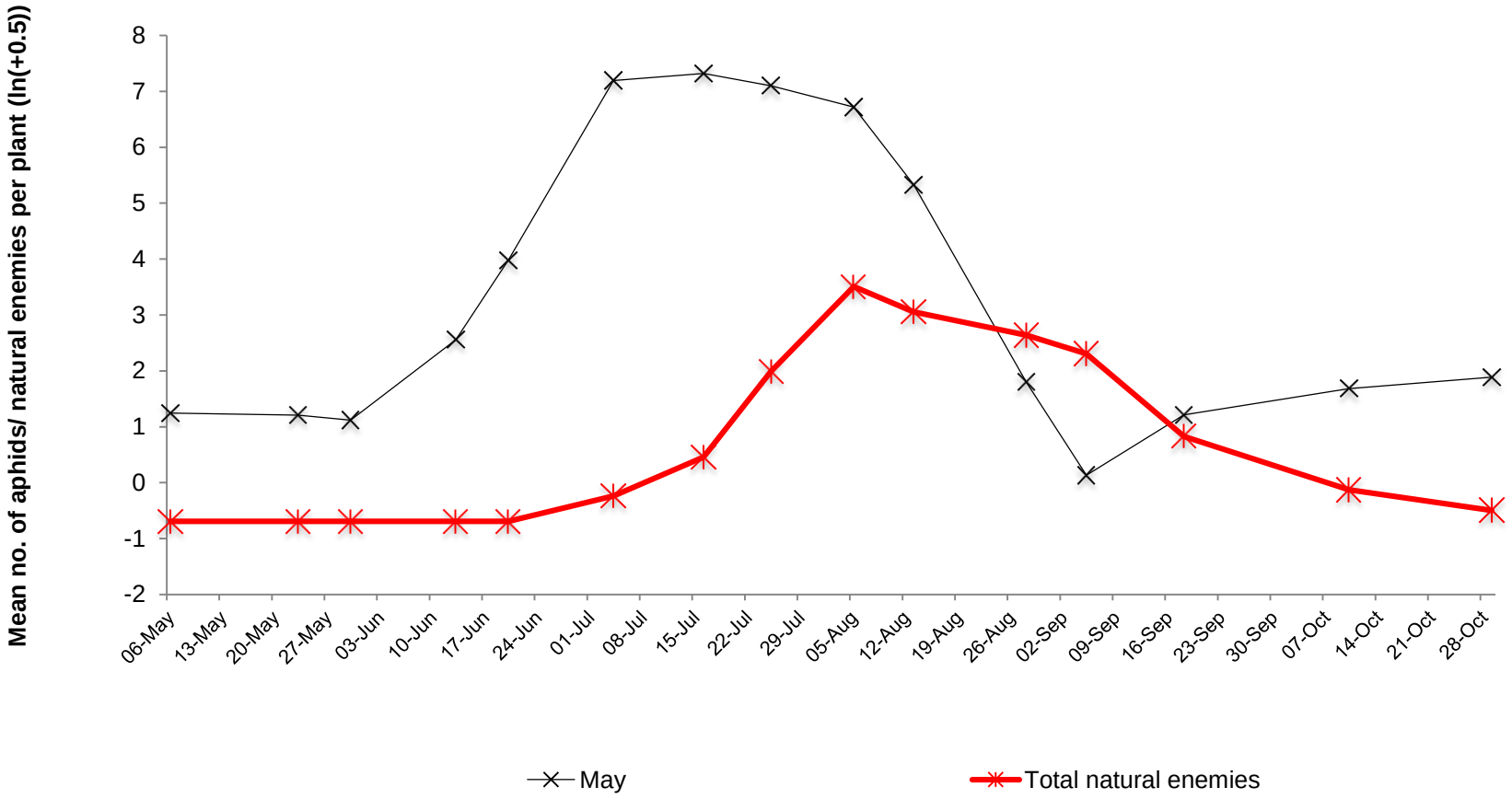
# Why should we be considering them for field crops?

- Number of products increasing while conventional pesticides decreasing.
- They are not silver bullets but they have attractive properties for IPM, human safety & the environment.
- An opportunity: how can we get the best out of it?

# IPM in field crops: challenges & opportunities

- Outdoor environment (weather, climate).
- Not enough new plant protection products.
- Integration can be complex.
- Cost of bio-based protectants.
- Improve biodiversity & soils.
- Exploit beneficials.
- Cultural control options at different scales.
- Manage pesticide resistance.

# Bioprotectants give natural control – they are already out there!

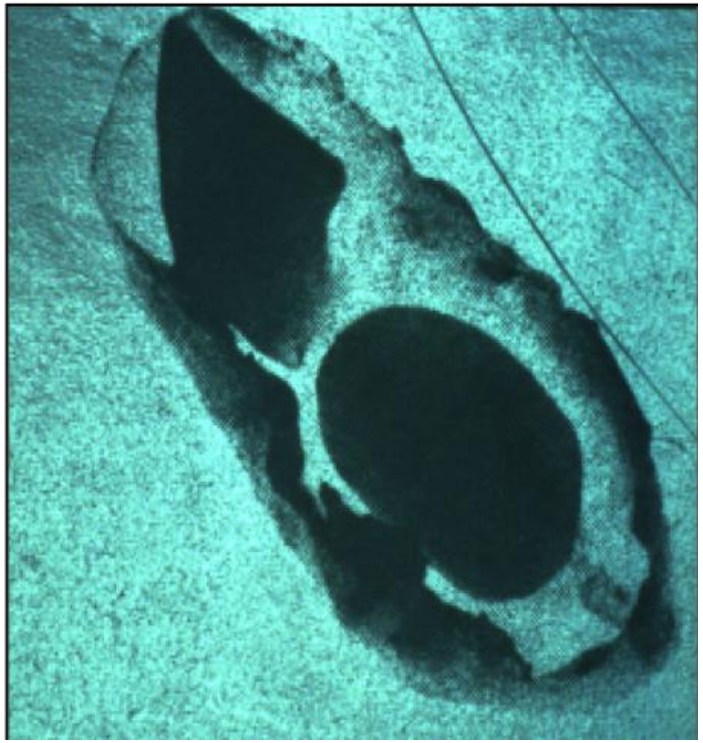


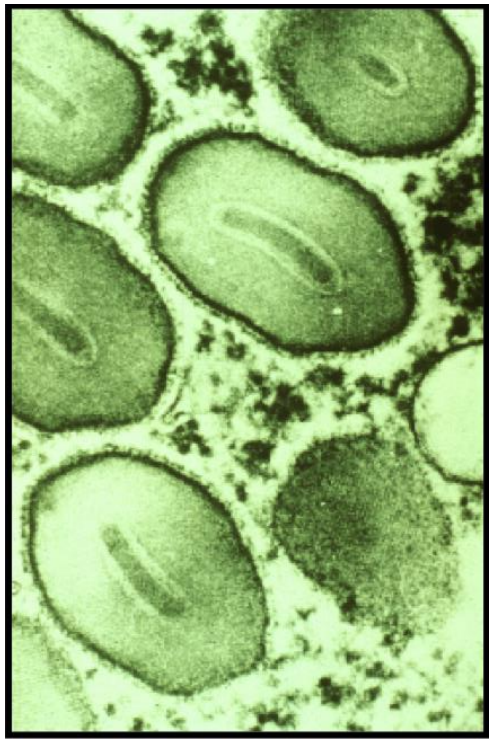

Aphid population dynamics on sequentially planted Brussels sprouts and associated guild of natural enemies

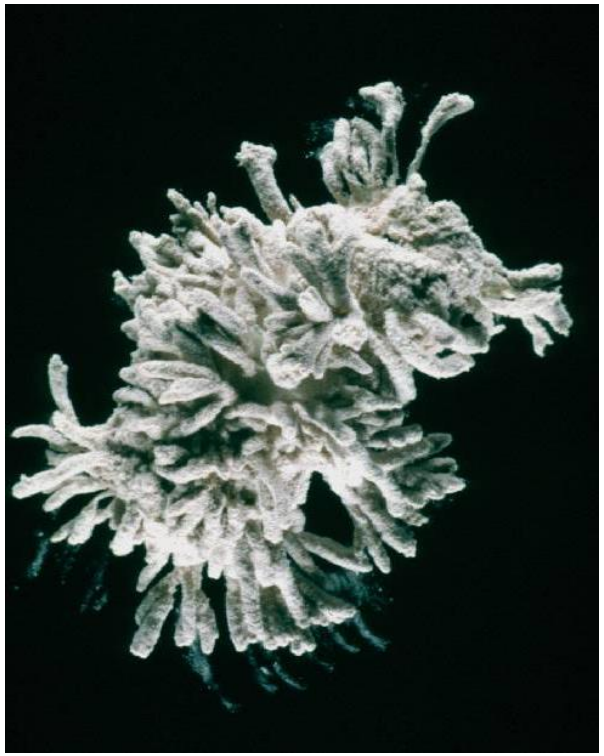
# Let’s look at 3 types of bioprotectant

- Microbial control agents of insect pests (insect pathogens).
- Microbial control agents of plant pathogens.
- Semiochemicals – insect pheromones.

# Insect pathogenic microbes







# Biofungicides – preventative vs curative

## Preventatives for Botrytis (but note MoA).

- *Bacillus amyloliquefaciens* QST 713 (Serenade): extracellular lipopeptides
- *Gliocladium catenulatum* J1446 (Prestop): colonizes plant surfaces, hyperparasite.

## Curative for powdery mildew

- *Ampelomyces quisqualis AQ10* - mycoparasite

# BASF Mating behaviour disruption pheromone against codling moth and leafrollers (RAK 3+4)

Other products & manufacturers are available!

➔ **one ampoule contains codling pheromone, the other contains tortrix pheromone. Gives 90 – 99% control depending on target species.**

## Increasing range of pheromones available

- Russell IPM – Europe's biggest producer.
- Pheromones for > 40 insect pest species.
- Leek moth, turnip moth, cutworm, diamondback moth

Russell IPM
INTEGRATED PEST MANAGEMENT

- Human & environmental safety.
- EU approval inc. efficacy.
- Compatible with the IPM pyramid.
- Not silver bullets. Lower potency, some are slow acting.
- Many are contact acting.
- Less forgiving:
  - Good knowledge. Attention to detail.
  - Environmental conditions.

**The challenge: capture their benefits & mitigate for their downsides.**

# Can they work in the field?

# Proof of potential

- Lab & field experiments with Botanigard (*Beauveria bassiana*).
- Reduced cabbage aphid by 70%.
- Lettuce aphid by 80%.
- No effect on peach potato aphid.


*insects*

MDPI

*Article*

**Susceptibility of *Myzus persicae*, *Brevicoryne brassicae* and *Nasonovia ribisnigri* to Fungal Biopesticides in Laboratory and Field Experiments**

**Gill Prince and Dave Chandler ***

Warwick Crop Centre, School of Life Sciences, University of Warwick, Wellesbourne, Warwick CV35 9EF, UK; g.prince@warwick.ac.uk

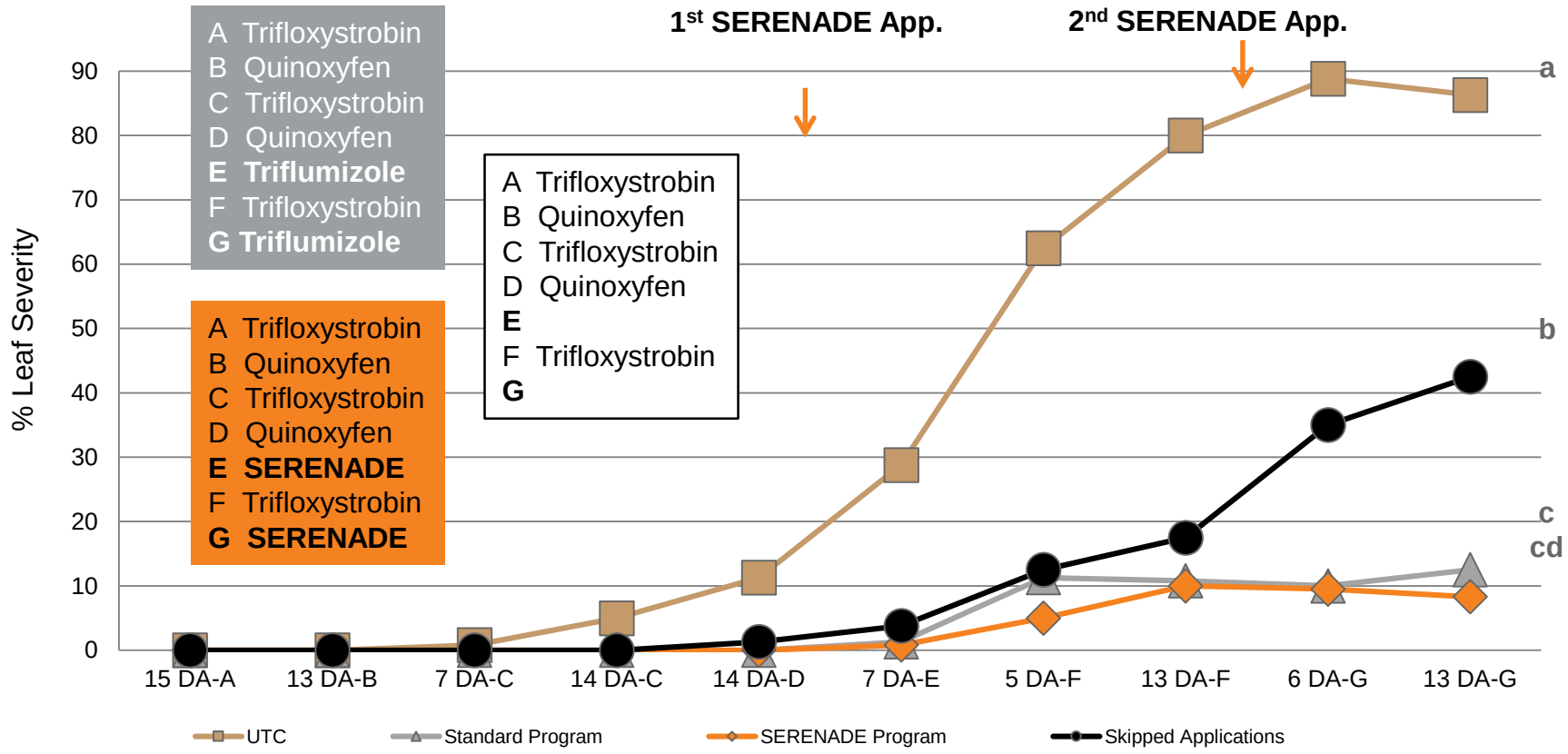
* Correspondence: dave.chandler@warwick.ac.uk; Tel.: +44-2476-575-2041

Received: 30 December 2019; Accepted: 15 January 2020; Published: 17 January 2020

check for updates

# Grapes: Integrated powdery mildew control using *Bacillus amyloliquefaciens*(Serenade)

## Disease control in grapes comparing an integrated program to a chemical program




Fischer, Columbia Ag Research, Hood River, OR – 2010..

# Combining microbials can improve pest control: fungus (*Beauveria bassiana*) and microbial Bt against Colorado potato beetle

Fungus infectious in lab.

Inadequate in field

Bt = some control in field.

Expensive.

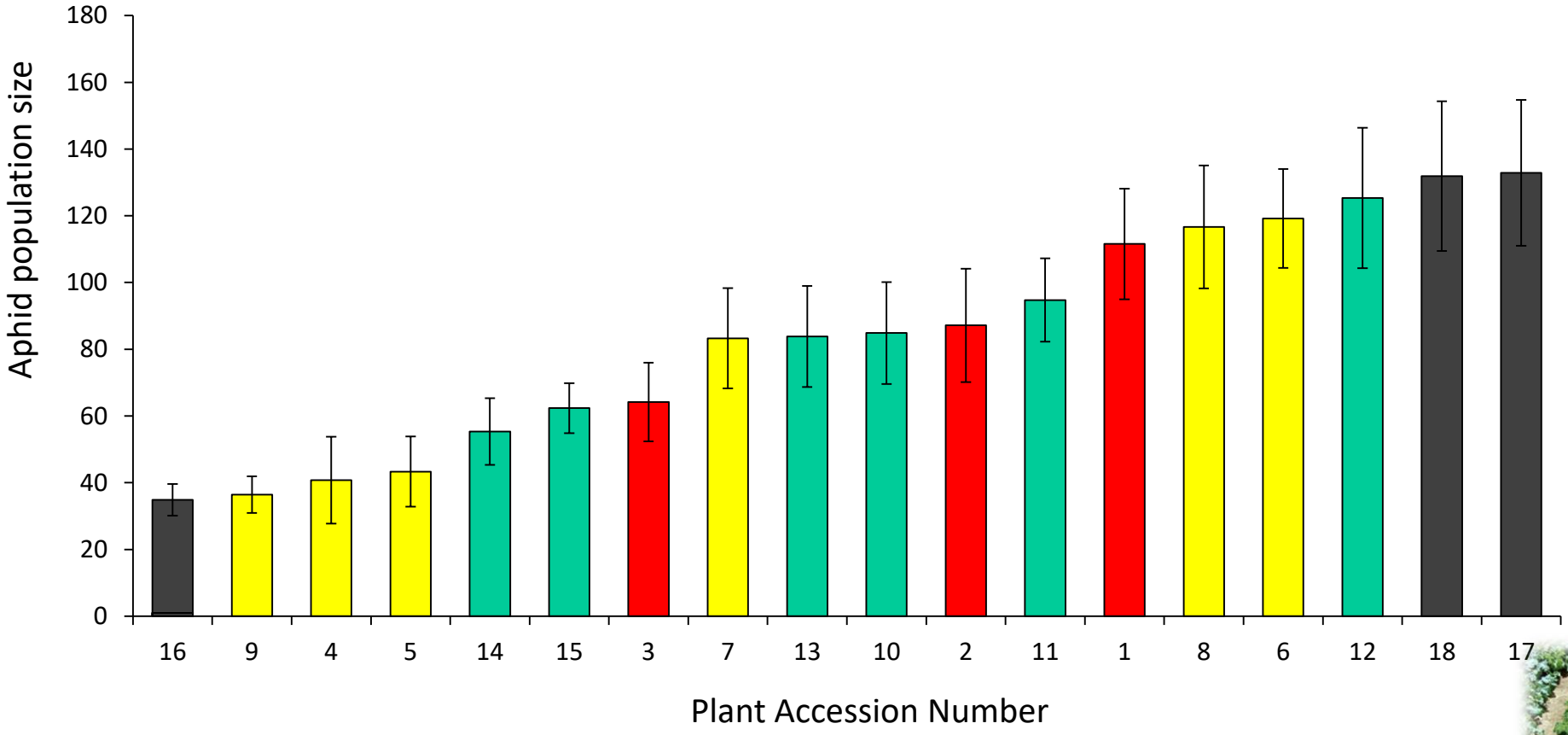
FIELD EXPERIMENTS

- **Fungus: c. 0%**
- **Bt: c. 50%**
- **Combined:85%**

- Bt prolongs inter-moult period?
- Bt causes starvation?

Wraight & Ramos (2005). J. Invert. Path., 90, 139 – 150.

# Integrated control: An IPM system for aphids on Brassica: combining durable crop resistance with biocontrol




BBSRC SARIC: Warwick, Keele, Harper Adams, Durham, ADAS

# Bioprotectant strategies must combine: understanding, utility, attention to detail

# The AMBER project

- **A**pplication & **M**anagement of **B**iopesticides for **E**fficacy and **R**eliability.
- PE, PO & HNS crops.
- Identify the reasons why biopesticides can be inconsistent.
- Develop management tools and practices that can improve performance.

AHDB
AGRICULTURE & HORTICULTURE DEVELOPMENT BOARD

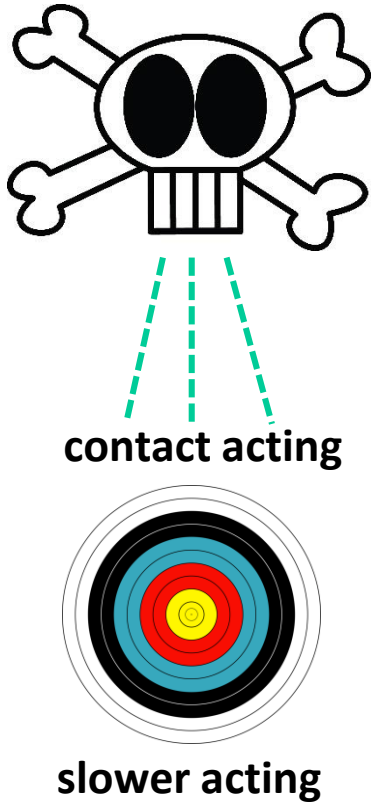
# Working in 4 areas

- Making spray application more efficient: relationship between water volume and % of spray retained on crop.
- Biofungicide performance: biofungicide persistence to improve timing of application. Integration with decision support system.
- Bioinsecticide performance: how pest population growth rates influence  biopesticide application strategy.
- Knowledge exchange.

# Biopesticides: Good application is critical

Effective dose

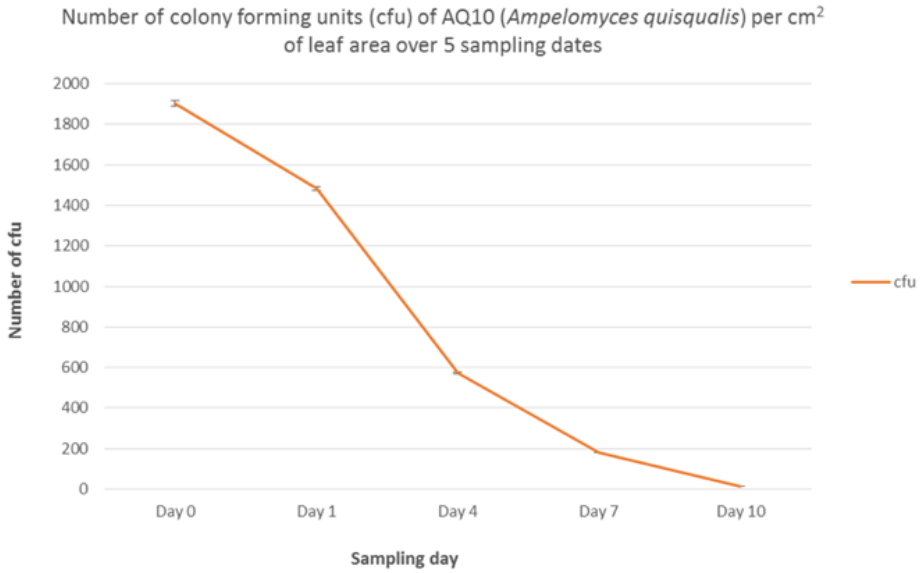
Avoid waste




Right place & time

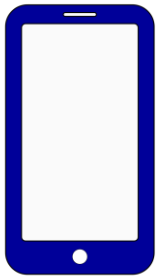
Biology of pest / disease: informs use strategy in IPM

**Environment; other IPM tools**




Powdery mildew control: Persistence of biofungicide AQ10 on foliage

Apply AQ10

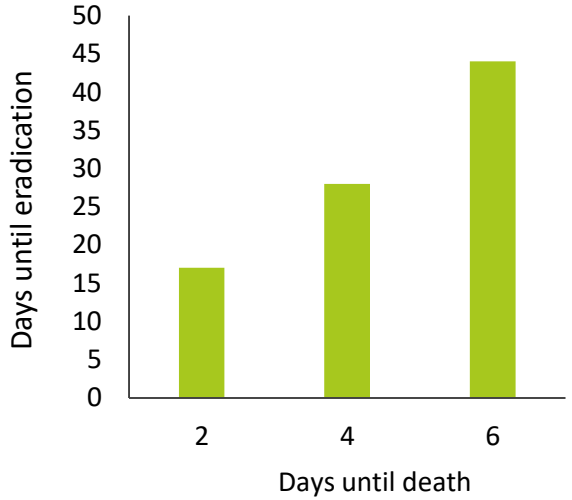


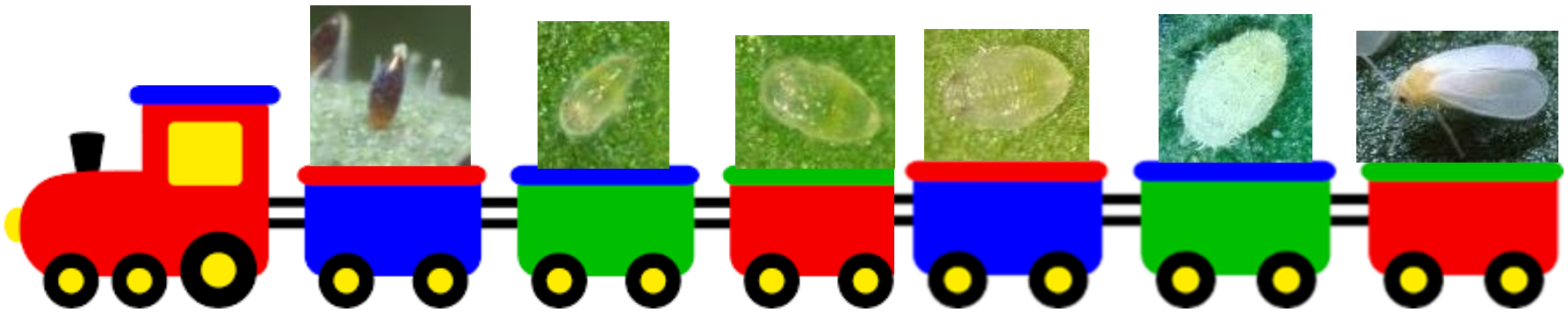
Temp. ‘spikes’.

On line sensor (30 MHz, Fargro)

# Boxcar model of pest development: informs biopesticide use strategy in IPM

- Tracks maturation of individuals.
- Simulates applications of biopesticides and control efficacy – important for when kill is not instantaneous (persistence, mortality, speed of kill, frequency).

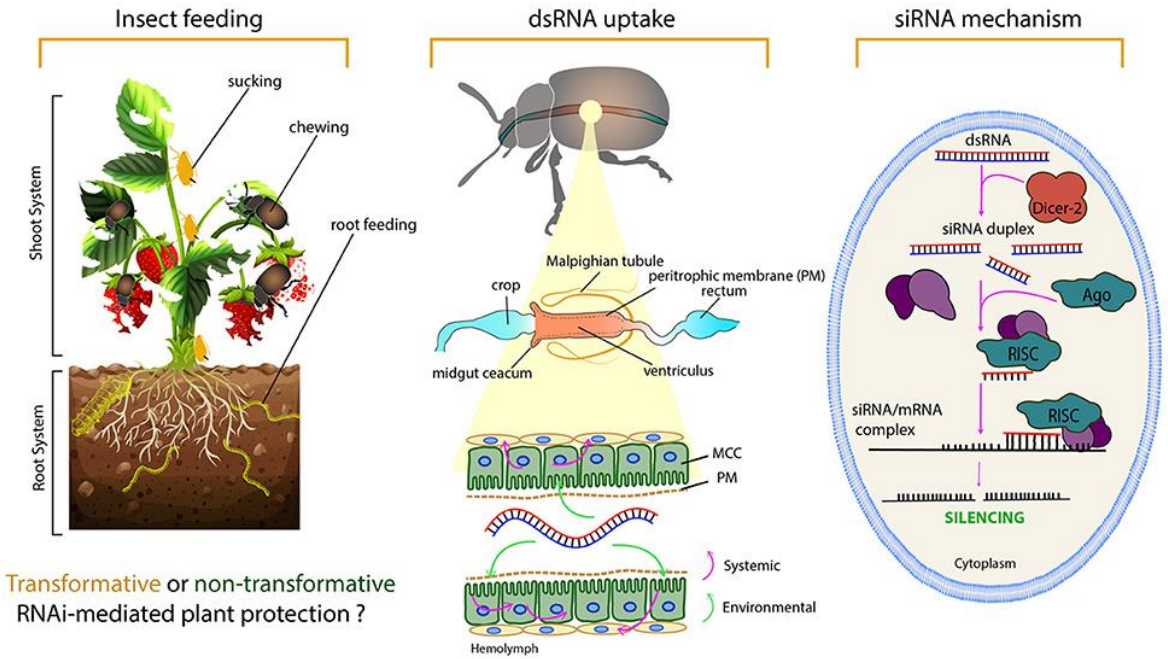


# The future: new biologically based products

- Microbes + metabolites:
  - Grandevo (Marrone): *Chromobacterium subtsugae* – whitefly, mites, caterpillars.
  - Requiem (Bayer) - terpenes

- RNAi mediated silencing of gene expression:
  - Exogenous dsRNA


Frontiers in Physiology, 7, 553

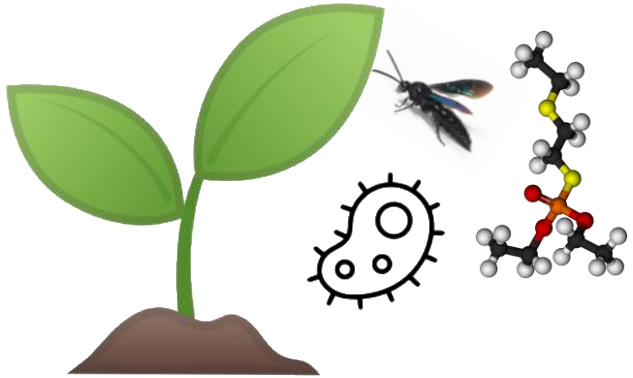
Naio technologies

Hummingbird Tech

30MHz

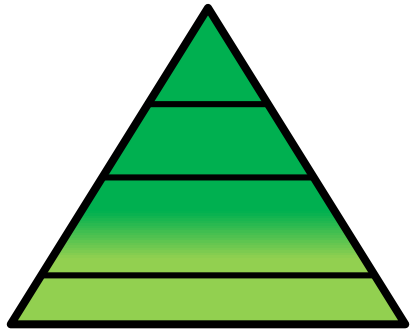
Innok robotics

# Future IPM: new technology & understanding



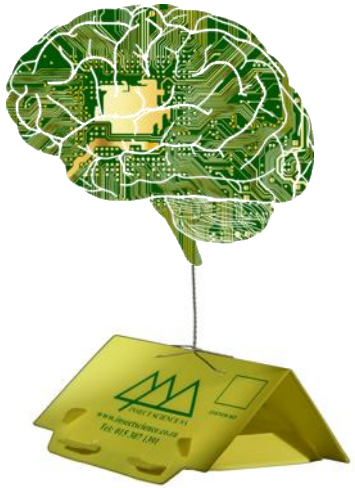
'Bio'-crop protection

Precision farming
(sensing; spraying)



IPM pyramid

Decision
support



# Moving forward

- Transition to full IPM: more biopesticides will be used.
- We need a crop protection ‘road map’ based around IPM.
- Growers, industry, research, government working together.
- Start of the journey – but business as usual is not an option.

AMBER

Thankyou

Google ‘amber biopesticides’

AHDB

AGRICULTURE & HORTICULTURE DEVELOPMENT BOARD

# PANEL SESSION

# Refreshment Break

## Back to start at 11:45

# Disease Management Options for the 2020 Season

Stuart Knight, NIAB

CEREALS & OILSEEDS

**Note:**

**The graphs in these slides show dose-response curves up to 100% label dose.**

The graphs at the AHDB Agronomy Event, East Anglia (12 February 2020) showed dose-response curves up to 200% label dose.

Fungicides are tested at double rate to improve the ‘fit’ of the dose-response curves.

# Background information

## Choosing fungicides

- Match fungicides to the primary disease risk, which depends mainly on variety, sowing date, location and local weather
- Mixtures and alternations of fungicides with different modes of action, from different fungicide groups, are often most effective and reduce the likelihood that fungicide resistance will develop in pathogens
- Resistance poses a significant threat to the performance of fungicides. It is essential to take resistance management into account when planning fungicide programmes
- For further information, visit the Fungicide Resistance Action Group's (FRAG) web page: ahdb.org.uk\frag

# Background information

**Protection and curative**

- ‘Protectant’ curves show the activity of fungicides when they are applied soon after the emergence of a leaf layer, before much infection has occurred
- ‘Curative’ curves indicate fungicidal activity after infection has occurred but before symptoms become visible
- Performance of products on each leaf layer and at each site was classified as protectant or curative based on timing of leaf emergence relative to spray application
- Performance of individual active ingredients can be assessed by comparing dose-response graphs. These show average performance measured across a range of sites, seasons and leaf layers

# Trial methods

In order to provide a good test of the fungicides:

- Trials are located in areas that are at high risk from the target disease in most years
- Trials are carried out on varieties that are very susceptible to the target disease and not too susceptible to other diseases
- If necessary, over-sprays that are not active against the target disease are used to reduce the effect of other diseases on the trial
- Fusarium trial inoculated with fusarium species and mist-irrigated before and after inoculation to establish infection

# Fungicide performance 2019 update for wheat

# Septoria tritici efficacy data 2019

| Site (Organisation) | Protectant | Curative | Mixed | Growth stage of application | Variety |
|---|---|---|---|---|---|
| Herefordshire (ADAS) | ✓ | | ✓ | GS37 | KWS Kielder |
| Hampshire (NIAB) | ✓ | | ✓ | GS32 | Dickens |
| East Lothian (SRUC) | ✓ | ✓ | ✓ | GS39 | Viscount |
| Carlow, Ireland (Teagasc) | ✓ | | | GS37 | KWS Lumos |
| Cardigan (ADAS) | ✓ | ✓ | | GS39 | KWS Santiago |
| Shropshire (NIAB) | | | ✓ | GS39 | Dickens |

# Revystar XE

New fungicide product for 2020

- Contains a new triazole (Revysol) and an SDHI (Xemium)
    - 100 g/L mefentrifluconazole + 47.5 g/L fluxapyroxad
- Maximum individual dose 1.5 L/ha
- Maximum of two applications
- To be applied before GS69
- Approved for wheat, barley, oats, rye, triticale, spelt and durum wheat

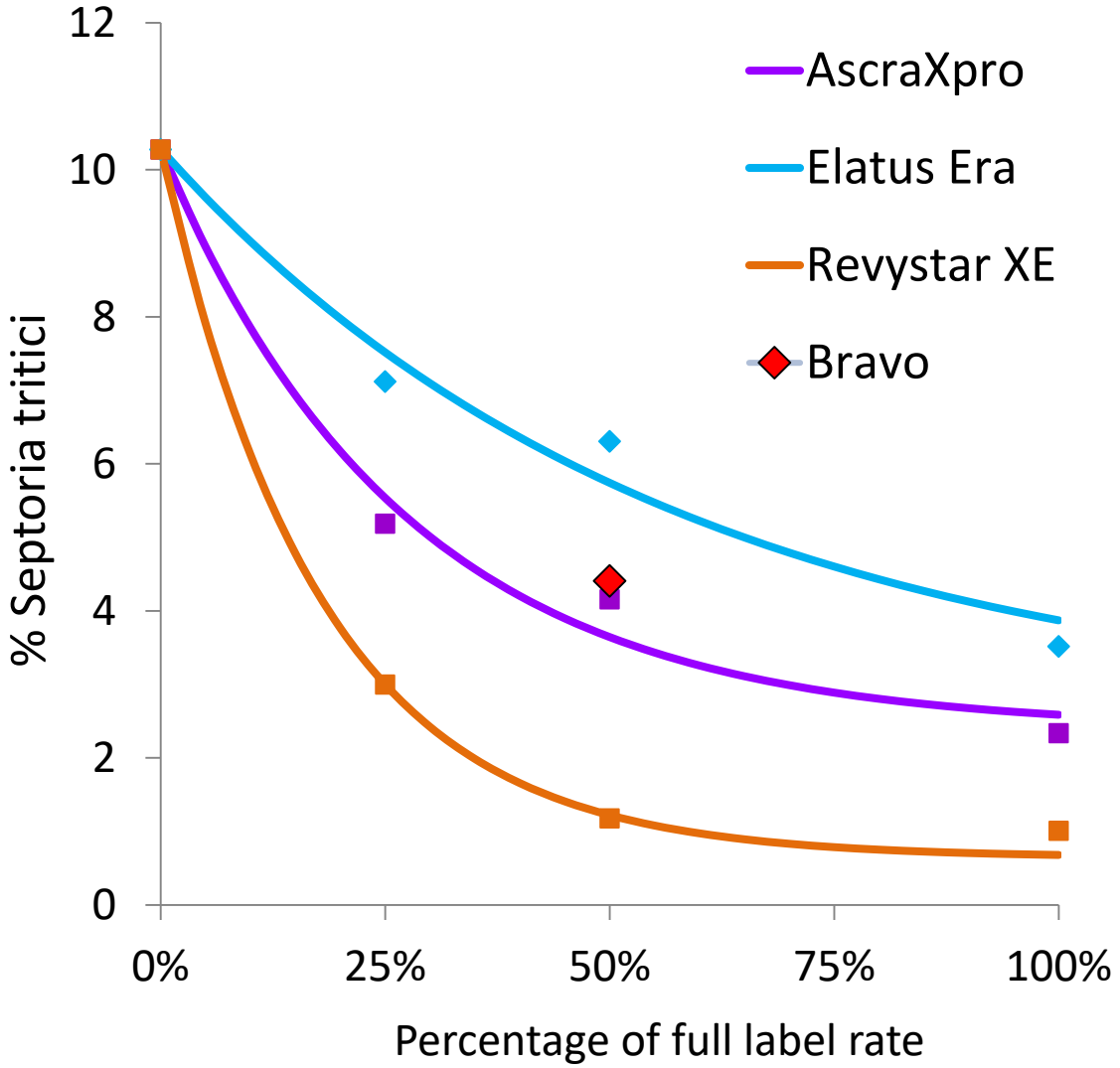
# Wheat products 2019

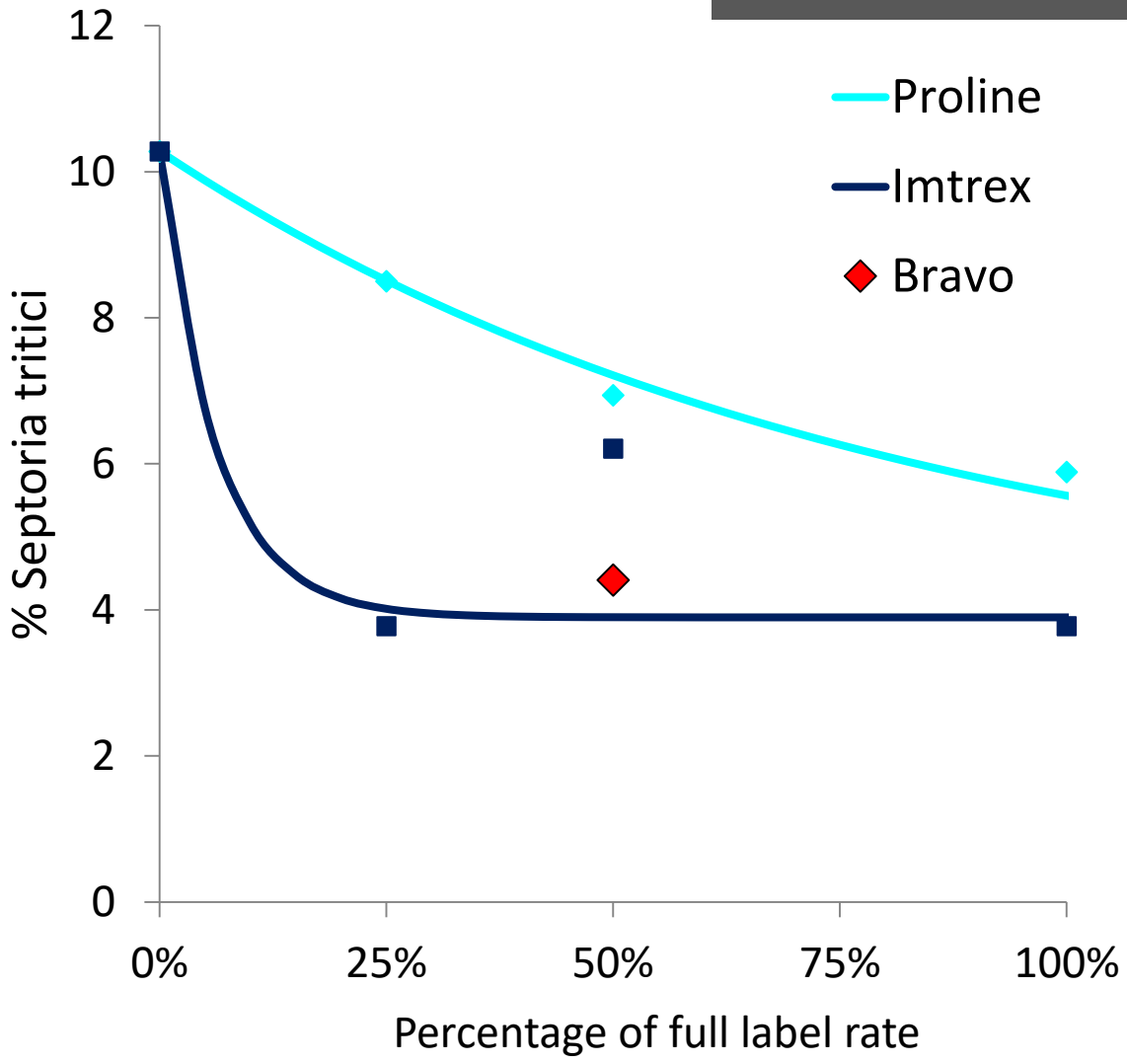
| Product | Active(s) | Septoria | Brown rust | Yellow rust |
|---|---|---|---|---|
| Bravo | chlorothalonil | ✓* | | |
| Proline | prothioconazole | ✓ | ✓ | ✓ |
| Bassoon | epoxiconazole | | | ✓ |
| Imtrex | fluxapyroxad | ✓ | ✓ | ✓ |
| Comet | pyraclostrobin | | ✓ | ✓ |
| Amistar | azoxystrobin | | | ✓ |
| Ascra Xpro | bixafen + fluopyram + prothioconazole | ✓ | ✓ | ✓ |
| Librax | fluxapyroxad + metconazole | | ✓ | |
| Elatus Era | solatenol + prothioconazole | ✓ | ✓ | ✓ |
| Revystar XE | mefentrifluconazole + fluxapyroxad | ✓ | ✓ | ✓ |

*Bravo at 50% dose only

# Septoria tritici protectant 2019 (5 trials)

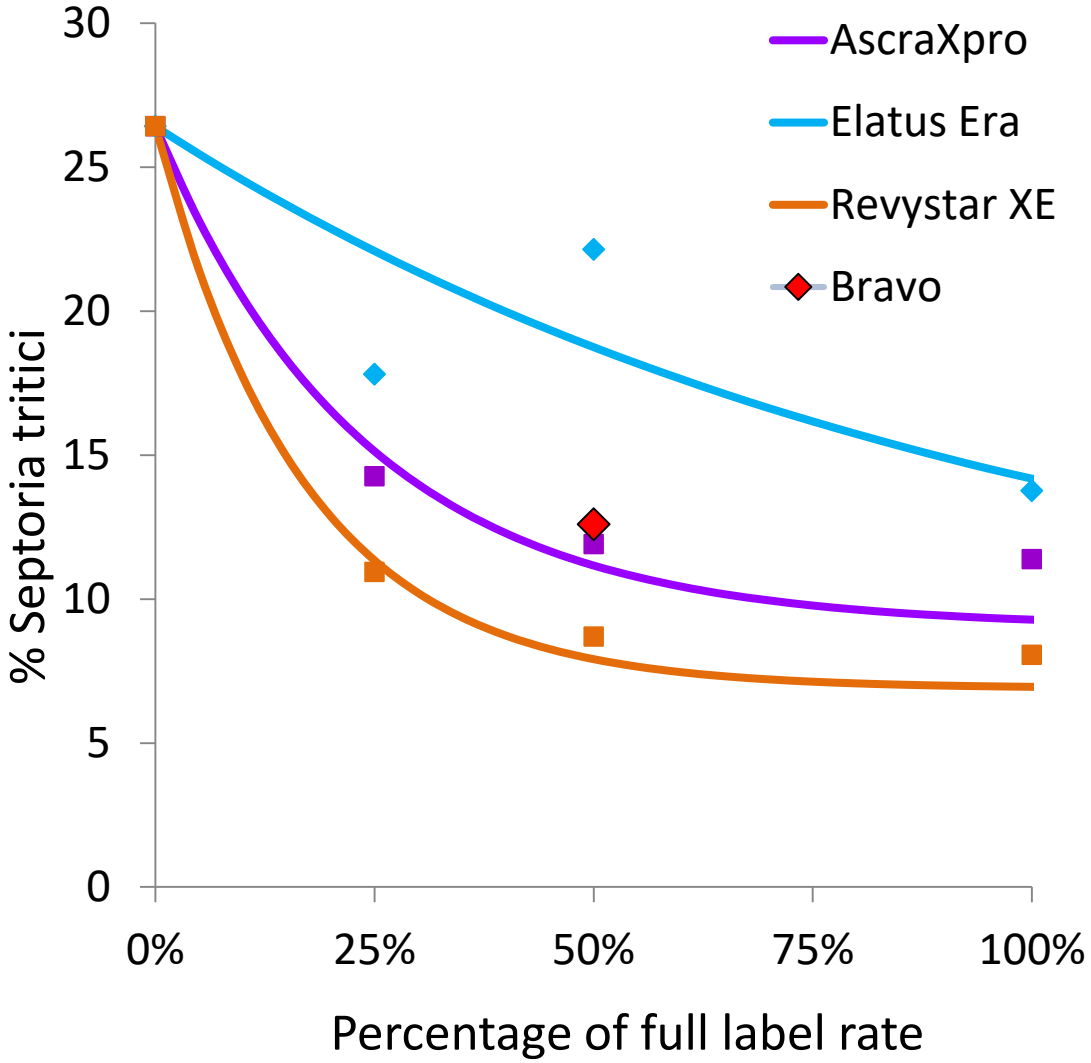
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

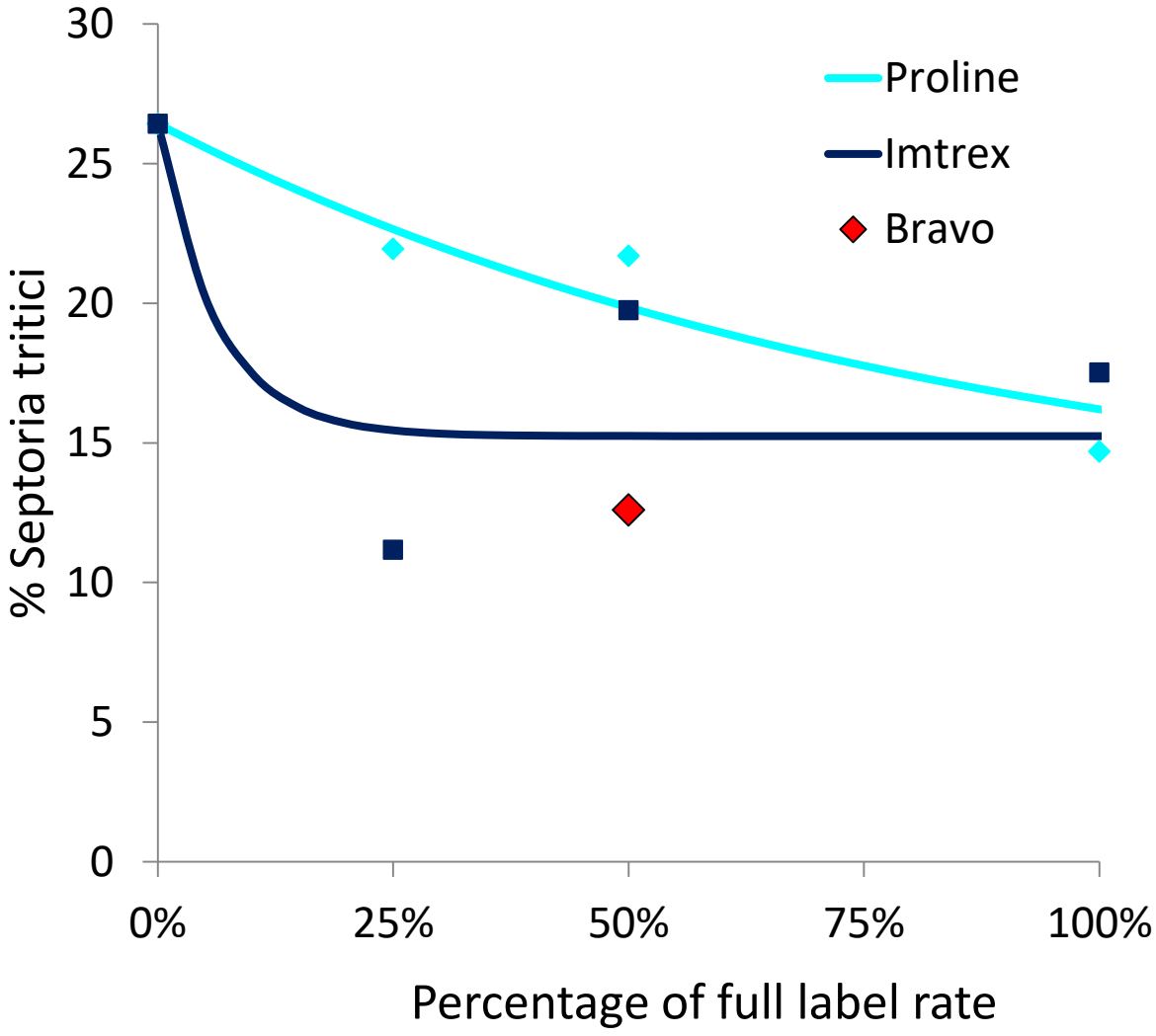


# Septoria tritici mixed protectant and curative 2019 (4 trials)

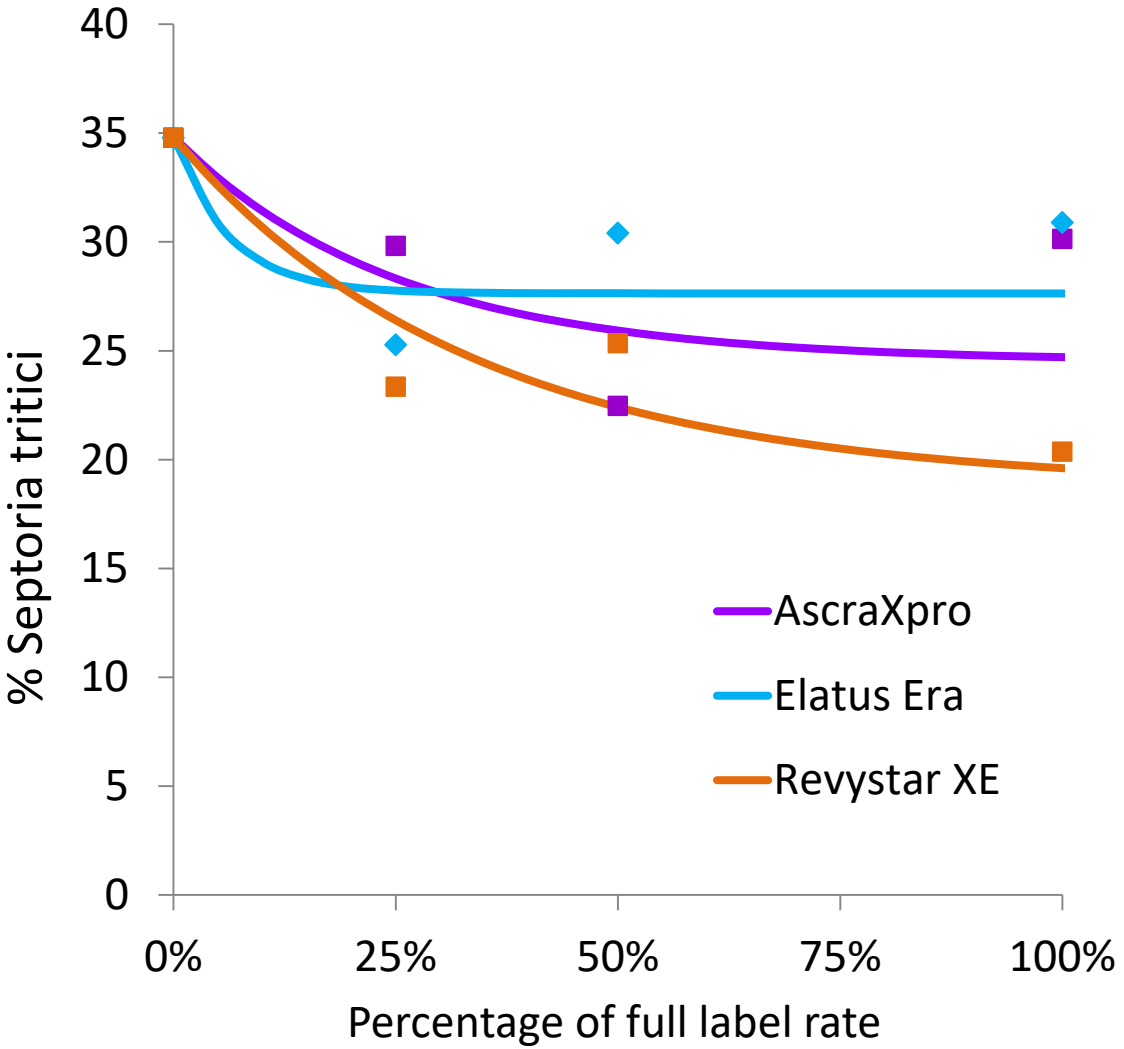
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

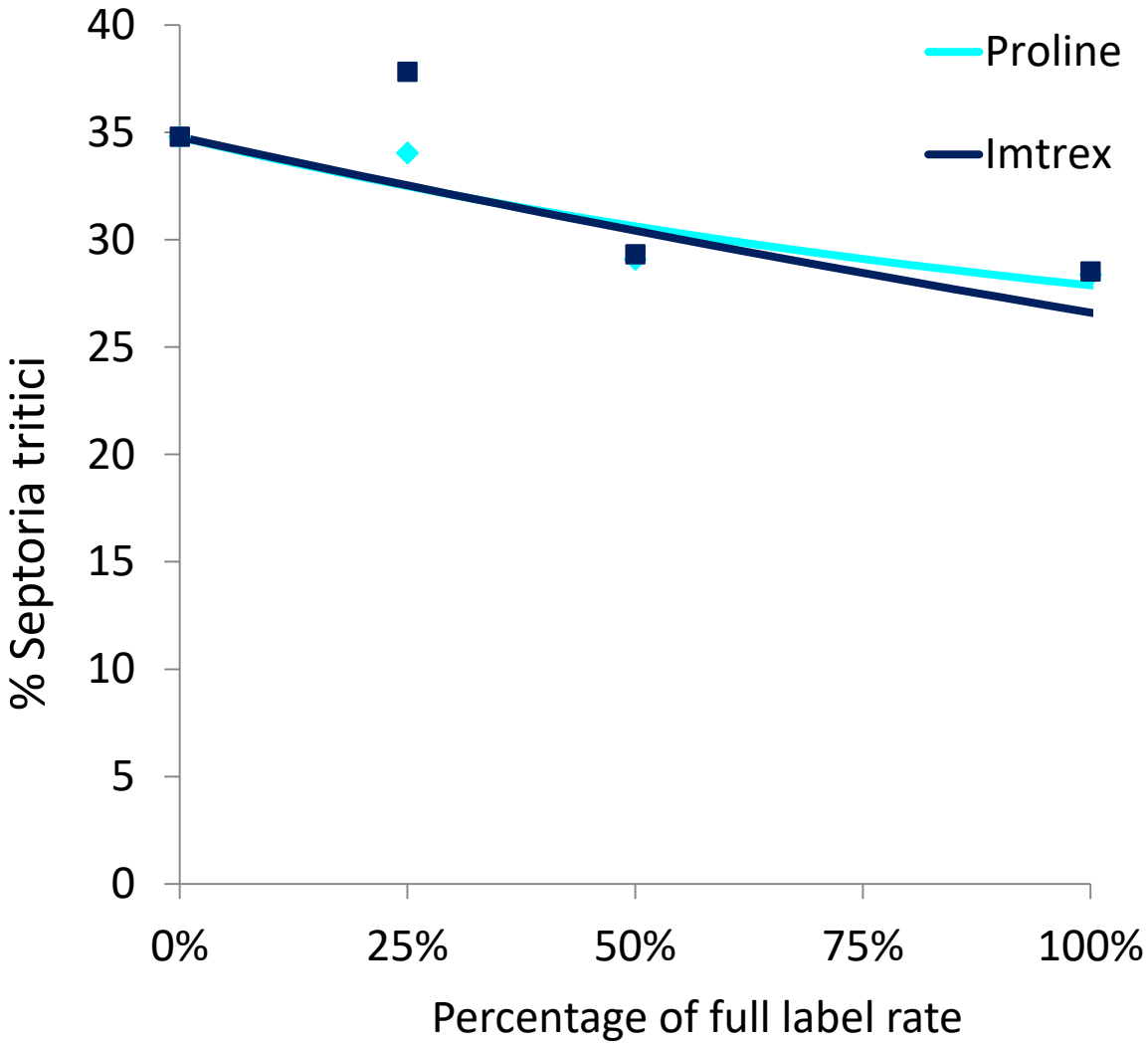


# Septoria tritici curative 2019 (2 trials)

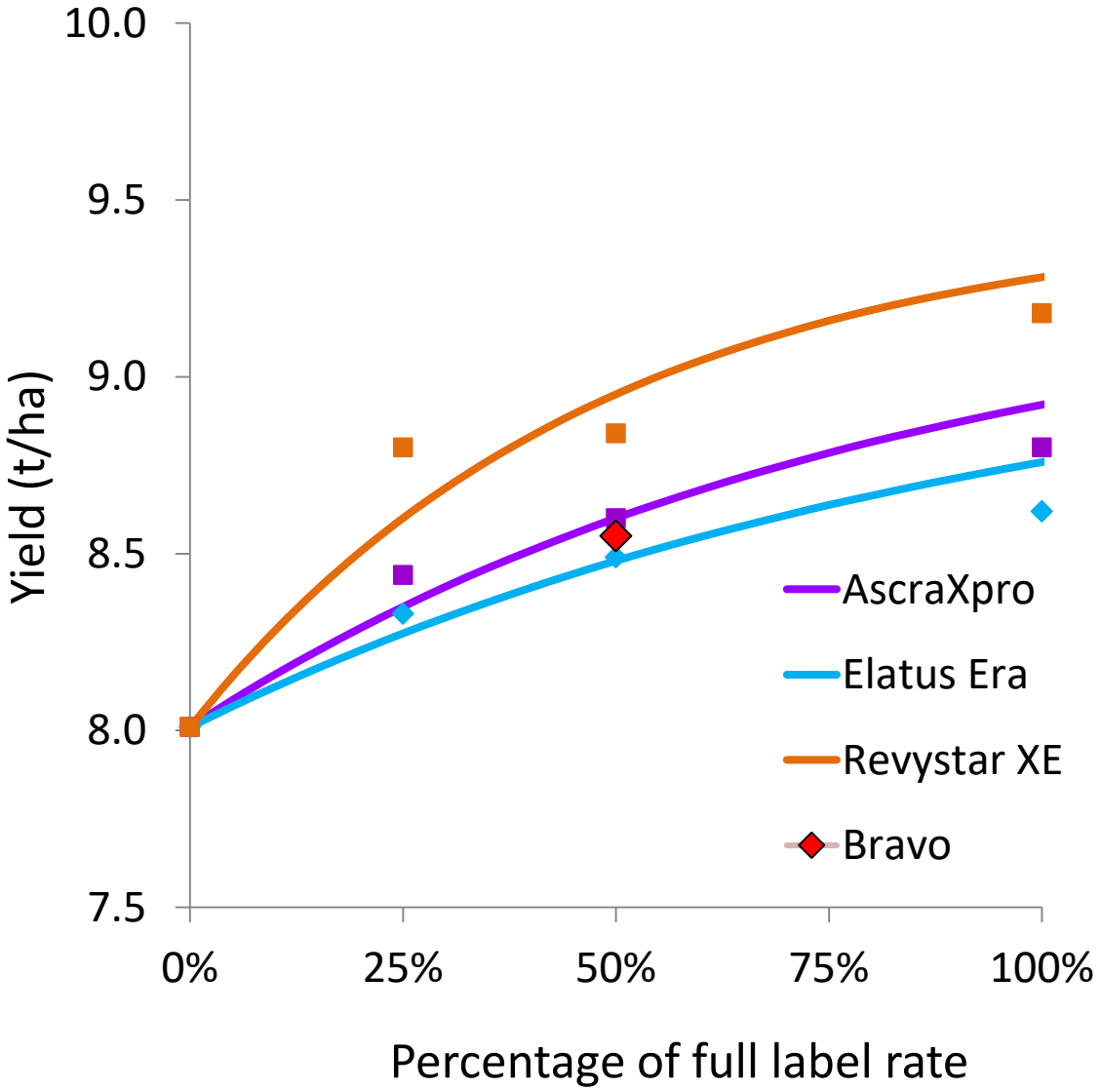
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

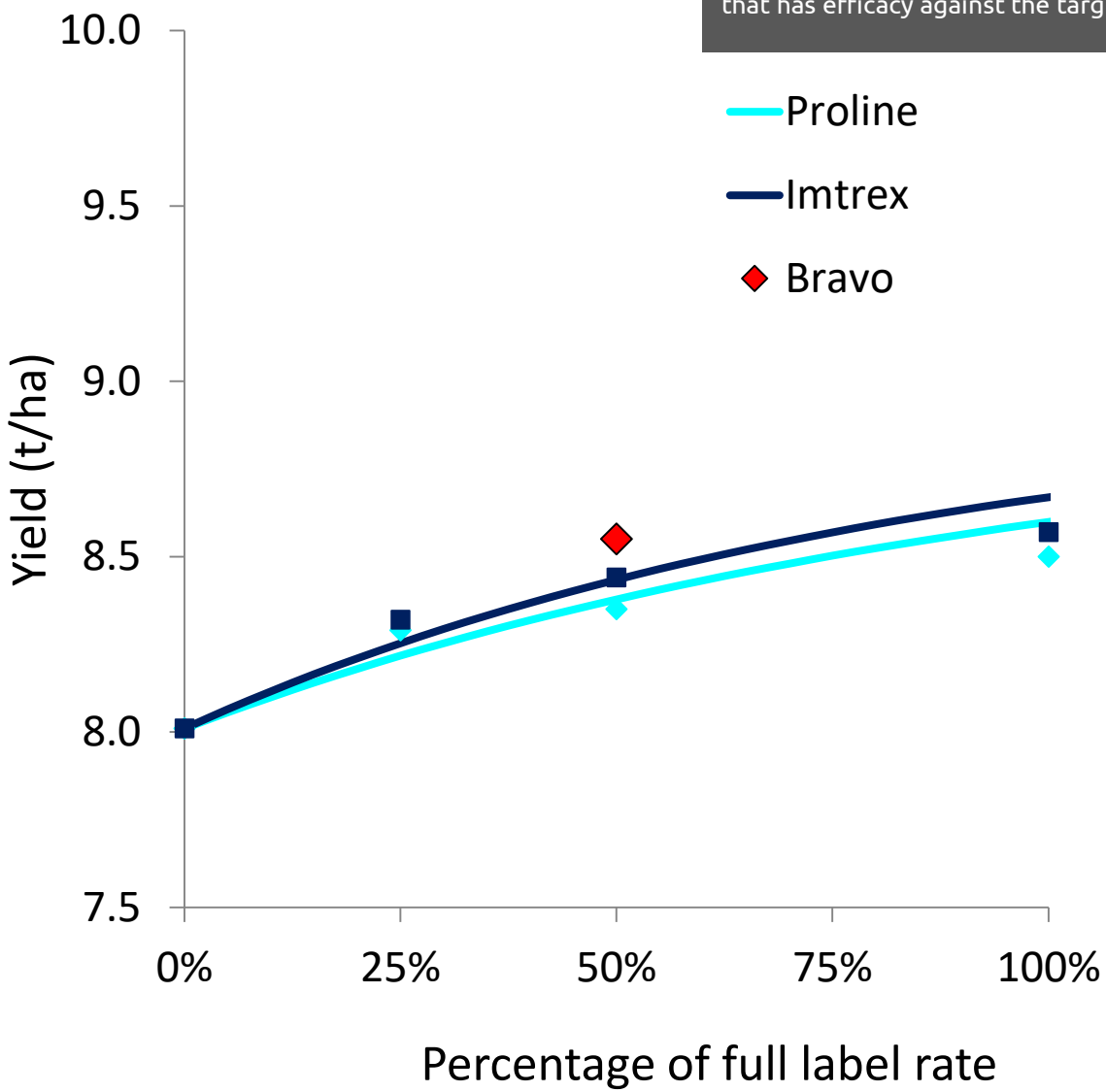


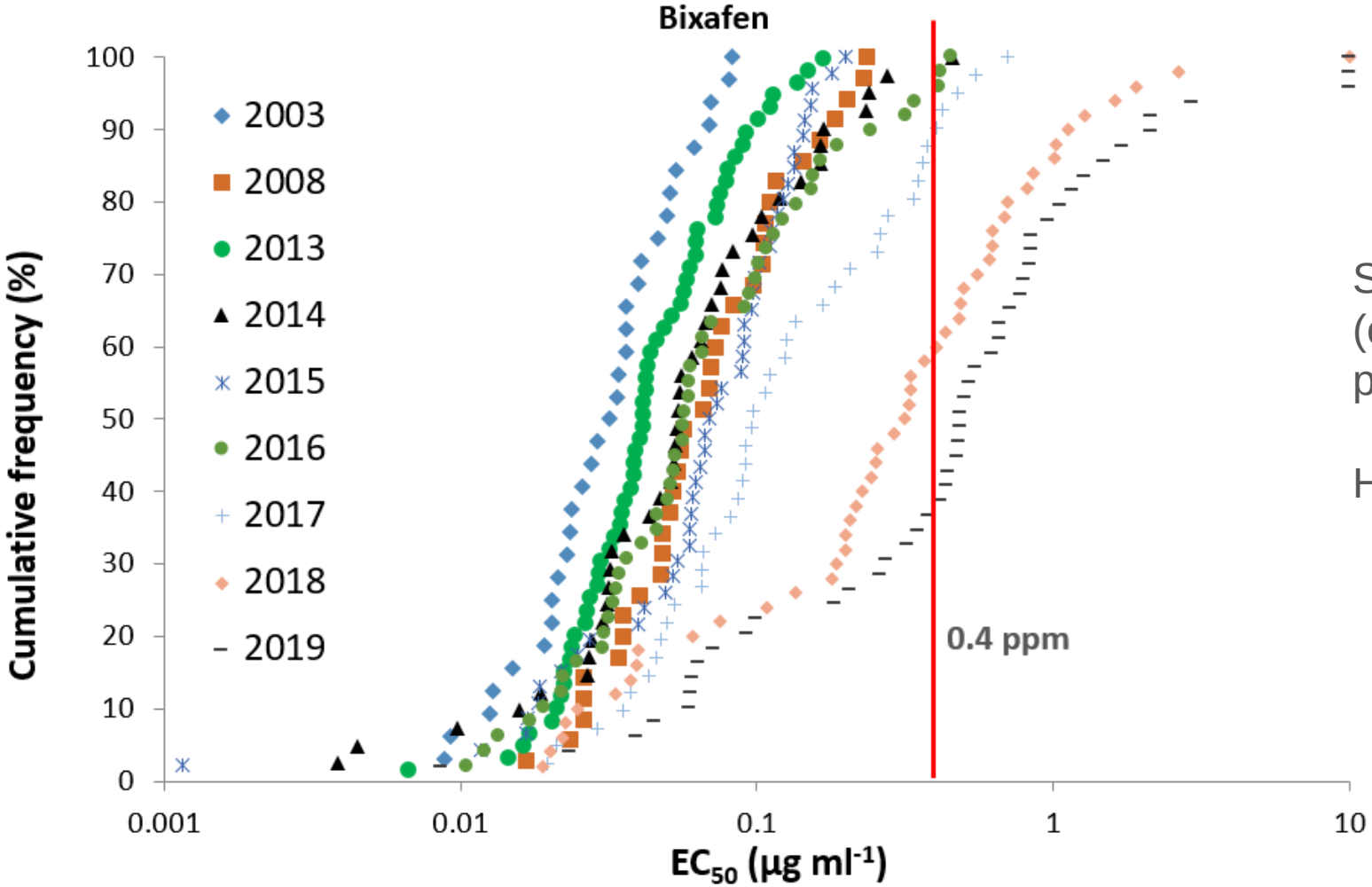
# Septoria tritici trial yields 2019 (7 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease



# Rothamsted early season monitoring 2019 SDHIs (n=49)

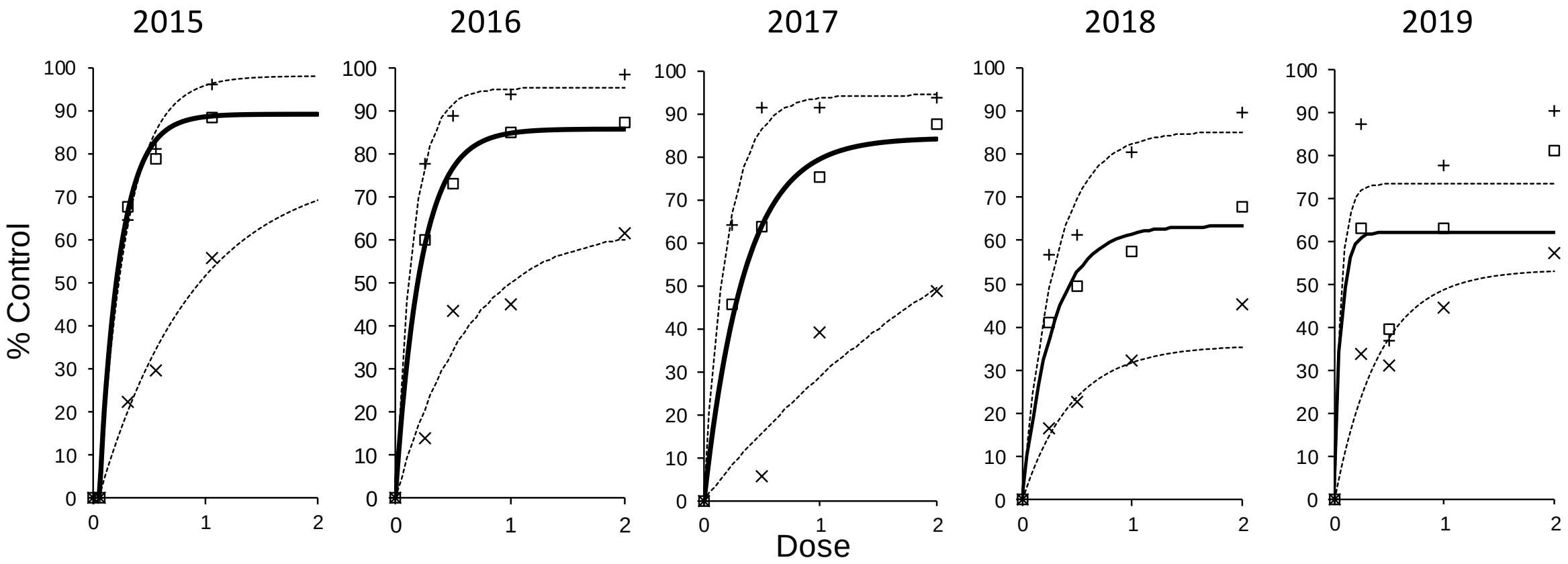



Strains less sensitive to SDHIs (e.g. T79N and N86S) now widely present in populations

H152R overwintered at this site

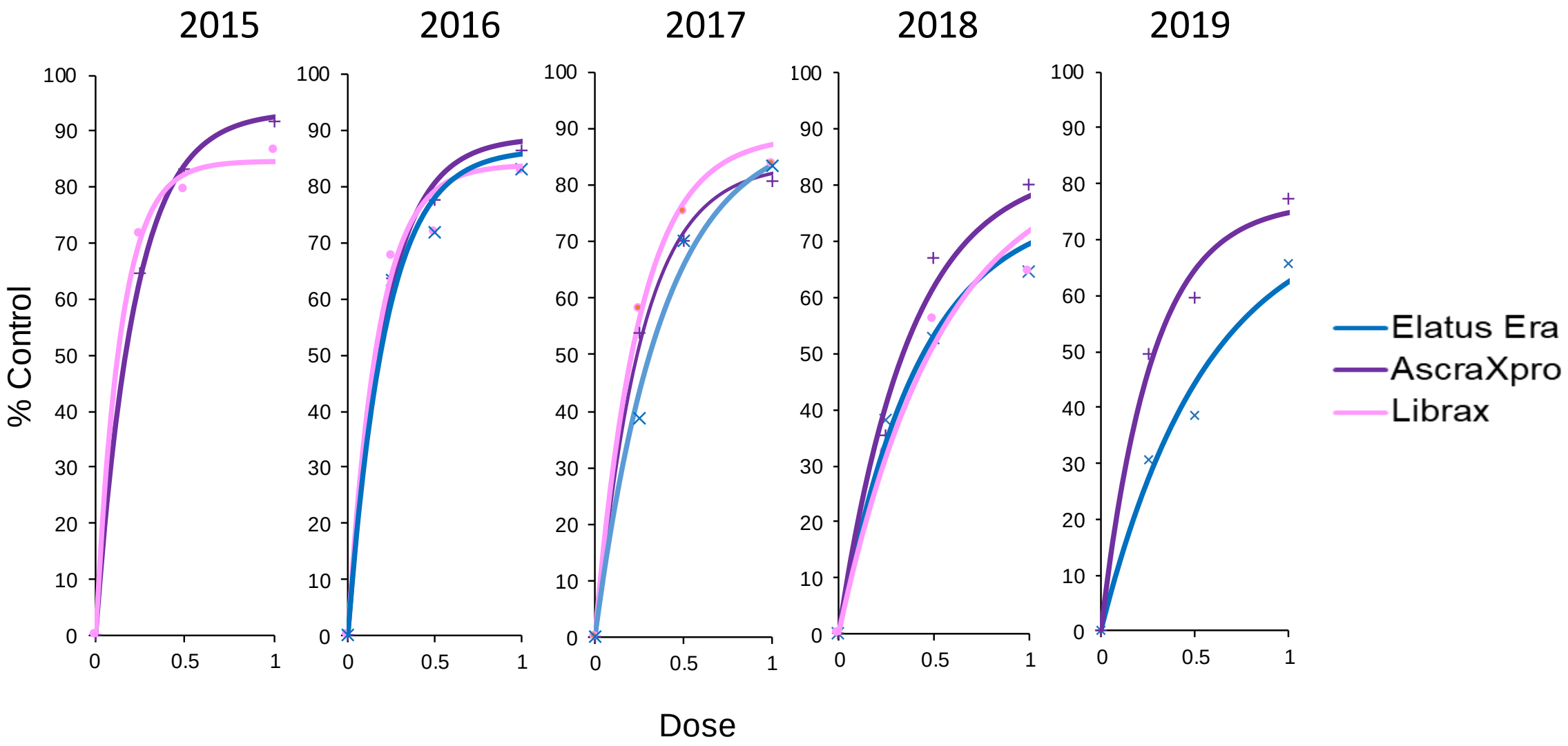
# SDHI decline and stabilisation?

## fluxapyroxad



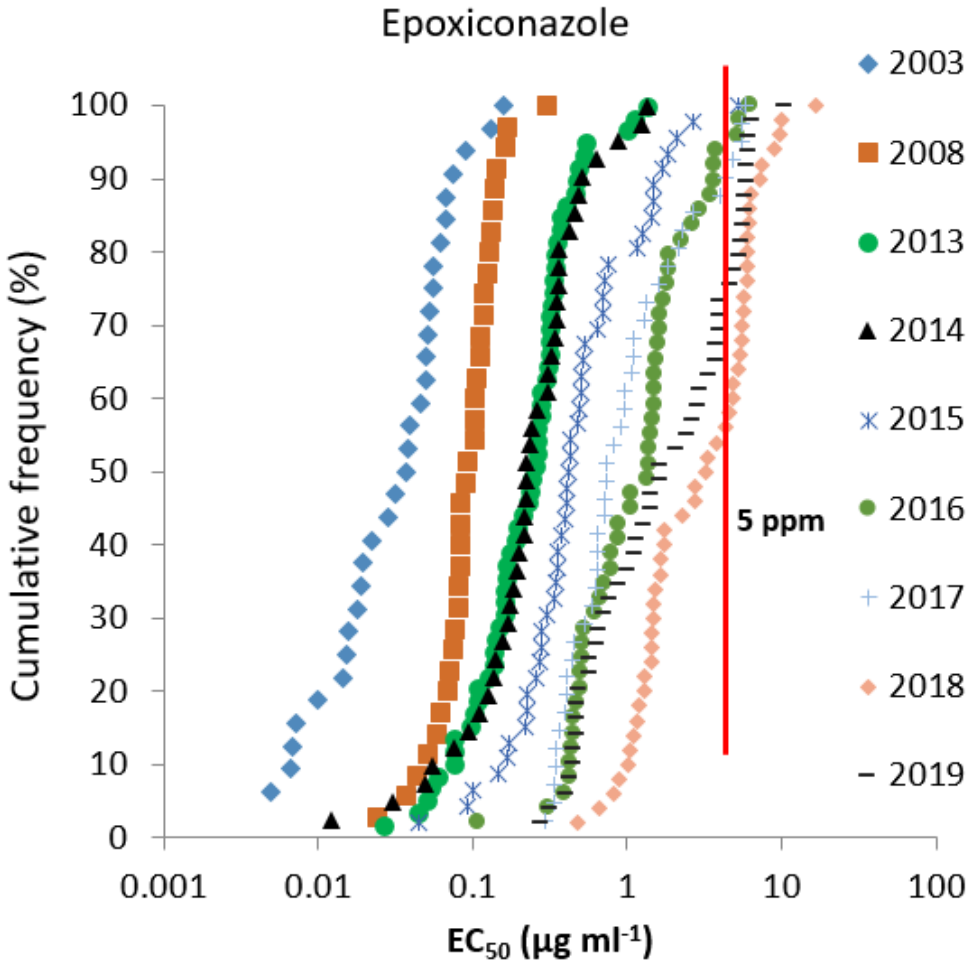

Data extracted from AHDB Fungicide Performance trials

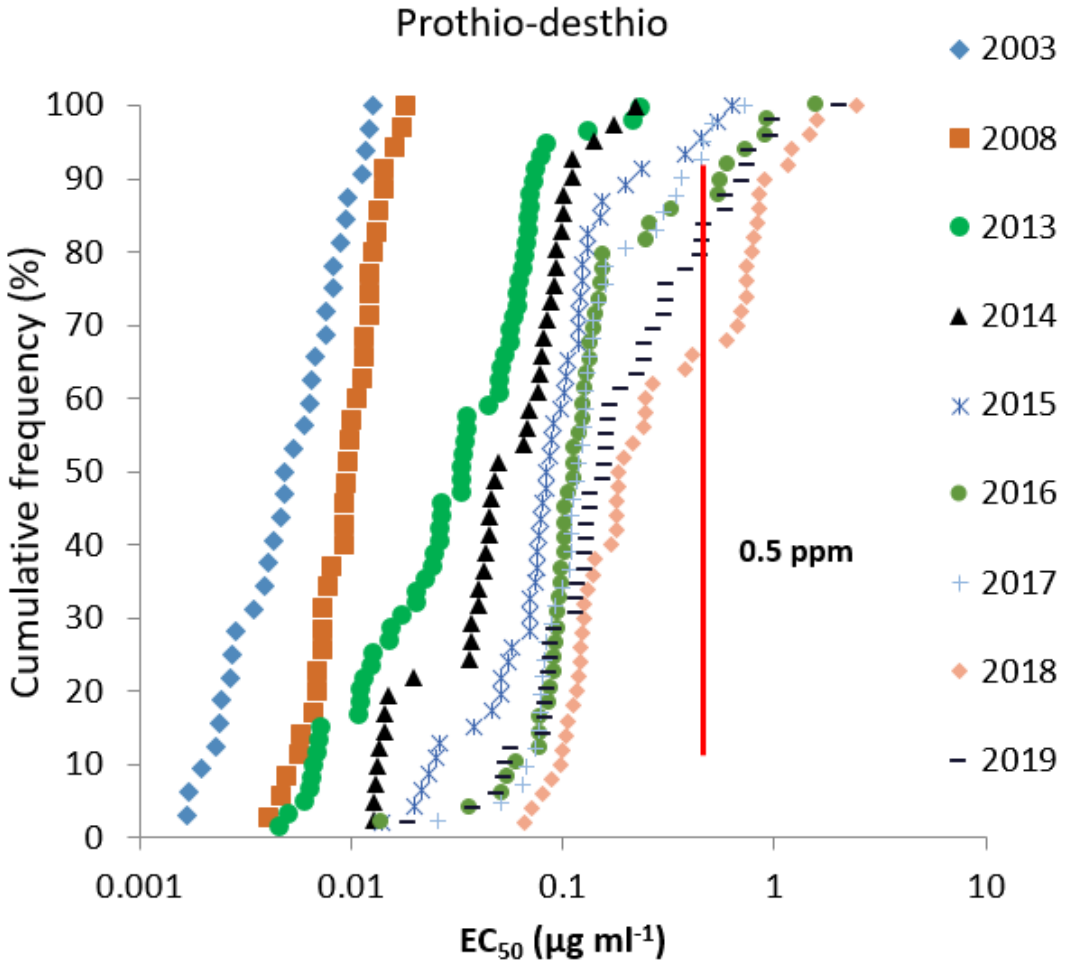
# SDHI/azole efficacy on septoria tritici



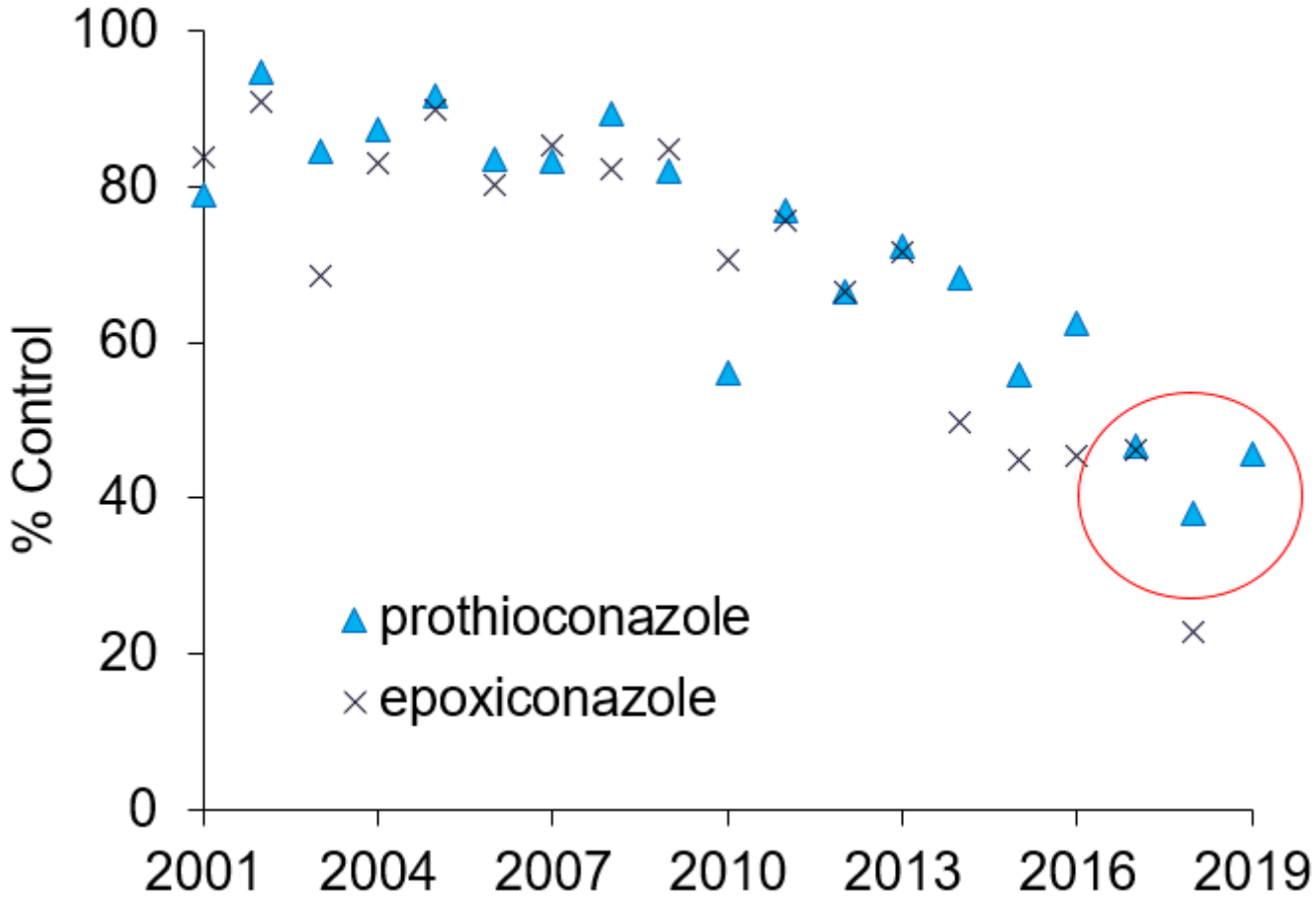
# Rothamsted early season monitoring 2019

## Azoles



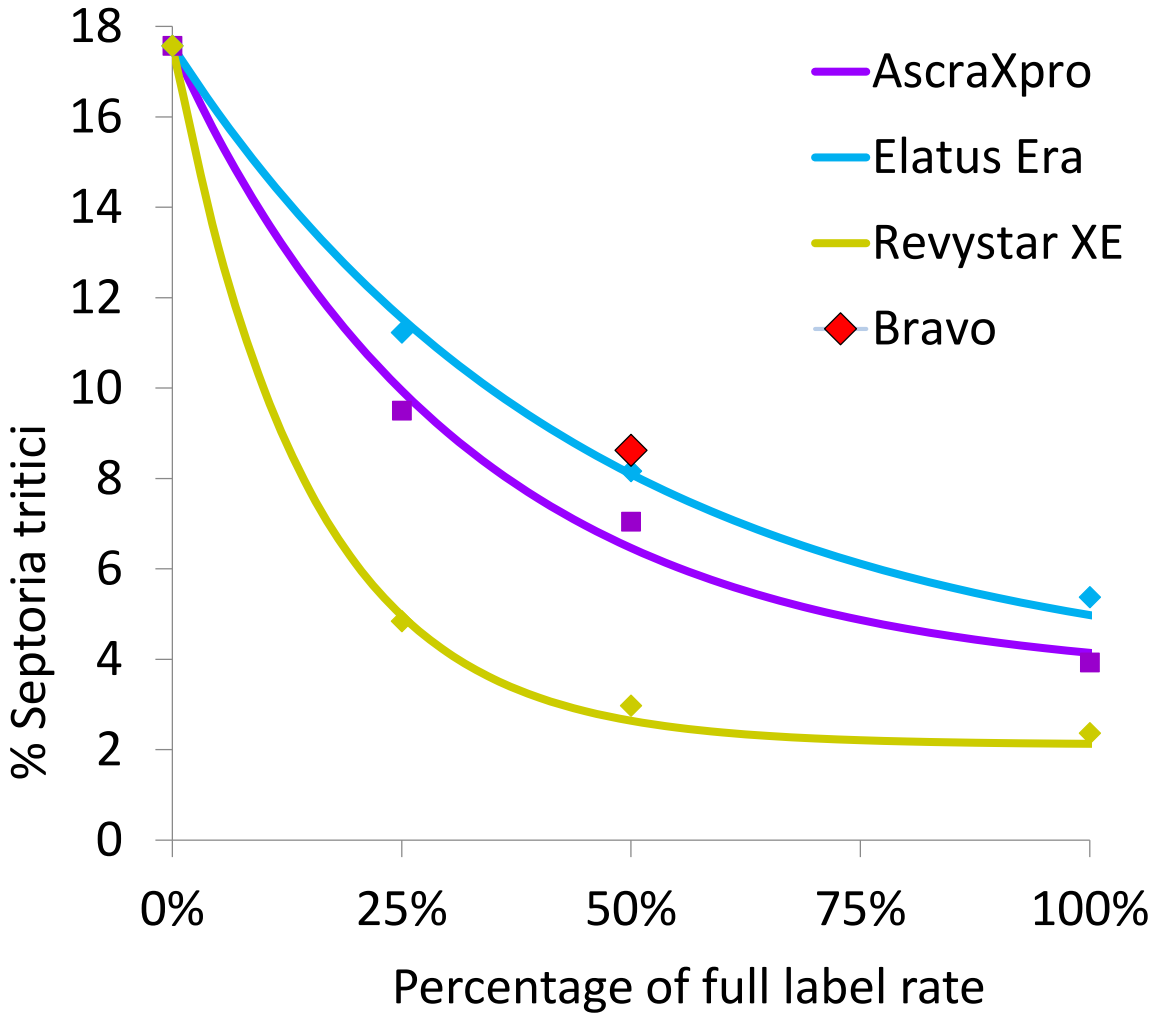



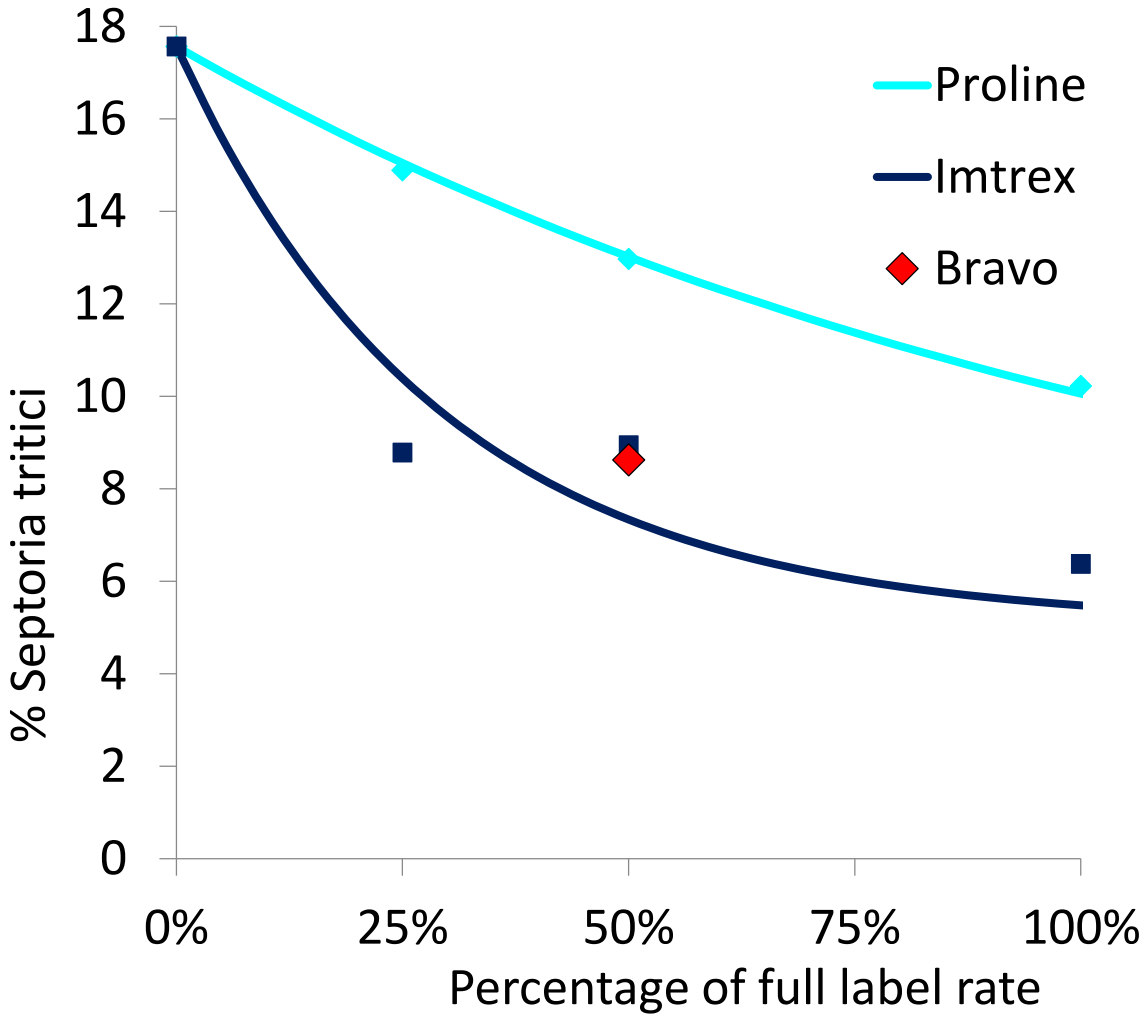
# Azole efficacy on septoria tritici (2001–19)
# Protectant activity at full rate



# Septoria tritici protectant 2017–19 (15 trials)

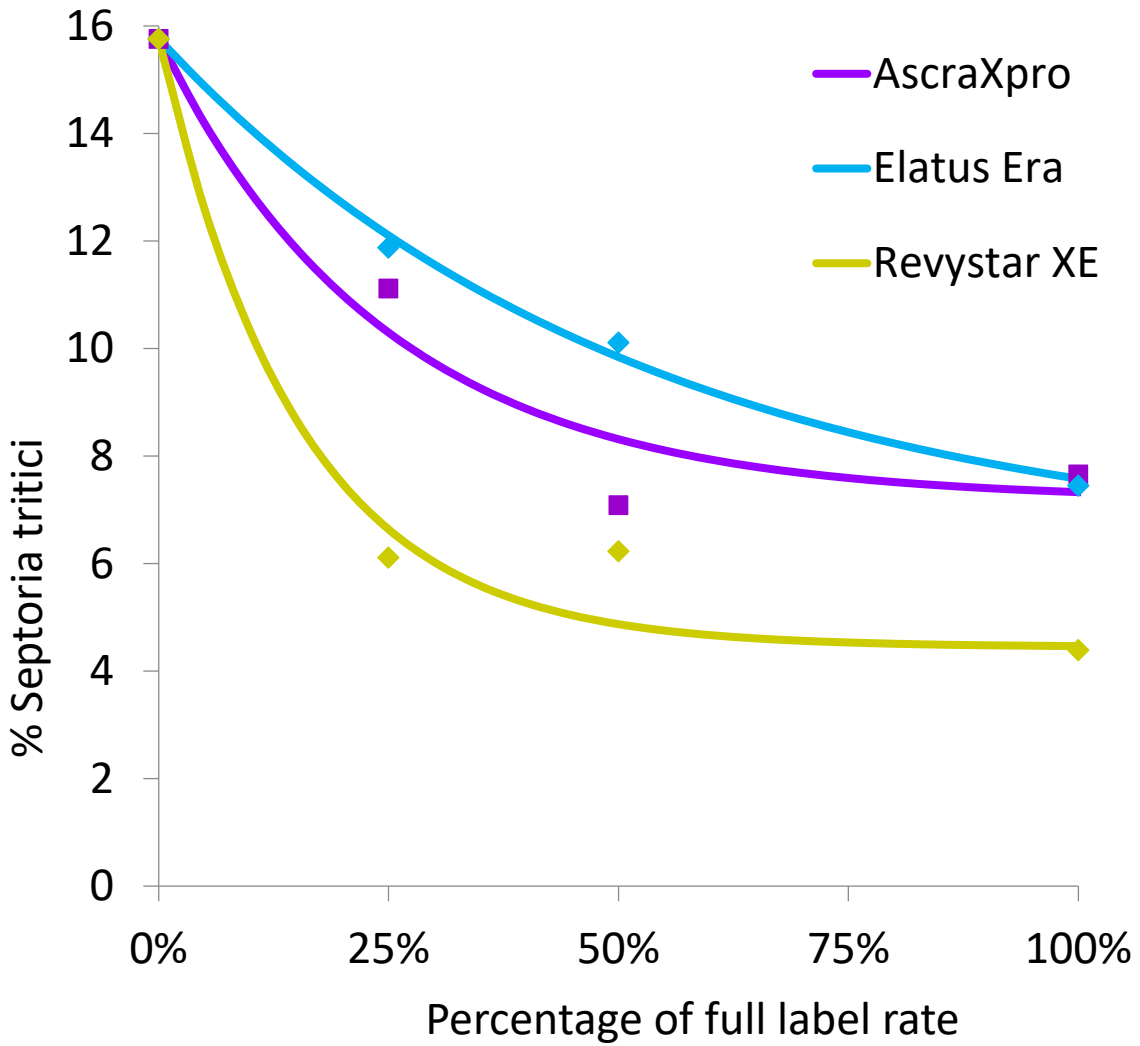
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

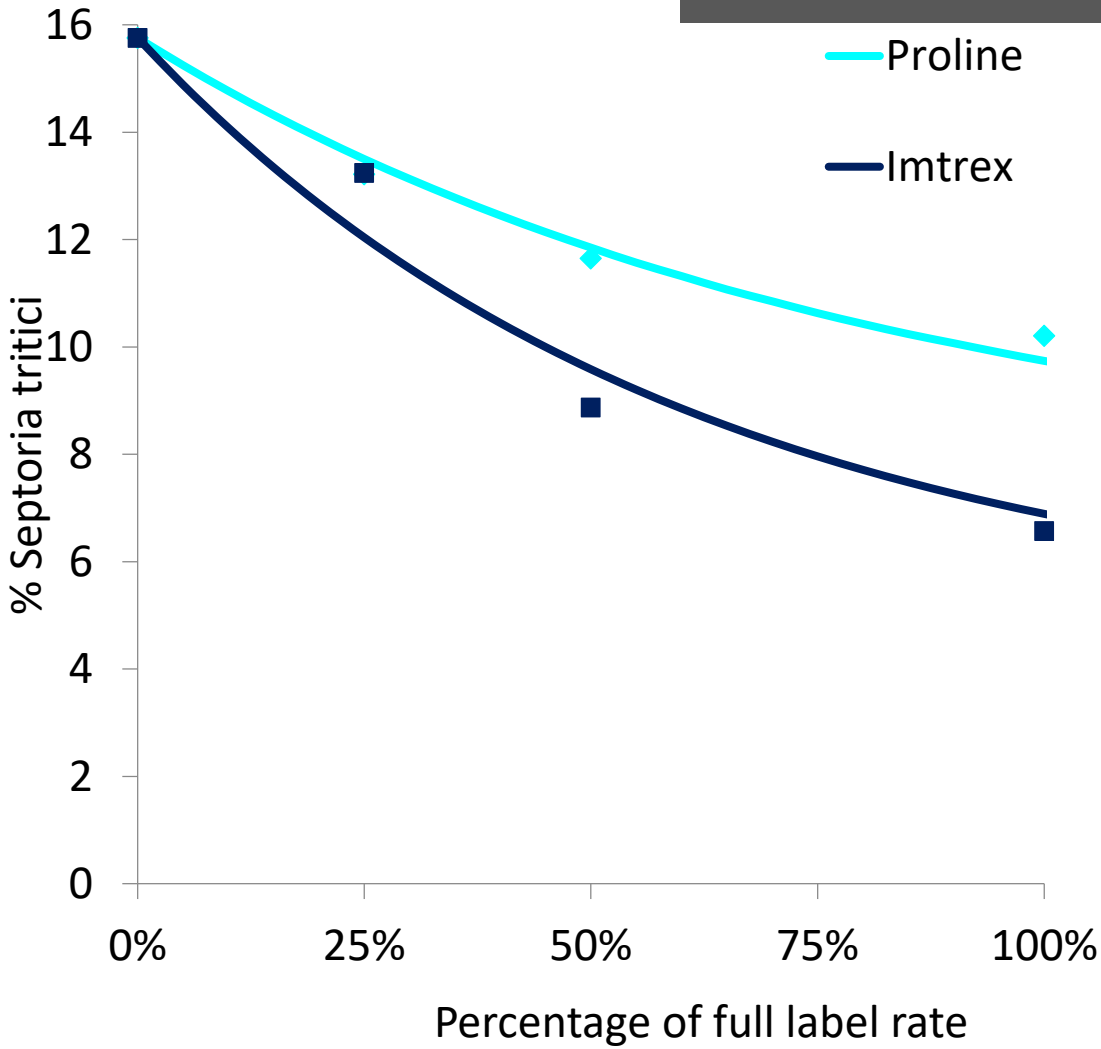


# Septoria tritici curative 2017–19 (6 trials)

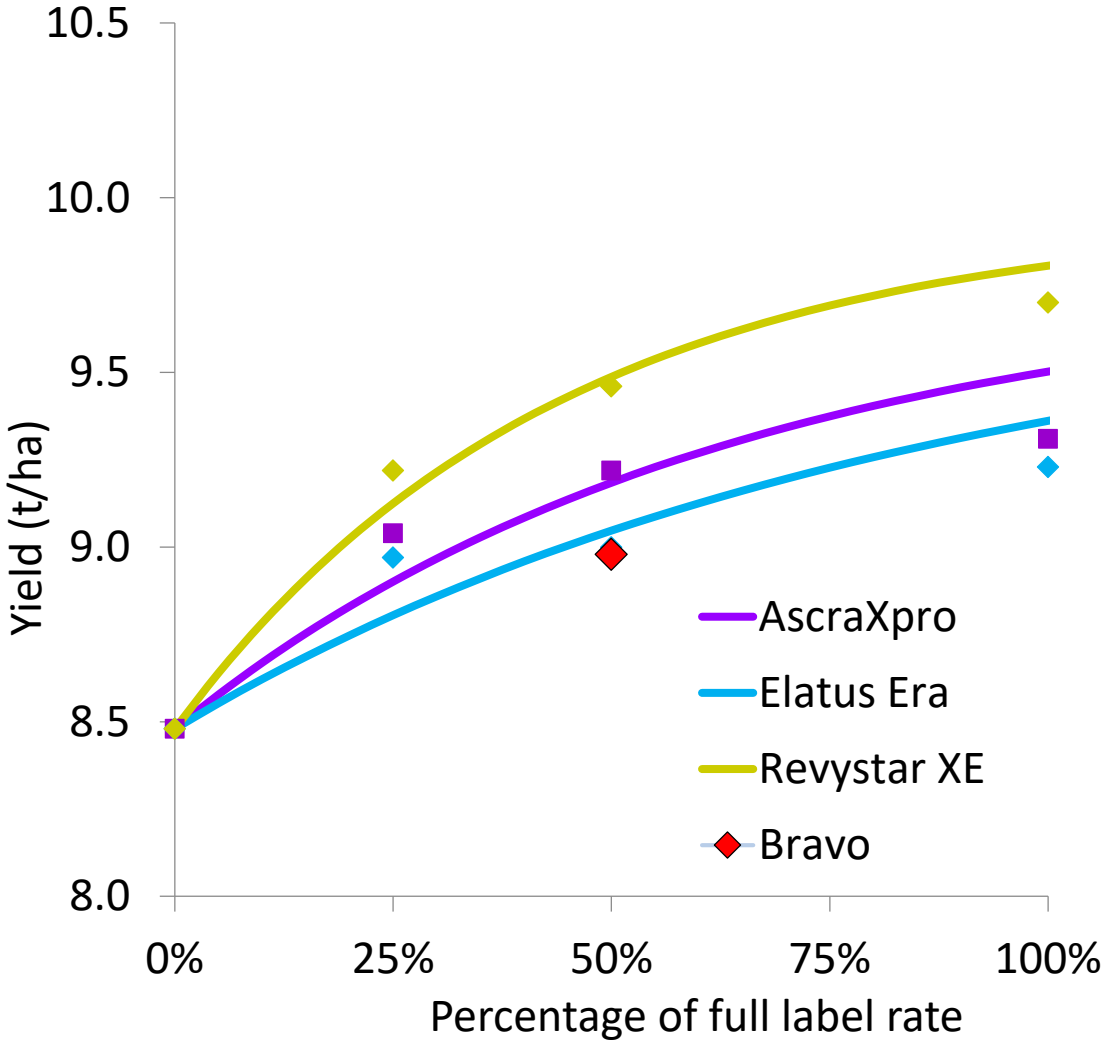
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

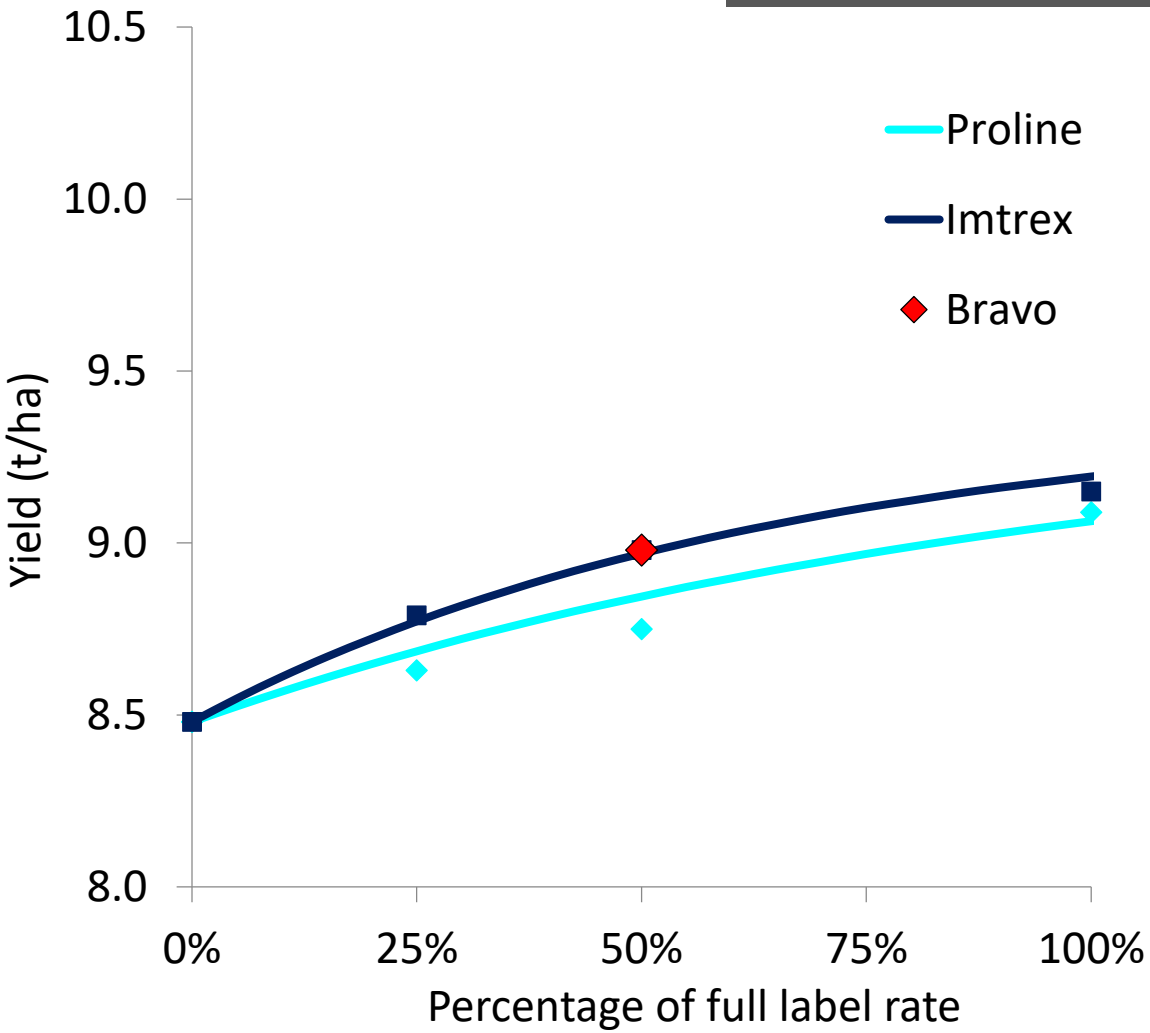


# Septoria tritici trial yields 2017–19 (20 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease



# Integrated Disease Management: Septoria

Up to 5 sites per year: (England, Scotland, Ireland)

3 varieties: high, moderate-high and moderate-low susceptibility to Septoria

2 target sowing dates: 10-20th September and 10-20th October

4 fungicide strategies

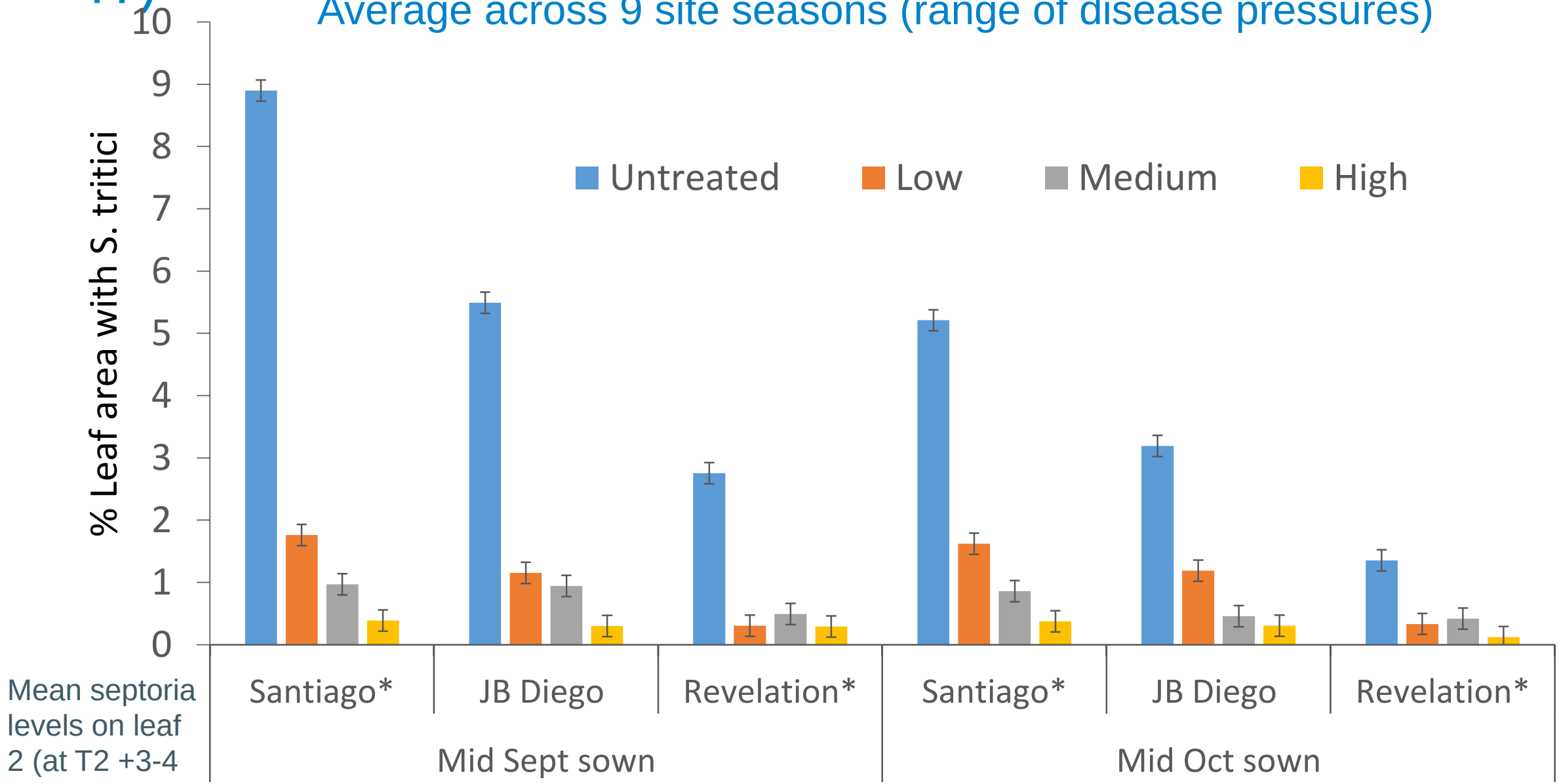
| Treatment | Fungicides Applied (L/ha) | | | |
|---|---|---|---|---|
| | **T0 – GS30** | **T1 – GS32** | **T2 – GS39** | **T3 – GS65** |
| Untreated | Amistar 0.5* | untreated | untreated | untreated |
| Low | Amistar Opti 1.0 | CTL 1.0 | CTL 1.0 | Folicur 0.75 |
| Medium | Amistar Opti 1.0 | Brutus 1.5 + CTL 1.0 | Brutus 2.25 + CTL 1.5 | Folicur 0.75 |
| High | Amistar Opti 1.0 | Brutus 1.5 + CTL 1.0 + Imtrex 1.0 | Brutus 2.25 + CTL 1.5 + Imtrex 1.5 | Folicur 0.75 |

CTL = chlorothalonil *e.g.* Bravo *Amistar (without CTL) applied at T0 for early rust control

This project is co-funded by BASF

# Effect of variety, sow date and fungicide on Septoria (2016-17)

## Average across 9 site seasons (range of disease pressures)

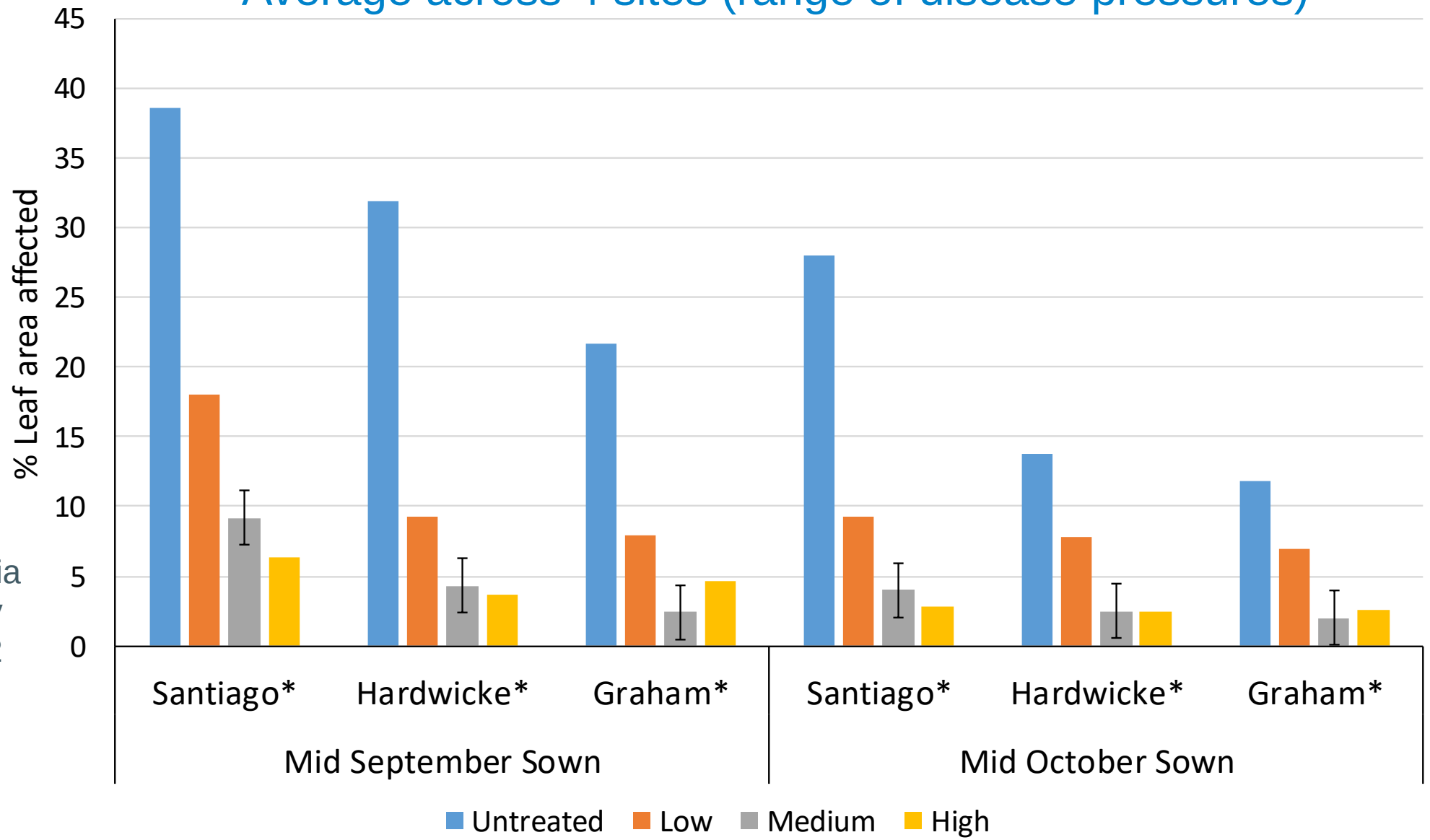



Mean septoria levels on leaf 2 (at T2 +3-4 weeks)

# Effect of variety, sow date and fungicide on Septoria (2019)

## Average across 4 sites (range of disease pressures)

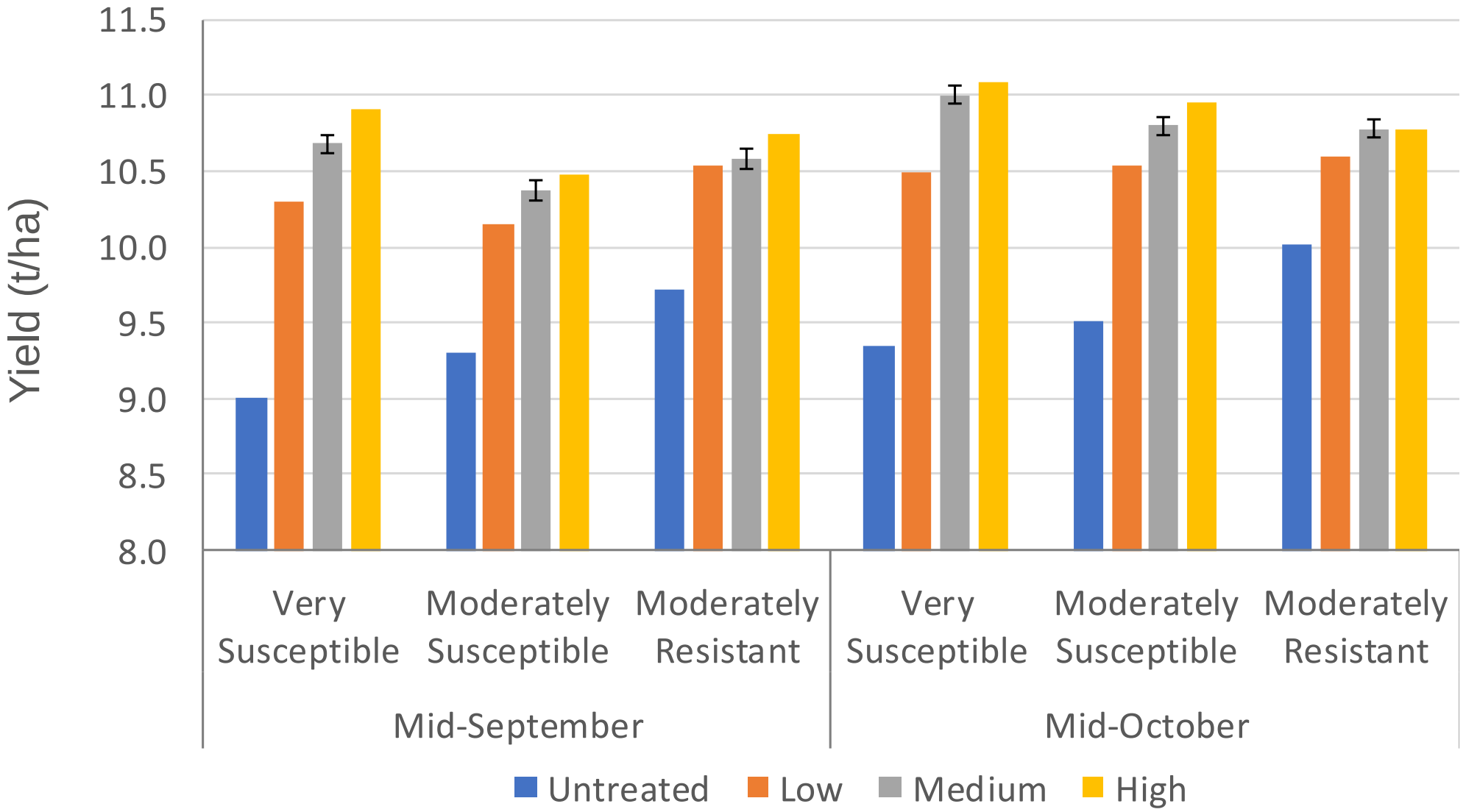
Mean septoria levels on key leaves (at T2 +6-8 weeks)




Error bar shows LSD for variety x fungicide interaction

# Effect of variety, sow date and fungicide on yield (2016-19)

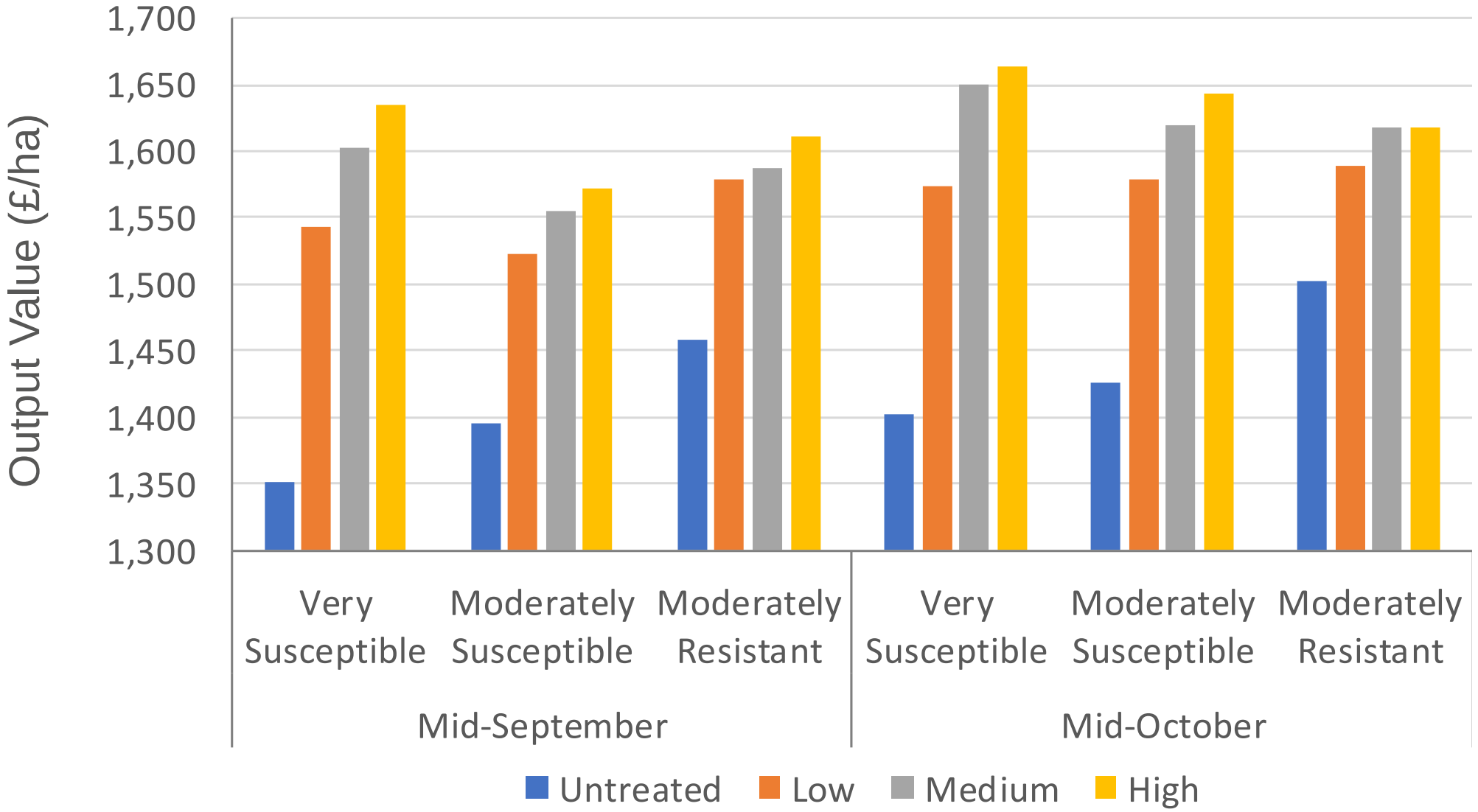
## Average across 19 site seasons




Error bar shows LSD for variety x fungicide interaction

# Effect variety, sow date and fungicide on output value (2016-19)

## Average across 19 site seasons




Assumed wheat price: £150/t

Values are before deduction of fungicide costs

# Incremental increase in output value with fungicide (2016-19)

## Average across 19 site seasons

| Sowing Date | Varietal Susceptibility | Incremental increase in output (£/ha) from fungicide treatment | | | |
|---|---|---|---|---|---|
| | | Low | Medium | High | Total |
| Average over both sowing dates | Very susceptible | +182 | +68 | +23 | +272 |
| | Moderately susceptible | +140 | +37 | +20 | +197 |
| | Moderately resistant | +104 | +18 | +12 | +134 |
| Mid-September | Average over all three varieties | +147 | +33 | +25 | +205 |
| Mid-October | | +137 | +49 | +12 | +198 |
| Mid-September | Very susceptible | +192 | +59 | +33 | +284 |
| Mid-October | Moderately resistant | +87 | +29 | 0 | +116 |

Assumed wheat price: £150/t

Values are before deduction of fungicide costs

# Yellow rust 2019

## Reflection (near Kings Lynn)

Yellow rust – widespread in 2019

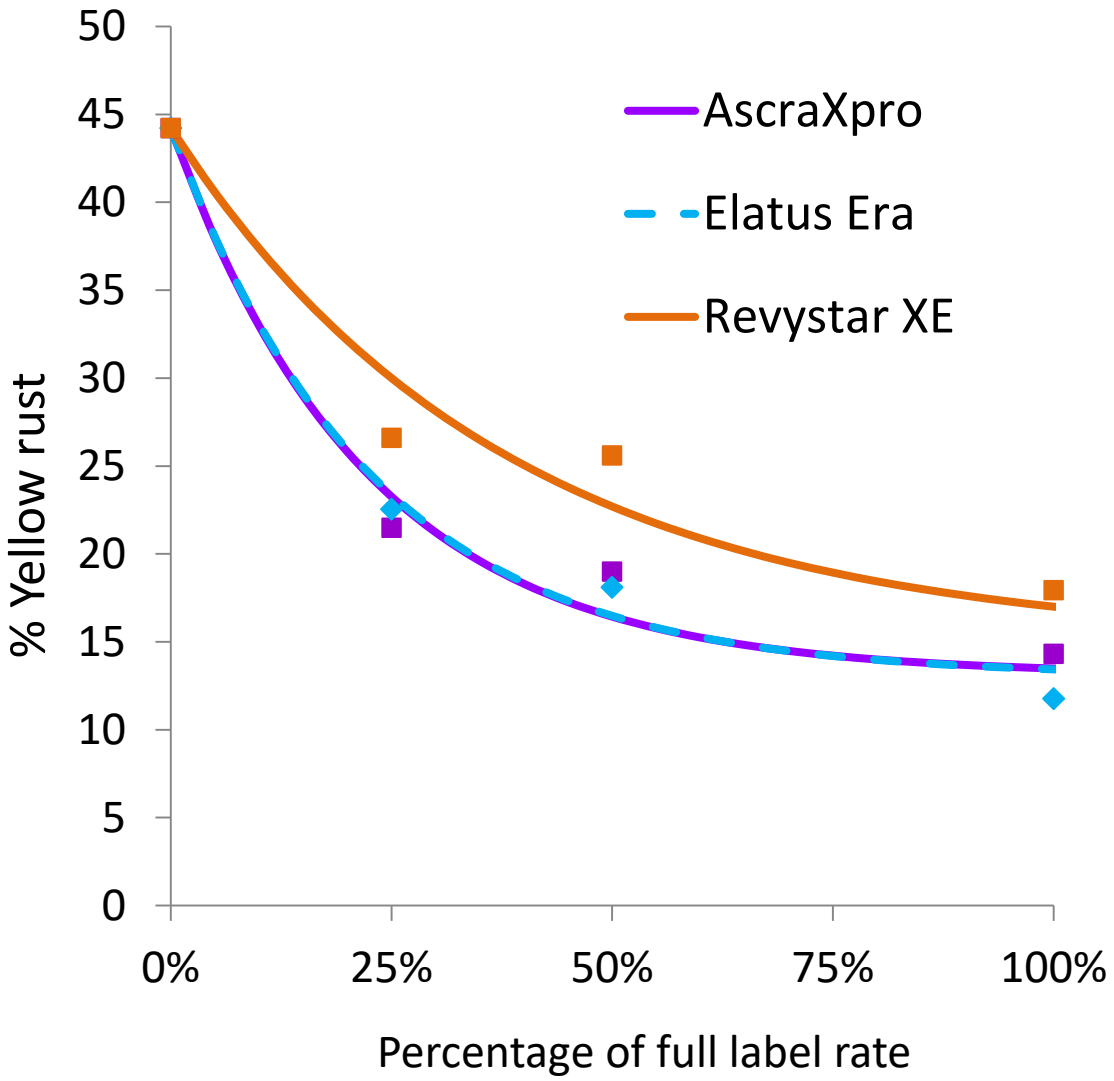
RL ratings changes

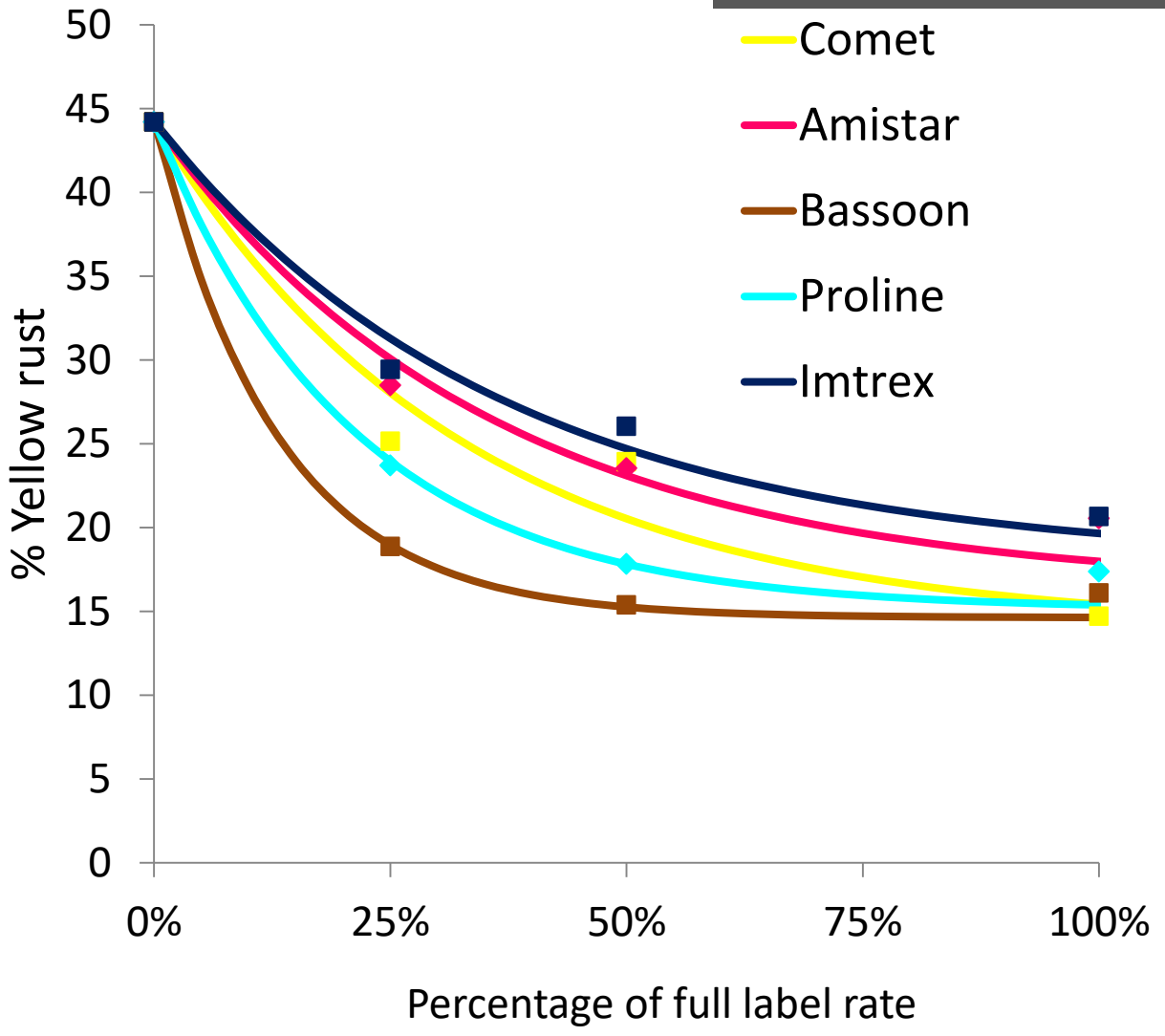
- Zyatt 8 to 7
- Bennington 6 to 5
- Viscount 7 to 6

Late sowings can be higher risk

# Yellow rust 2019 (1 trial)

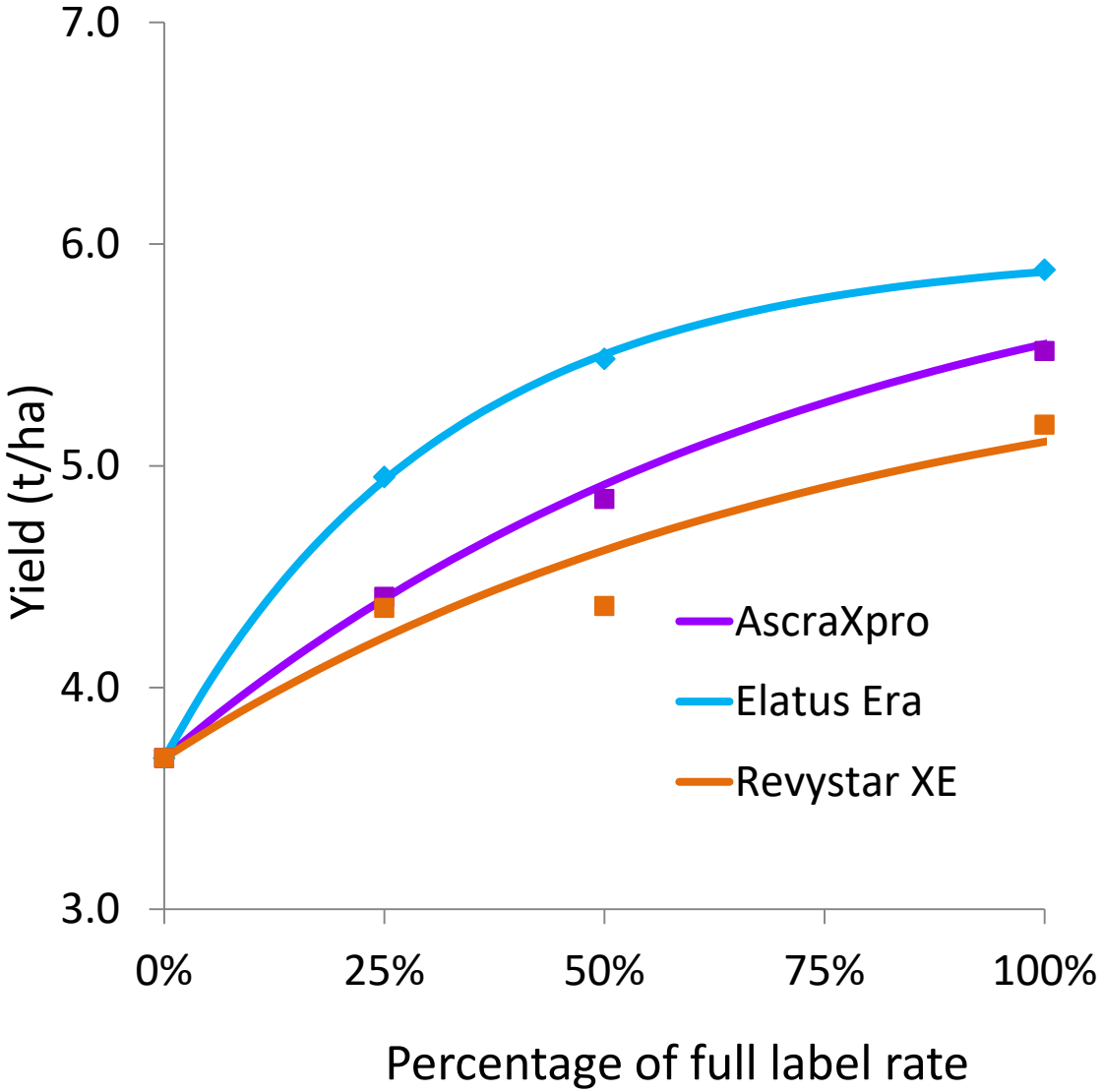
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

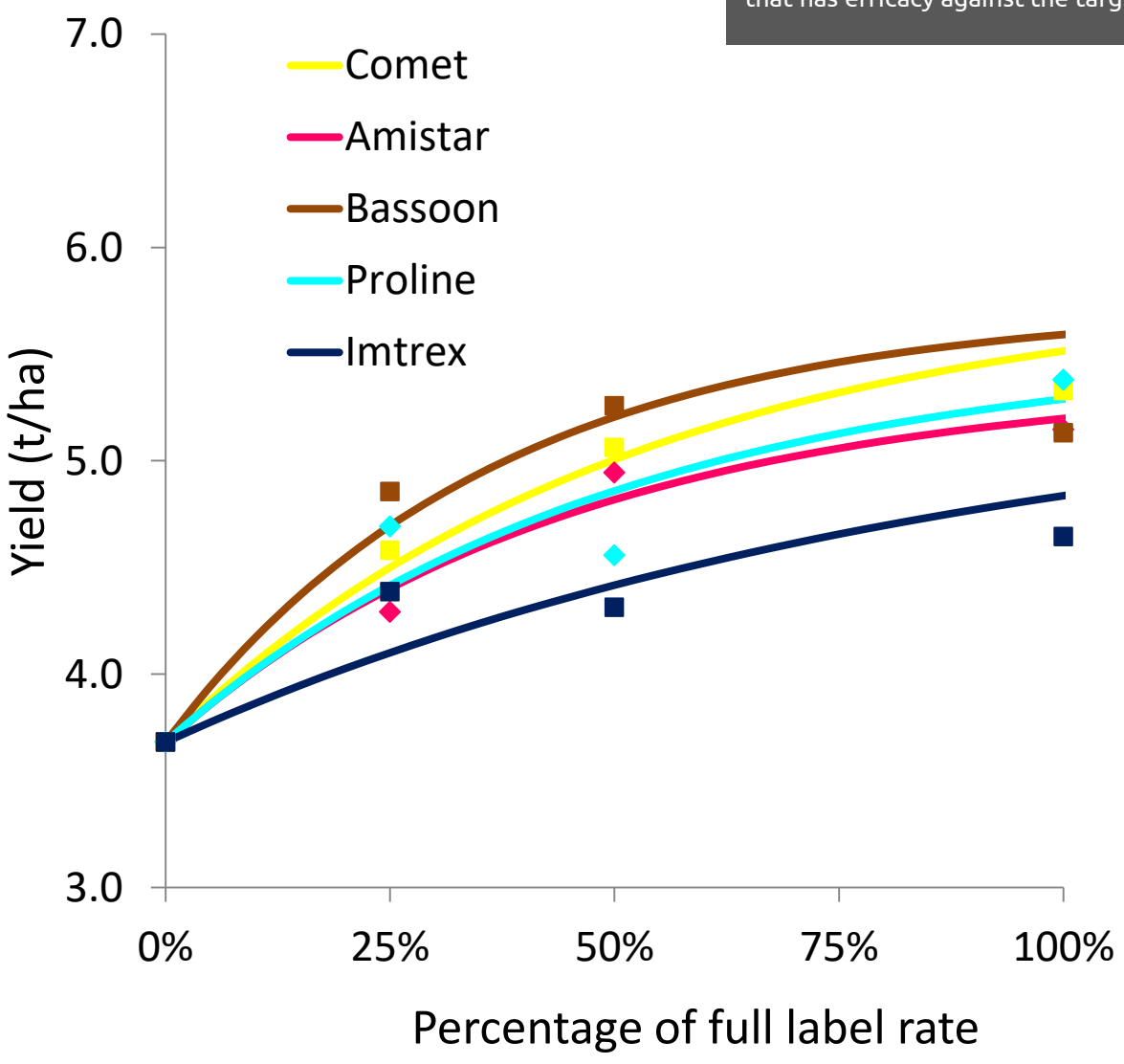


# Yellow rust trial yields 2019 (1 trial)

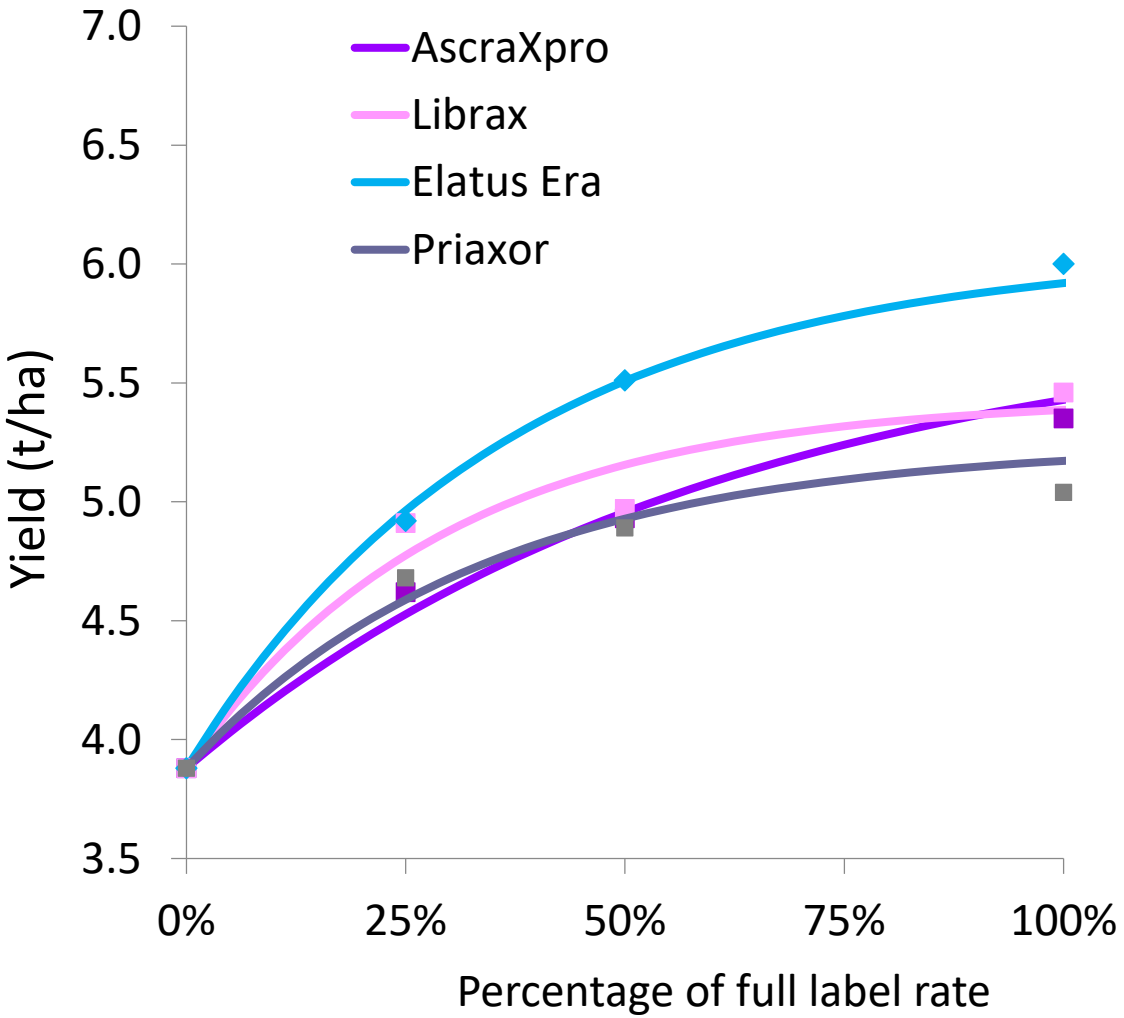
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

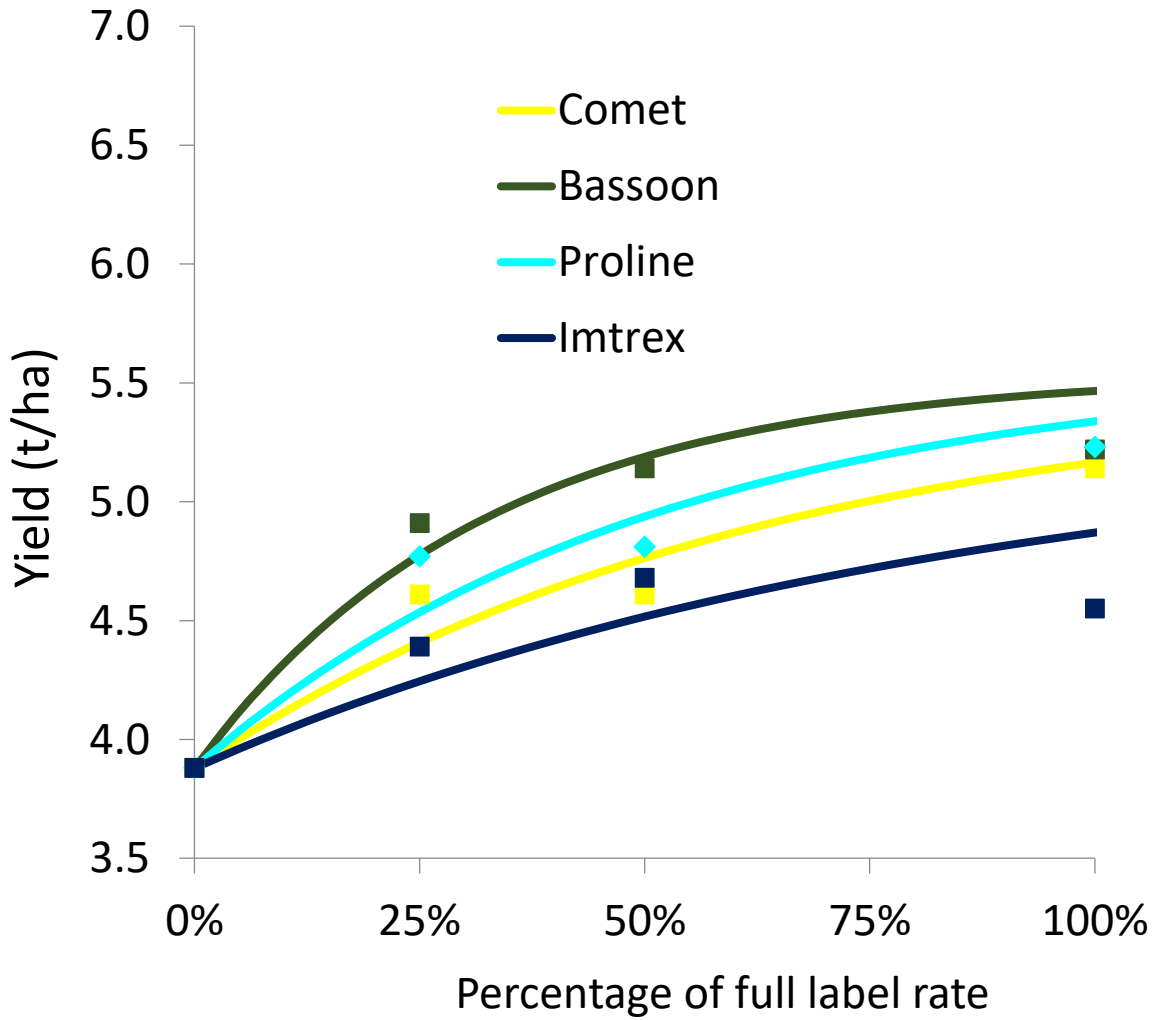


# Yellow rust yield 2017–19 (3 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease




Priaxor = fluxapyroxad + pyraclostrobin

# Brown rust 2019
## Crusoe (Cambridge)

Slow to develop in 2019 following cool spring weather

RL ratings changes

Firefly 8 to 6

Viscount 9 to 8

Skyscraper 5 to 6

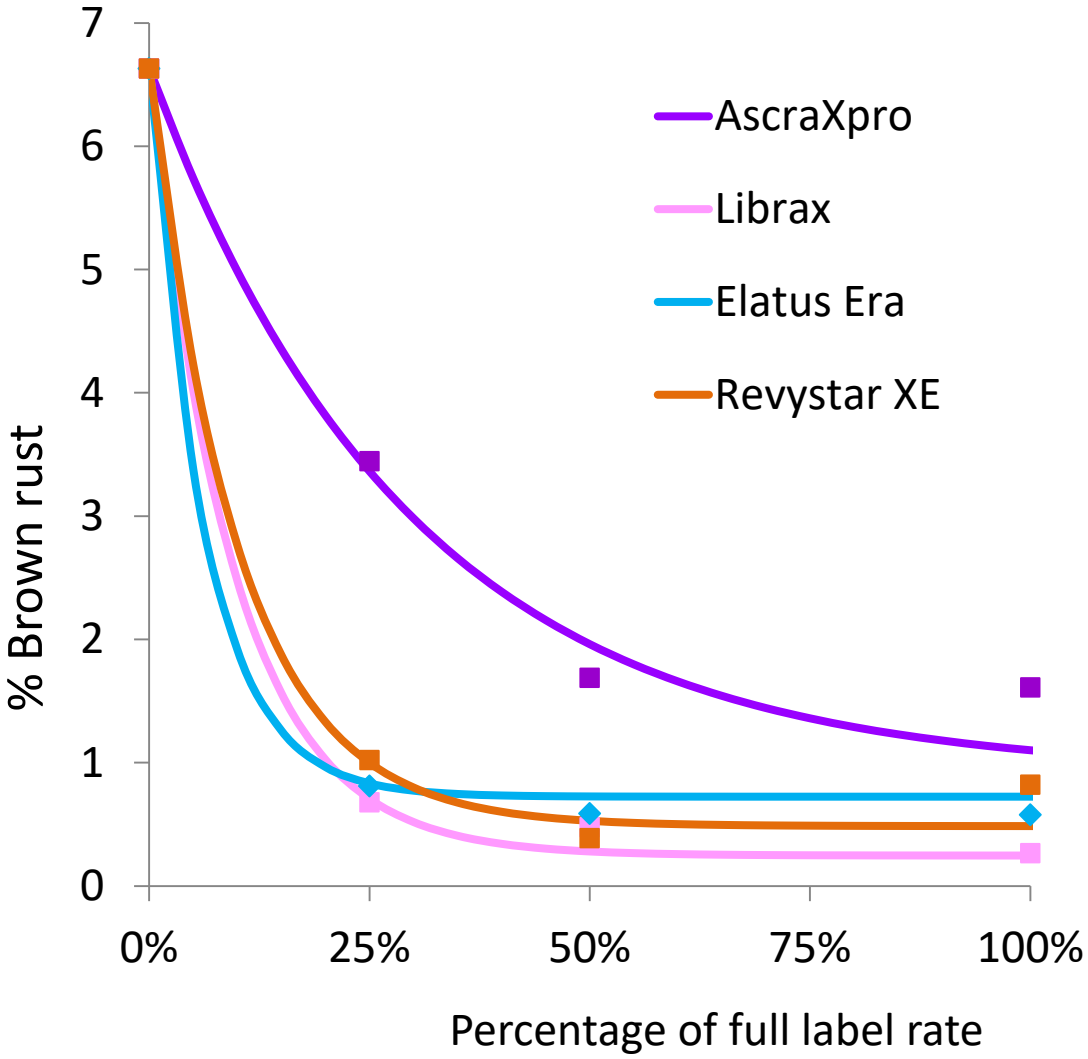
Spotlight 6 to 7

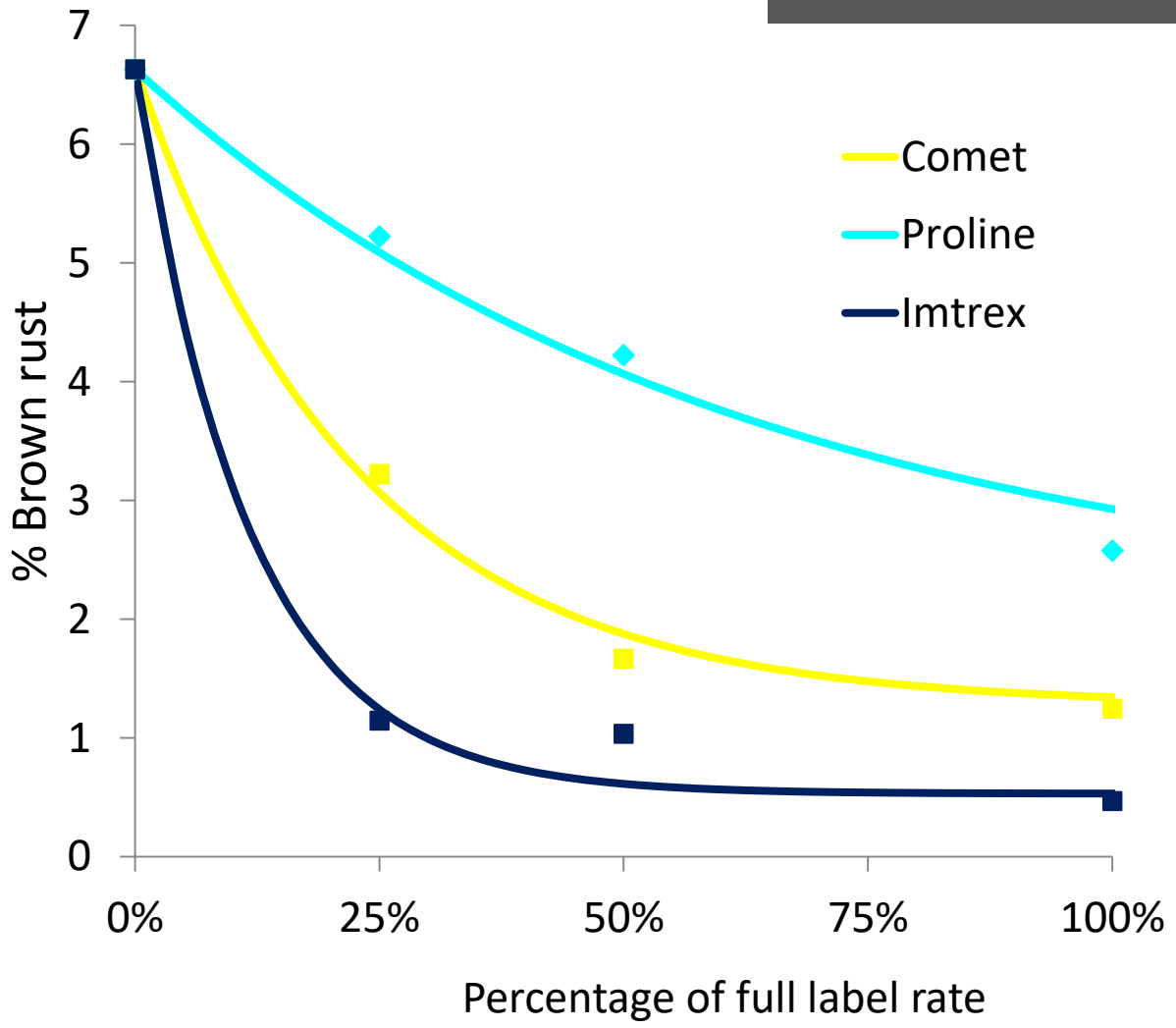
Fungicide performance trial (Cambridge)

- Crusoe
- GS 39 application

# Brown rust 2019 (1 trial)

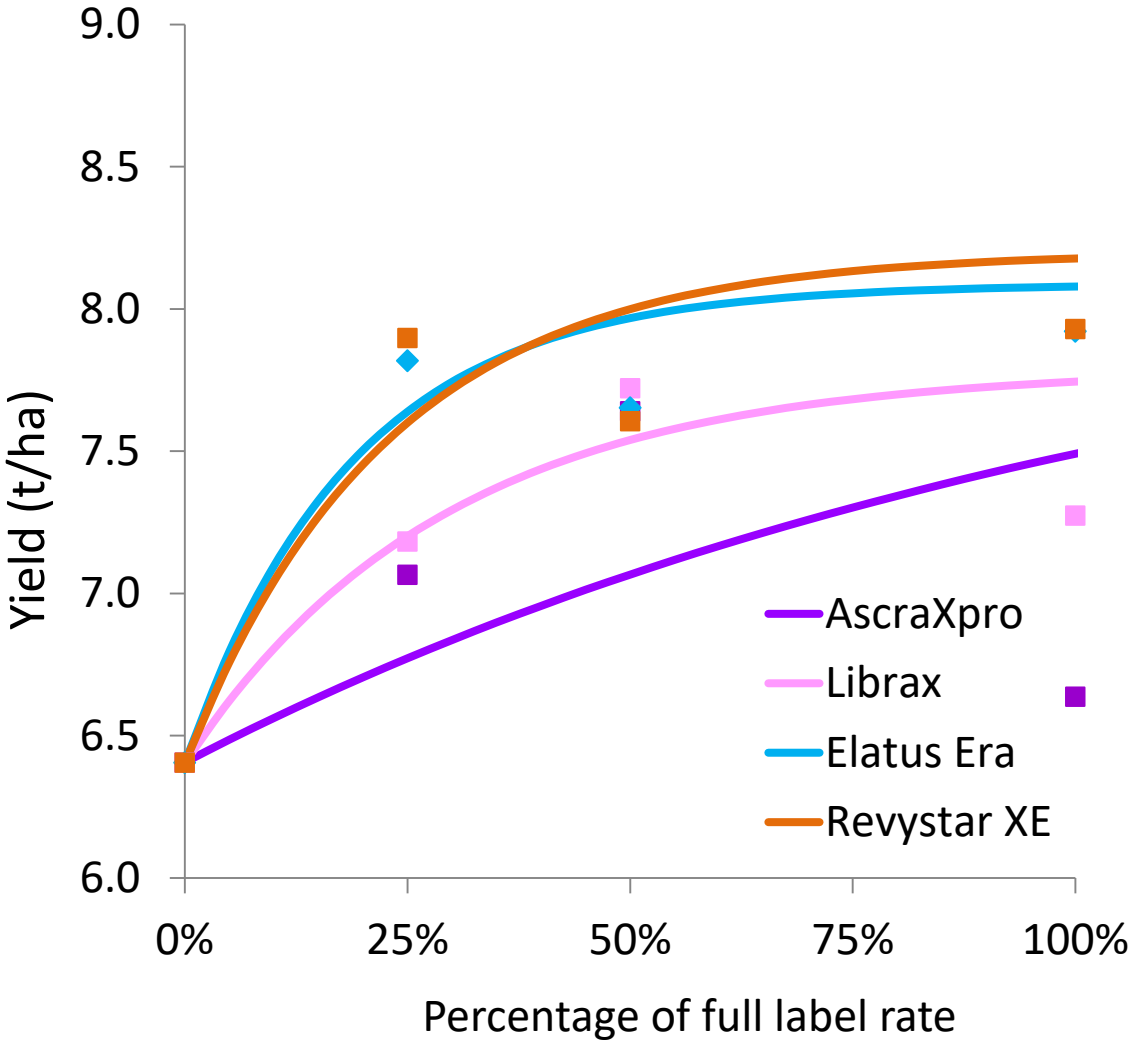
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

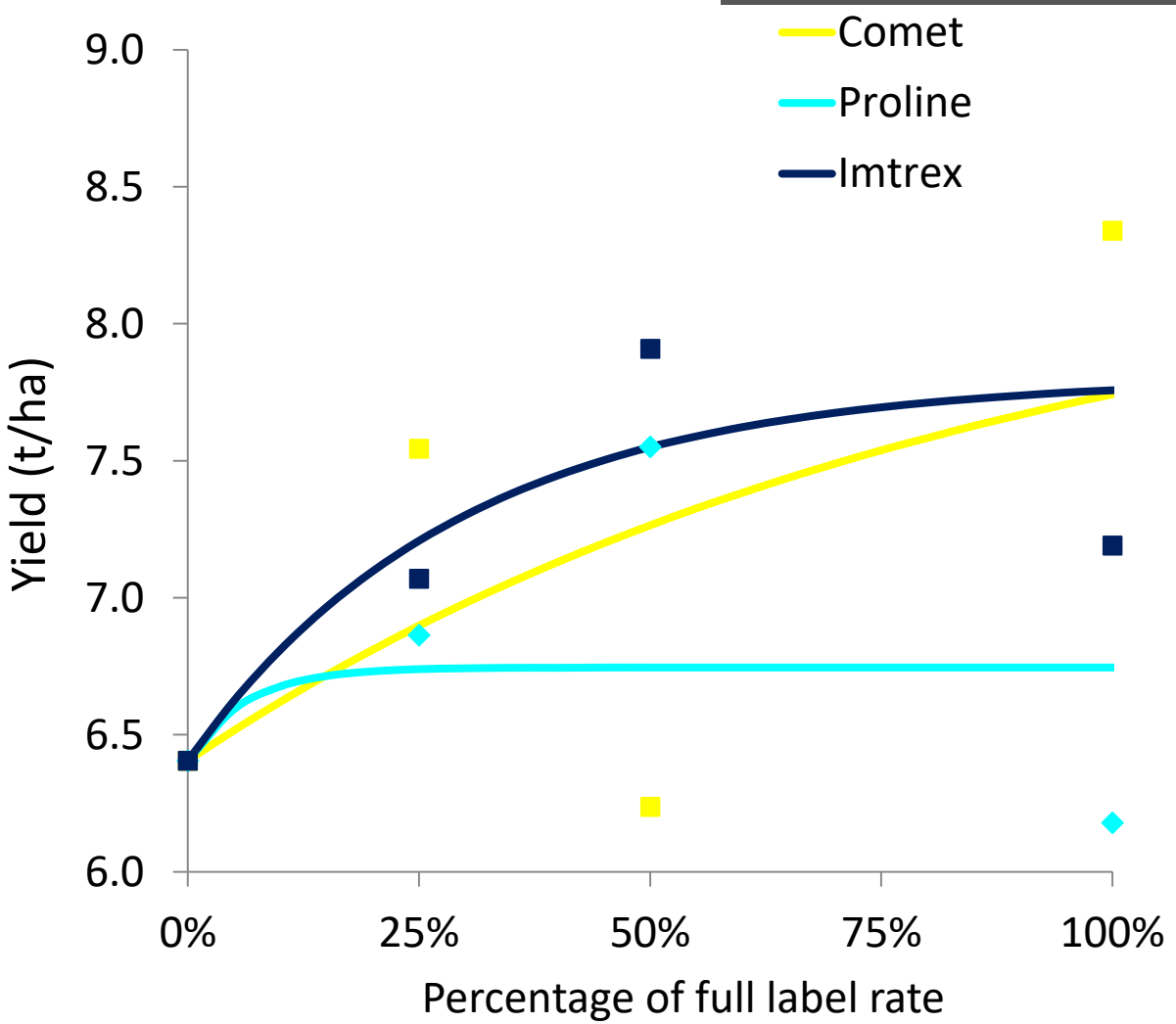


# Brown rust yield 2019 (1 trial)

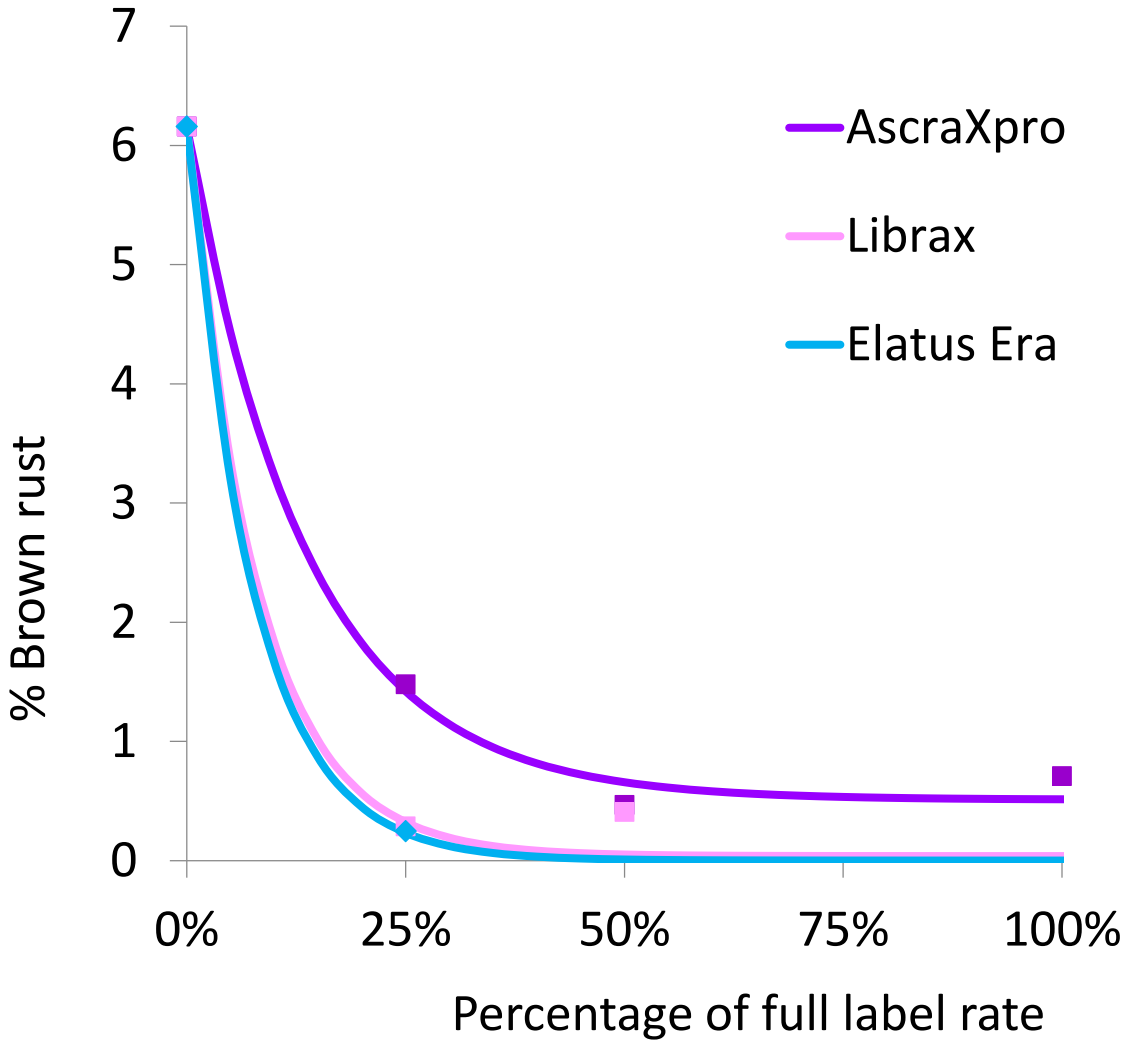
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

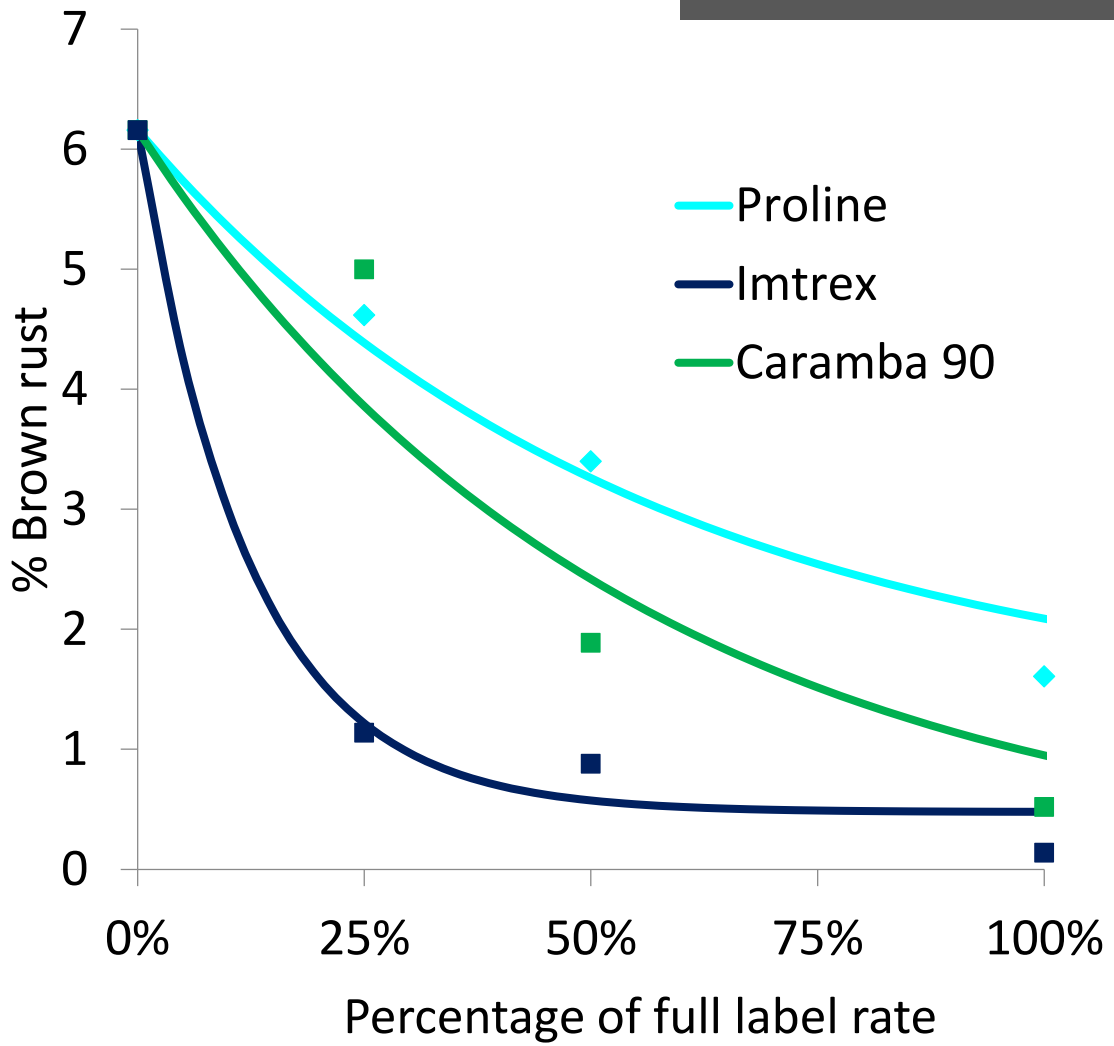


# Brown rust 2017–19 (3 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

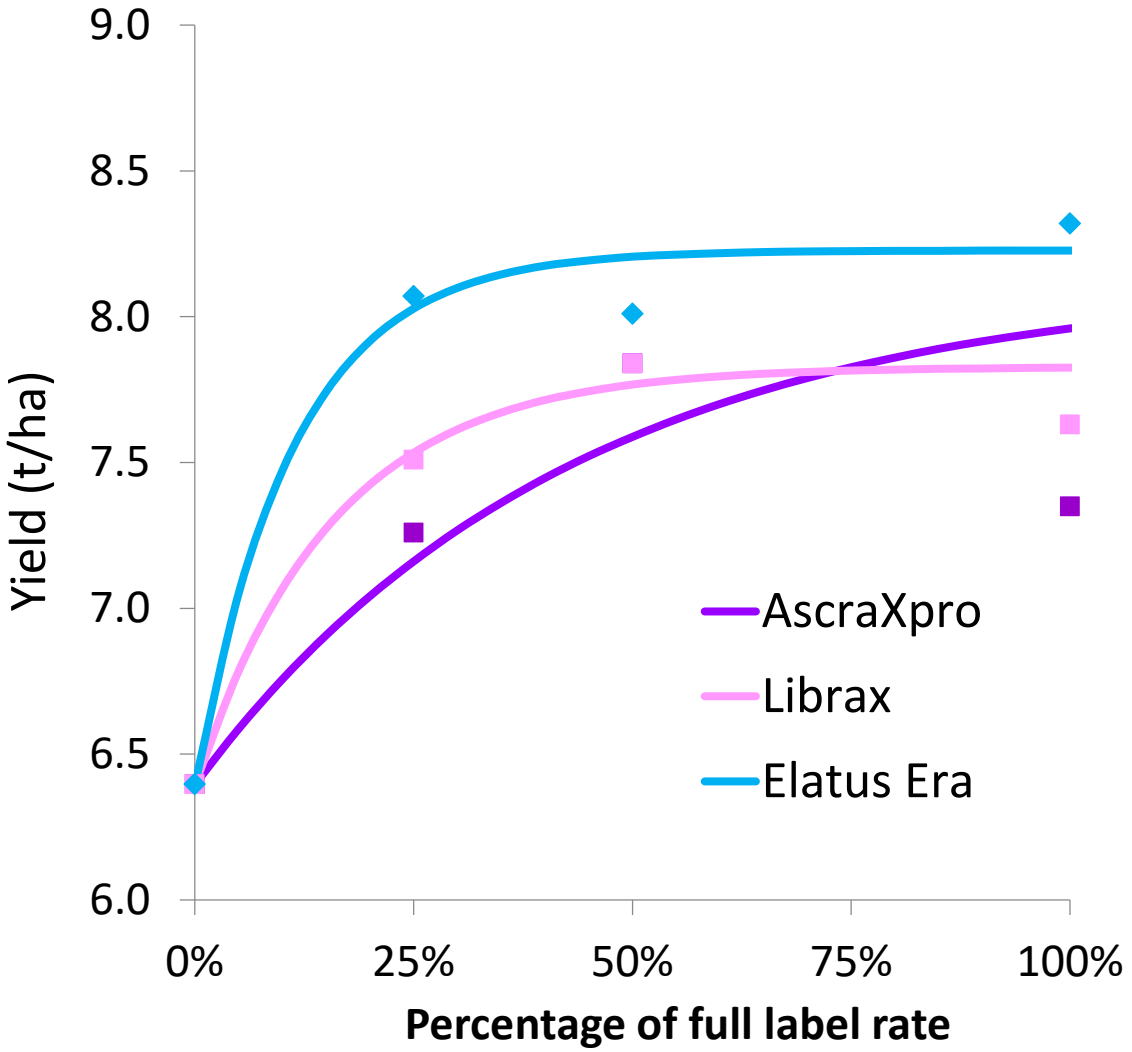


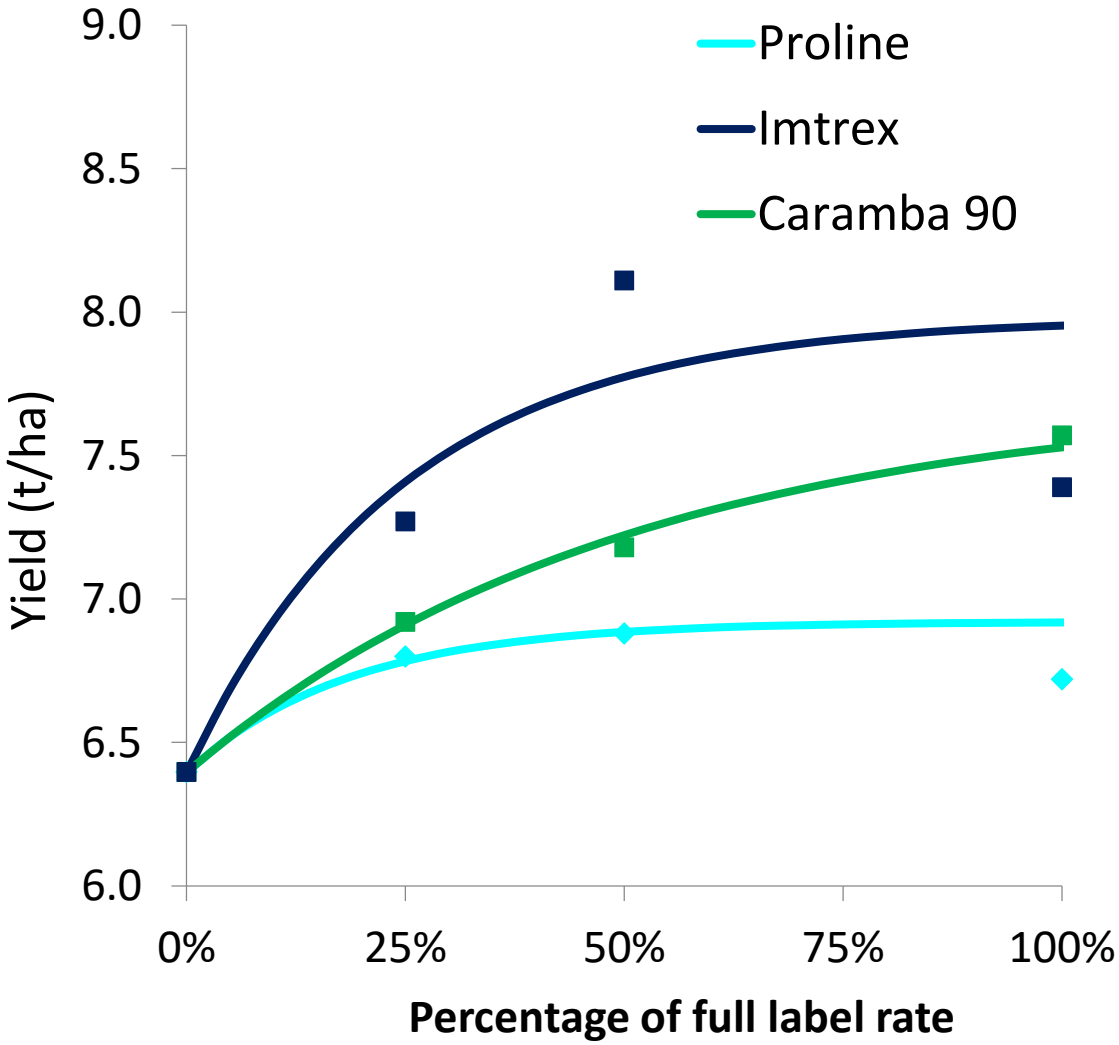




Caramba 90 = metconazole

# Brown rust yields 2017–19 (3 trials)

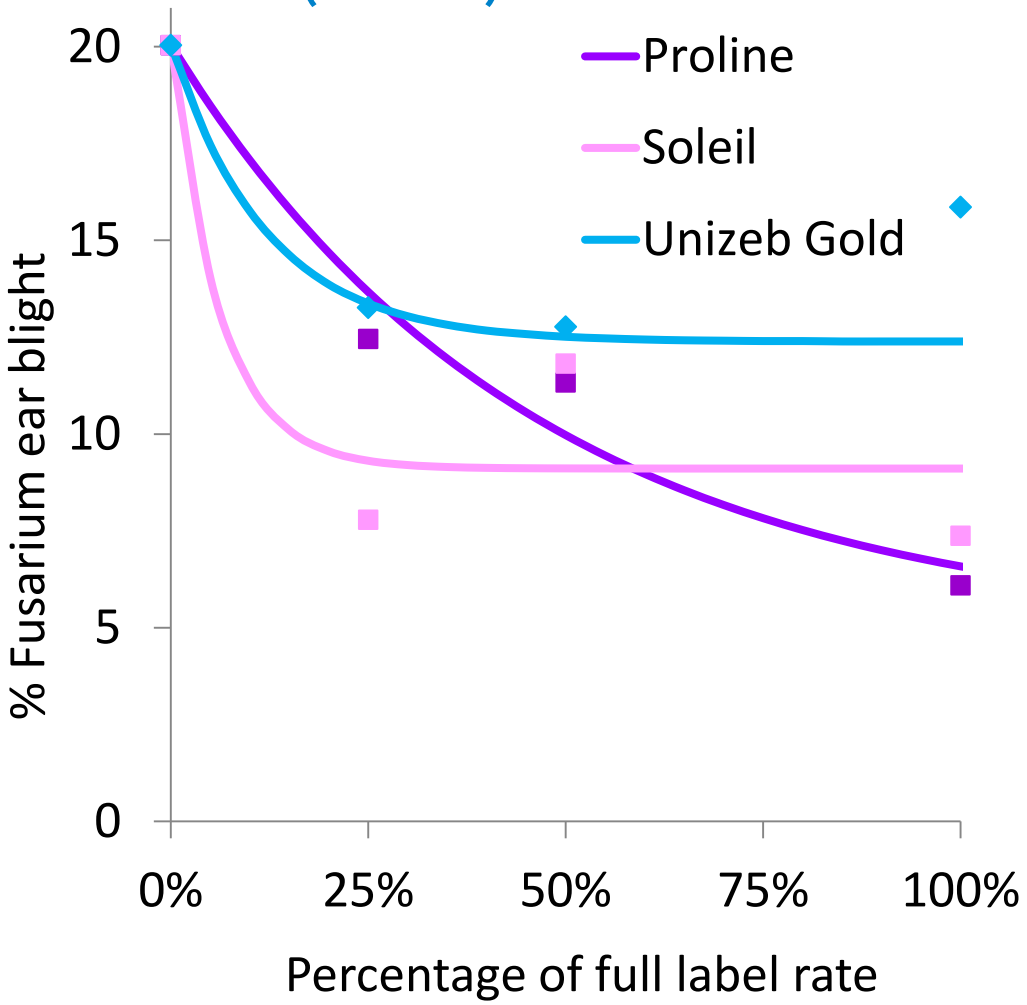
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease



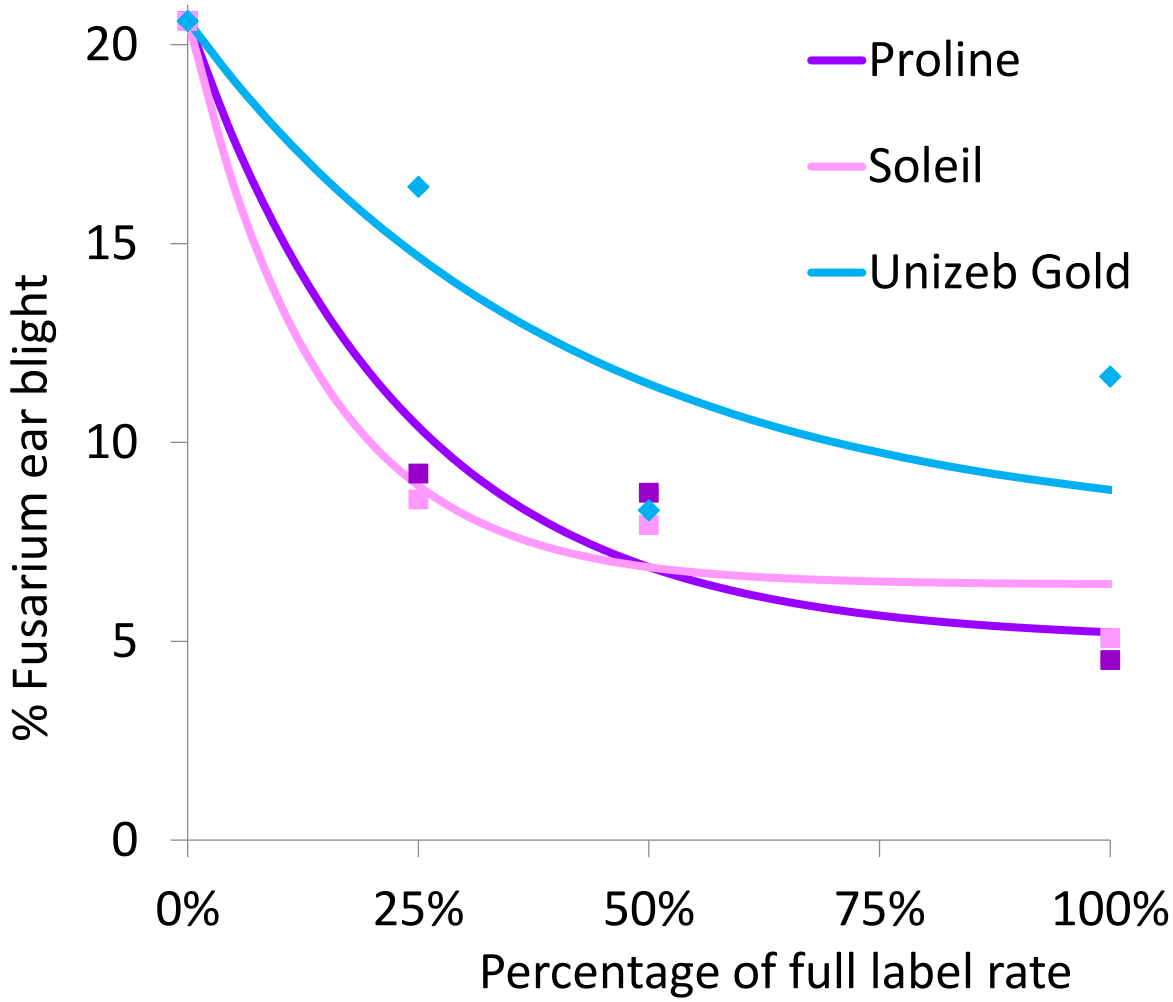



# Fusarium trial (inoculated)
# Zyatt (near Mansfield, Nottinghamshire)

## 2019 (1 trial)

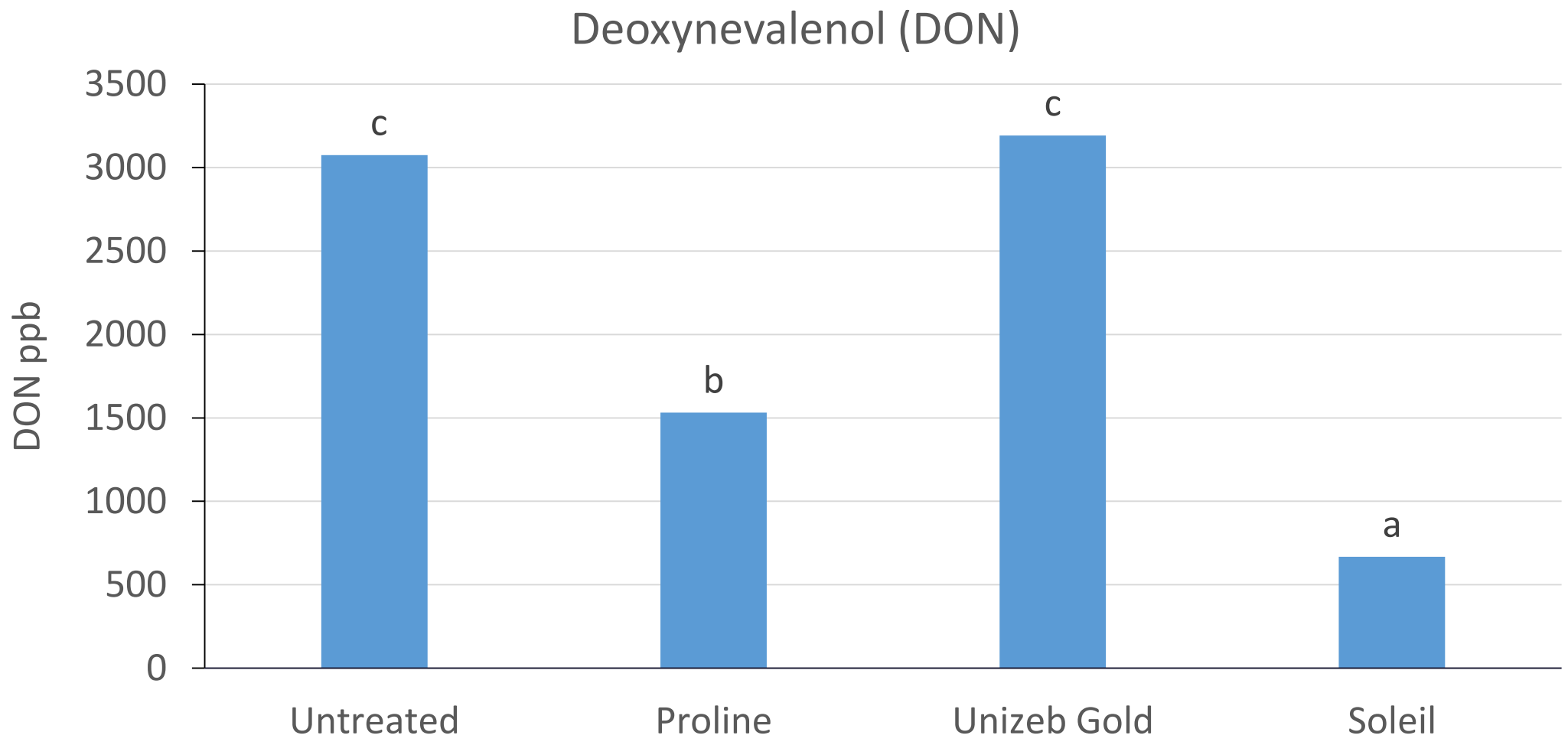



## 2018–19 (2 trials)




Soleil = tebuconazole + bromuconazole, Unizeb Gold = Mancozeb

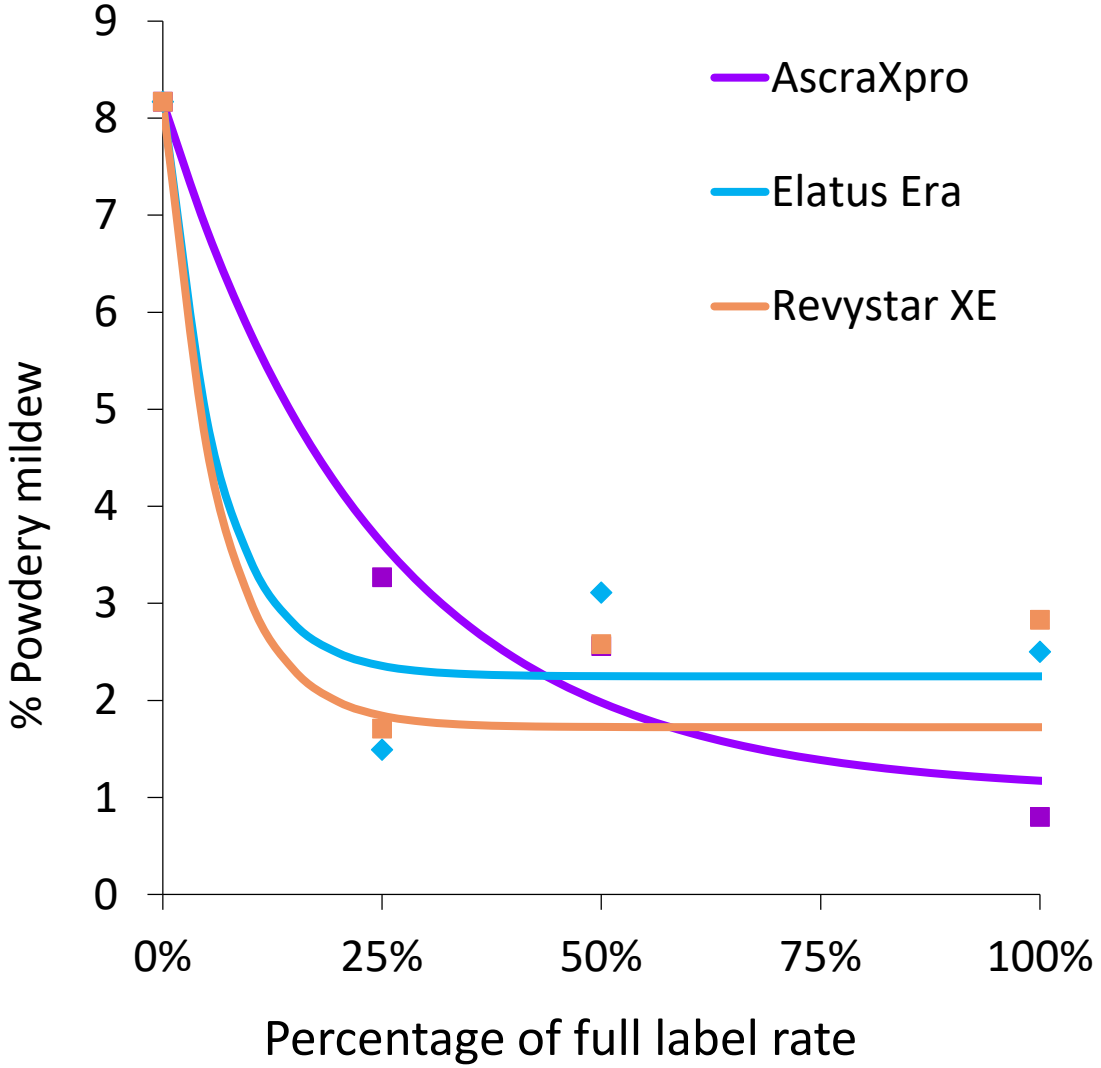
# Mycotoxin control 2019

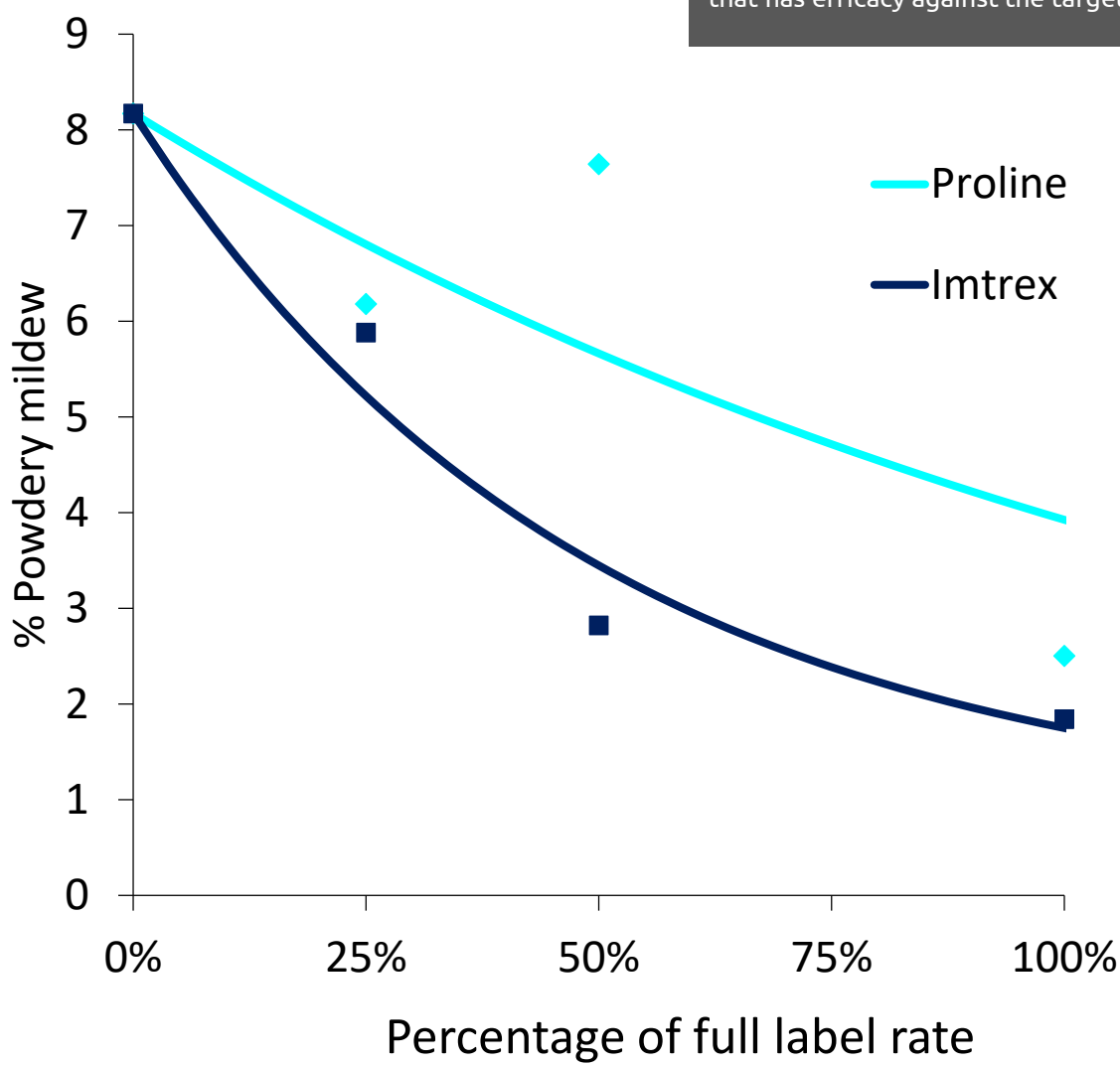



Maximum legal limit of DON in wheat for human consumption = 1250ppb

# Wheat powdery mildew 2019 (2 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease



# Wheat summary 2019

Septoria tritici

- Revystar XE very effective with a yield response up to full dose
- Ascra ahead of Elatus Era in 2019
- Solo SDHI Imtrex ~60% protectant control, prothioconazole ~ 45%

Rusts

- Elatus Era highest yield on yellow rust, matched by Revystar XE on brown rust

Fusarium

- Soleil and Proline effective, Soleil better DON reduction in 2019
- Unizeb Gold adding activity on visual head blight symptoms

Mildew

- All SDHI/azoles tested showed good levels of control

# Fungicide performance 2019 update for barley

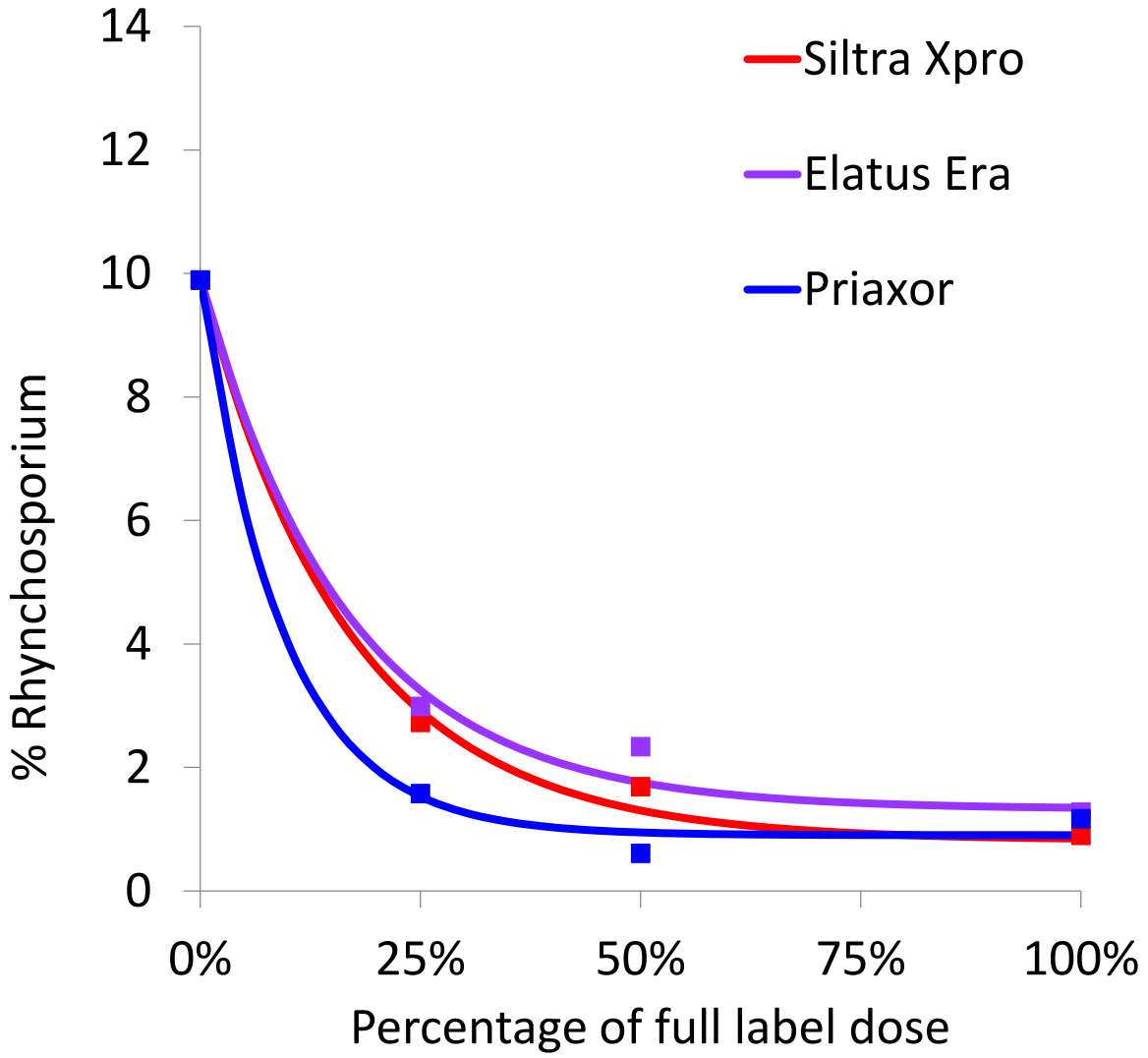
# Barley disease data in harvest year 2019

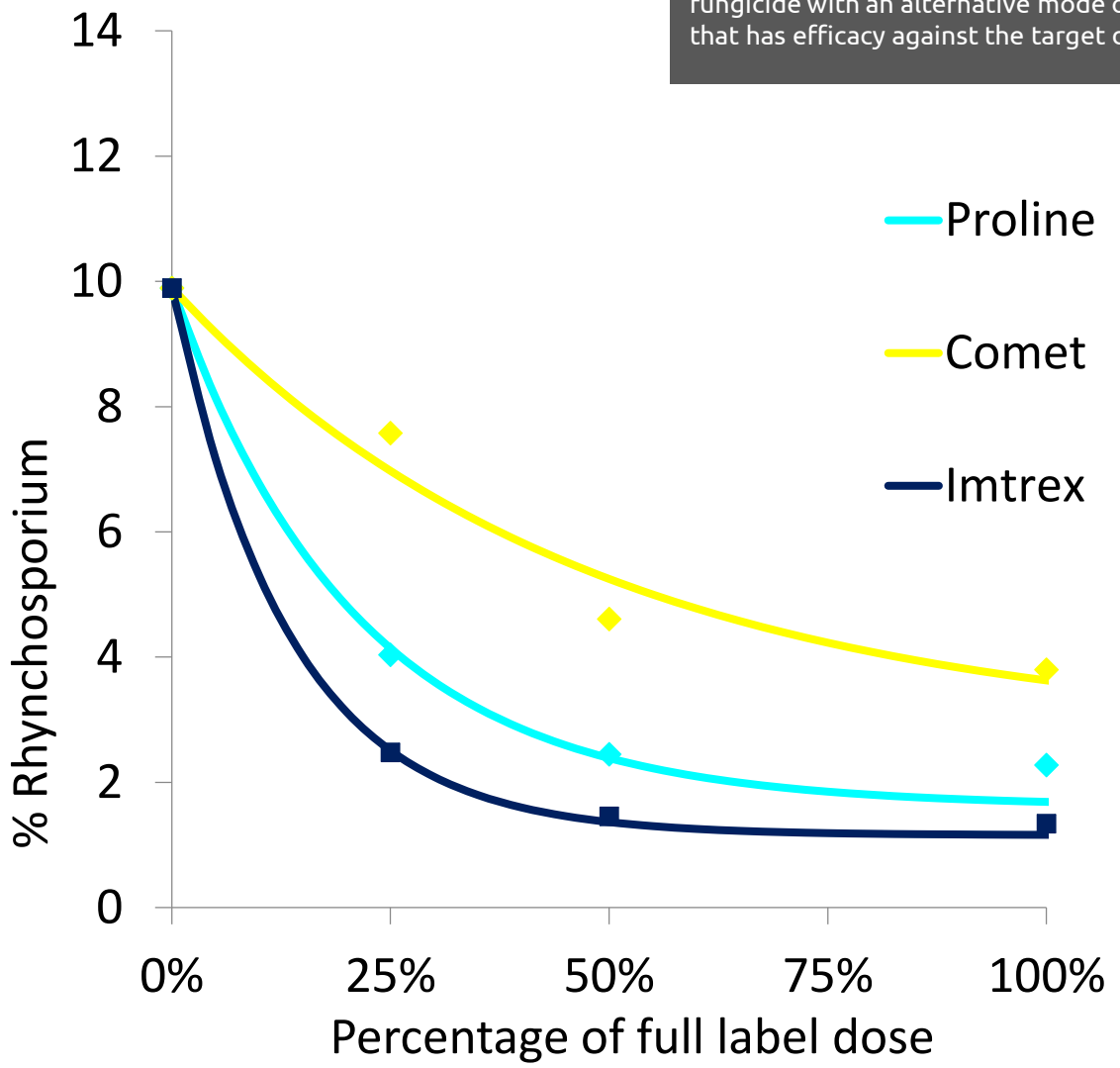
| Site (Organisation) | Target disease | Variety | Rhyncho | Net Blotch | Ramularia | Mildew | Tan spot |
|---|---|---|---|---|---|---|---|
| Lanark (SRUC) | Rhyncho | KWS Tower | ✓ | | | | ✓ |
| Cardigan (ADAS) | Rhyncho | KWS Cassia | ✓ | | | ✓ | |
| Carlow, Ireland (Teagasc) | Rhyncho | KWS Cassia | ✓ | | | ✓ | |
| Morley, Norfolk (NIAB) | Net blotch | Flagon | | ✓ | | | |
| Midlothian (SRUC) | Ramularia | Laureate (SB) | | | ✓ | | ✓ |
| Carlow, Ireland (Teagasc) | Ramularia | Pixel (WB) | | | ✓ | | |

# Rhynchosporium 2017–19 (8 trials)

## (protectant activity)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

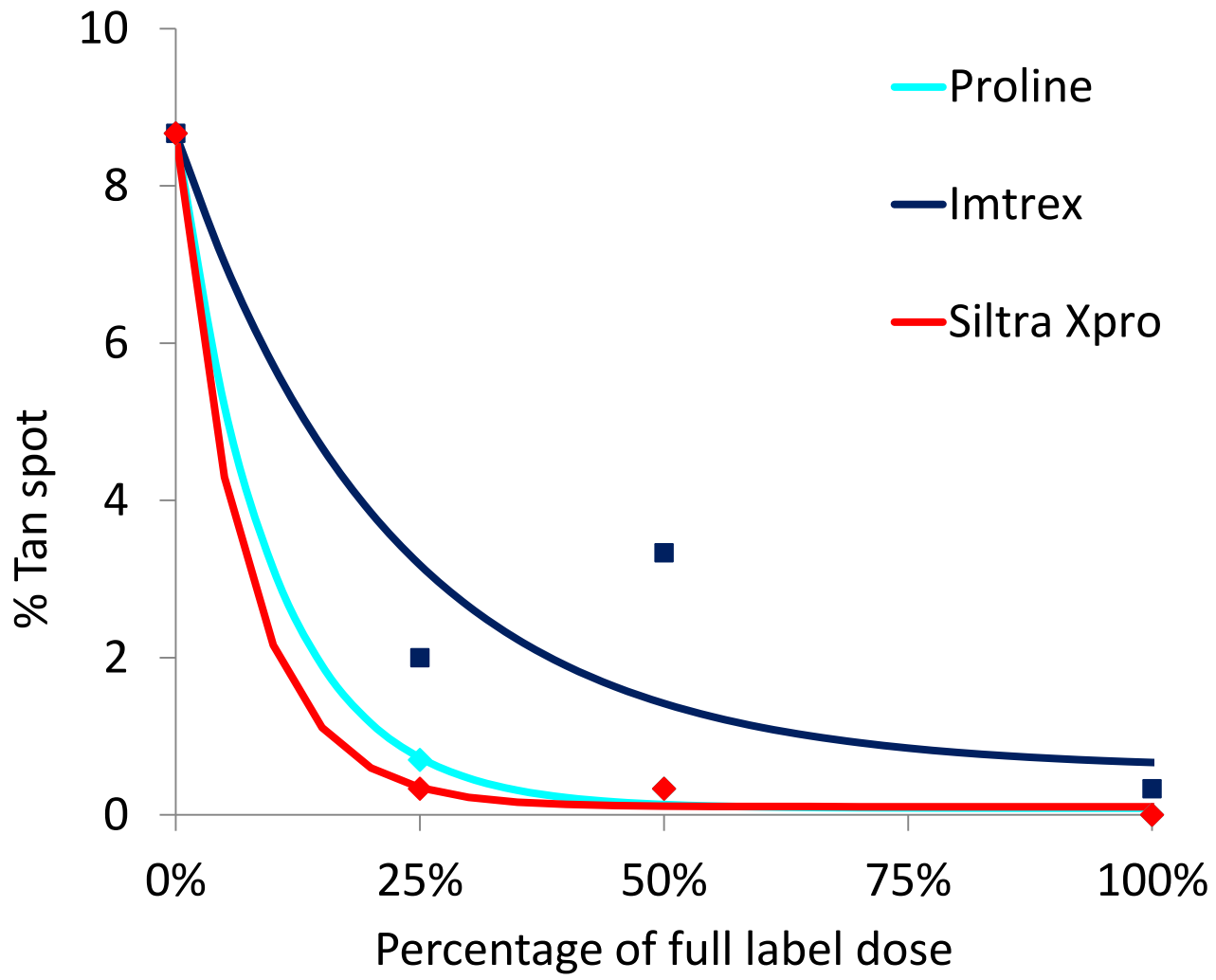



Priaxor = fluxapyroxad + pyraclostrobin

# Winter barley tan spot 2019 (1 trial)

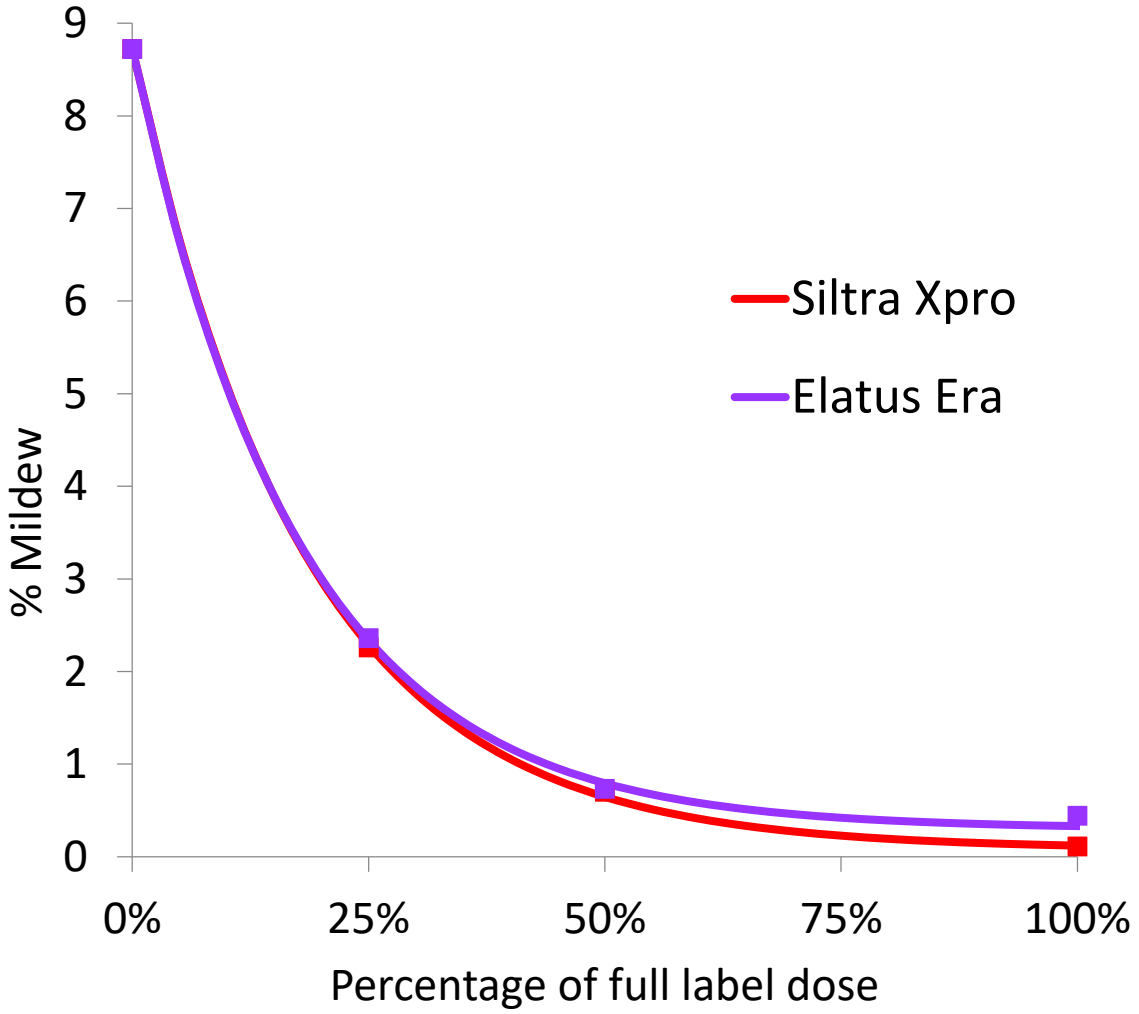
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

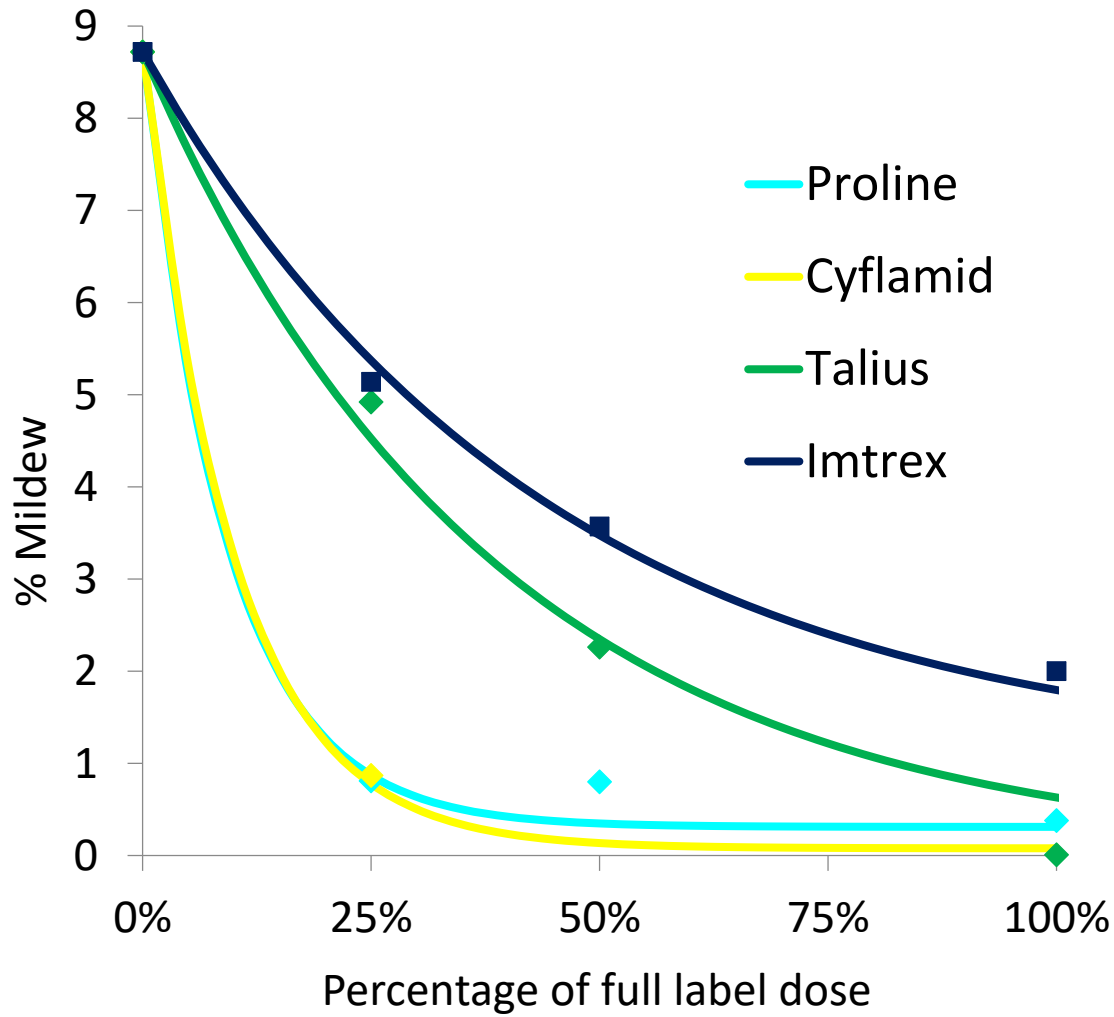


# Barley powdery mildew 2017–19 (6 trials)

## (protectant activity)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

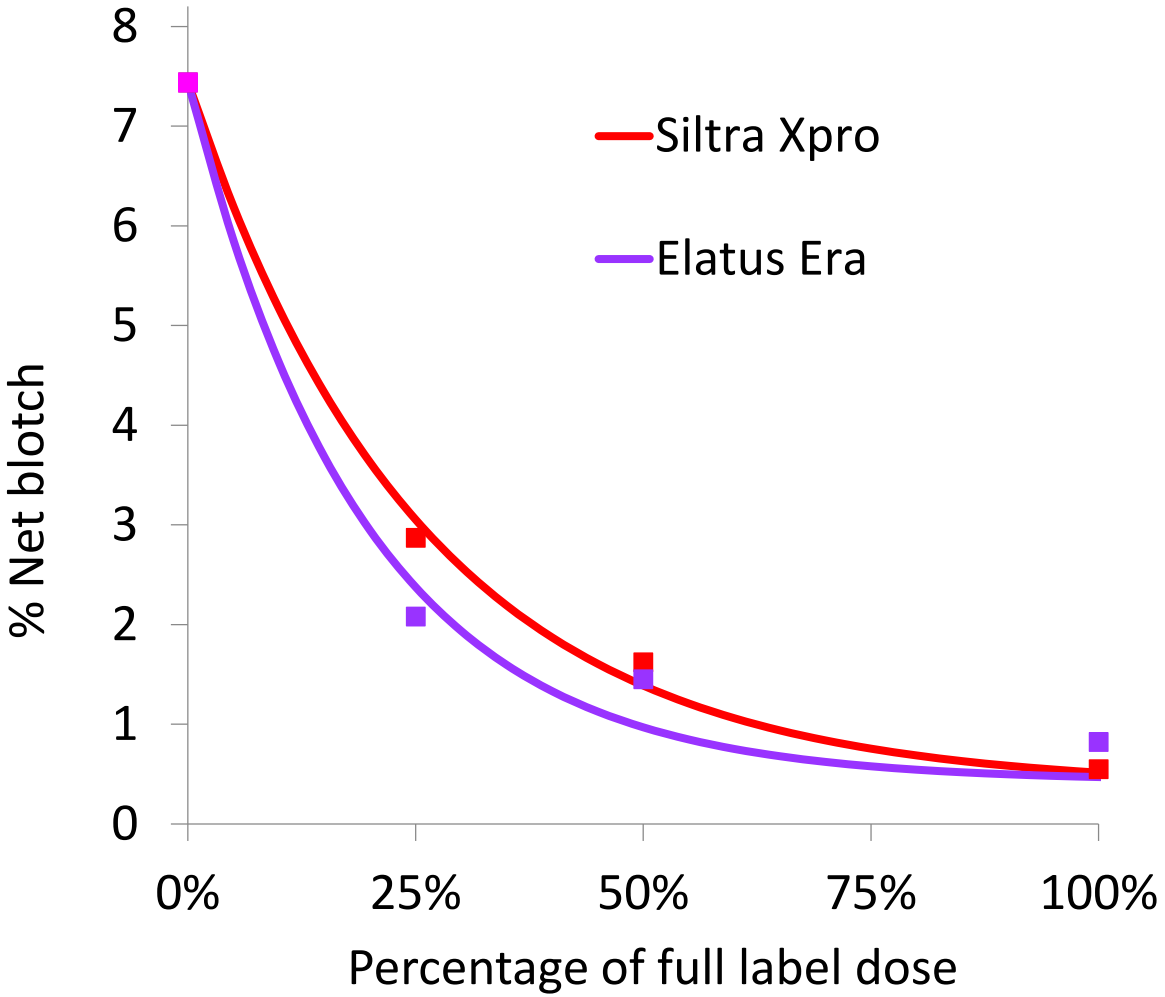


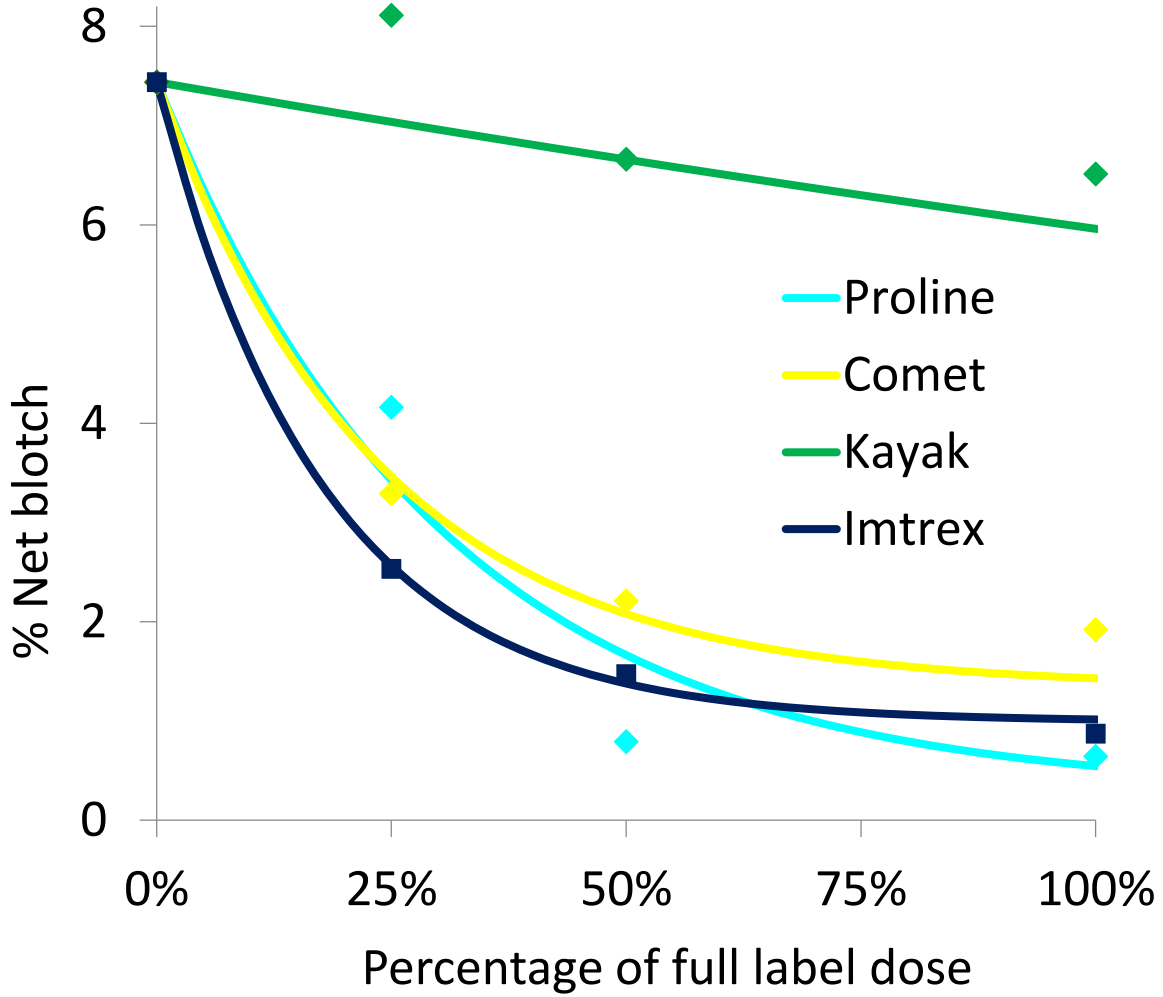



# Net blotch 2017–19 (4 trials)

(protectant activity)

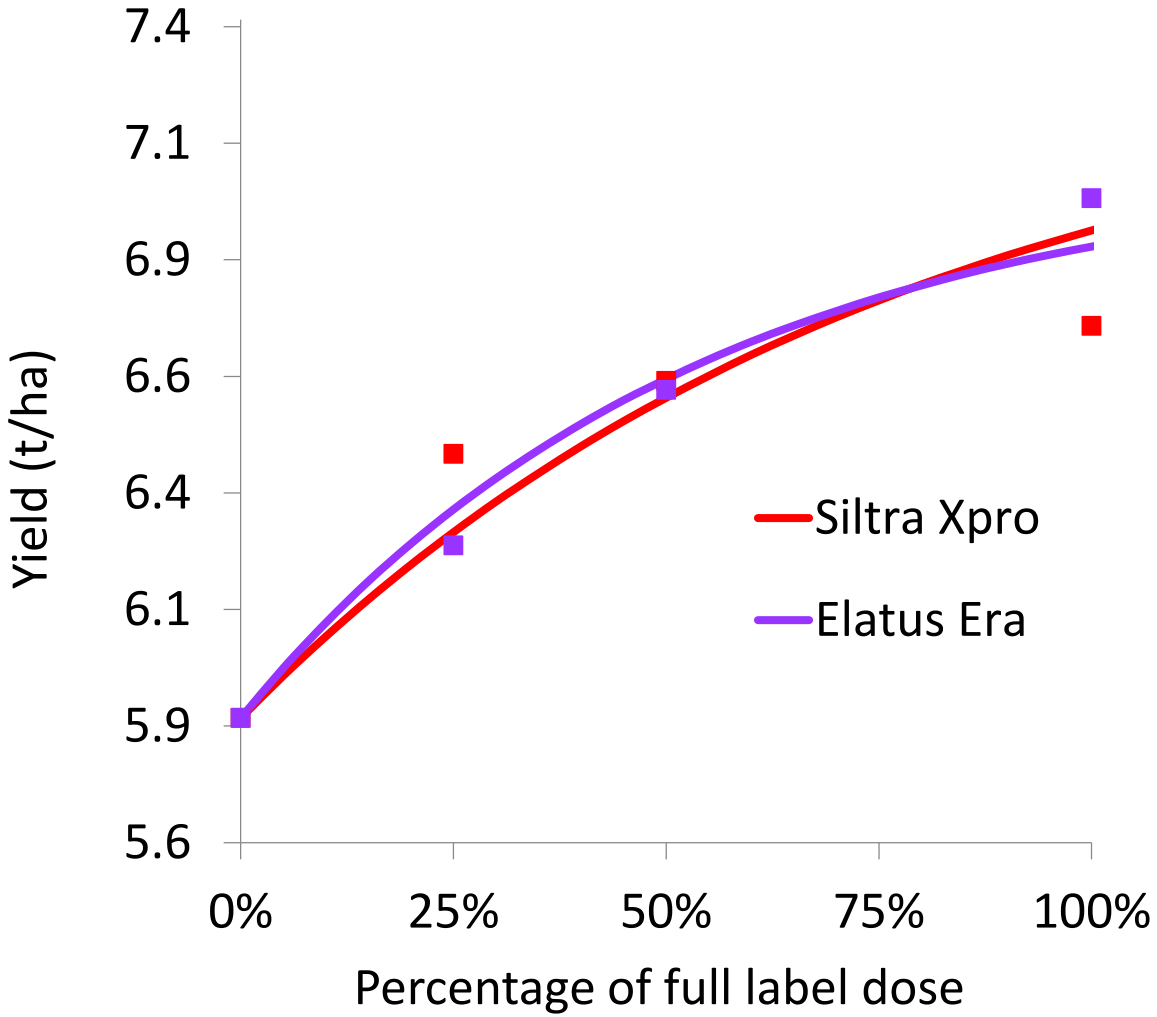
Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease

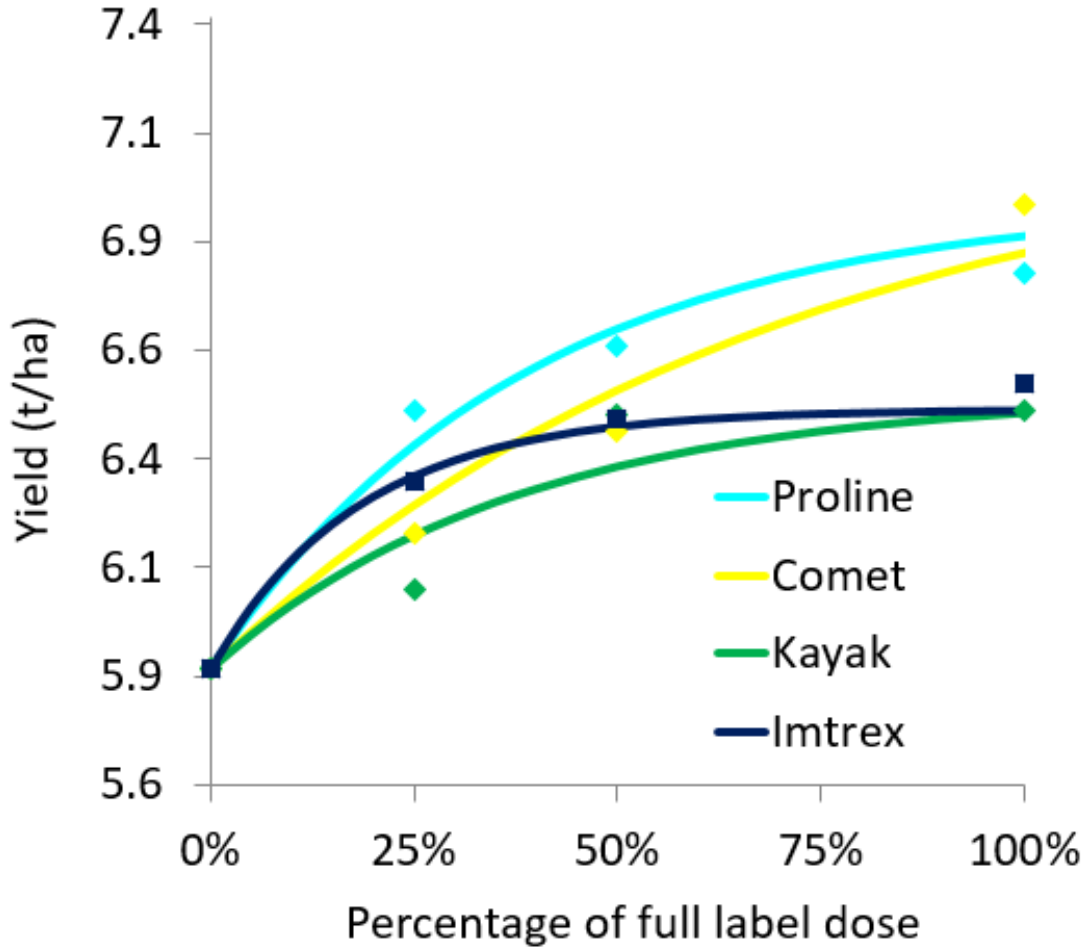


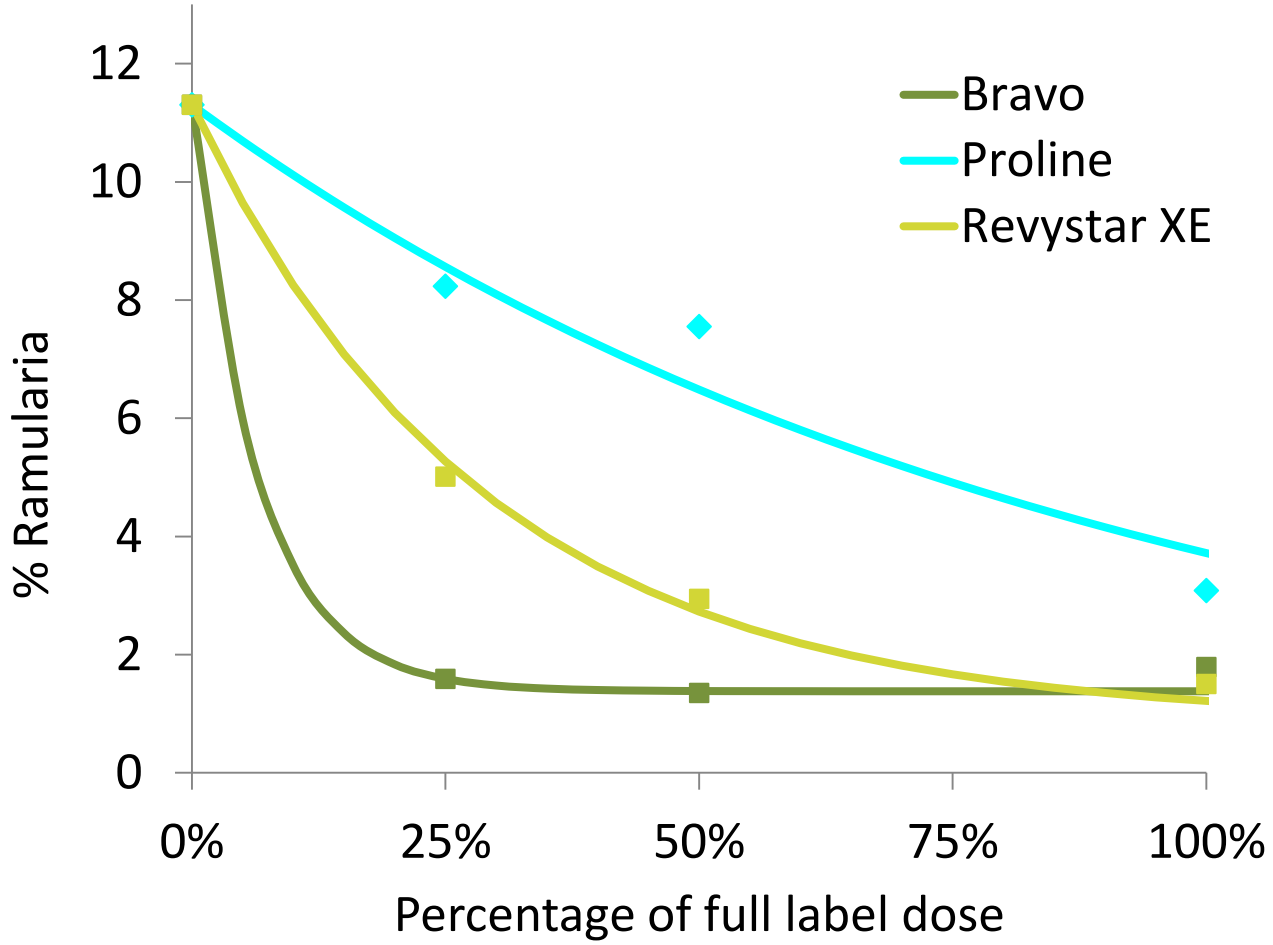
# Net blotch yields 2017–19 (5 trials)

Use Imtrex only in mixture with at least one fungicide with an alternative mode of action that has efficacy against the target disease



# Ramularia 2019 (2 sites)



# Barley summary 2019

- Rhynchosporium and net blotch – fluxapyroxad- or prothioconazole-based products lead (higher doses required for net blotch control)
- Mildew – prothioconazole-based products and Cyflamid most effective
- Tan spot – very good efficacy Proline and Siltra at low rates (Imtrex useful activity)
- Ramularia:
    - Revystar XE promising.
    - Resistance appears patchy – some activity from prothioconazole
    - Loss of CTL in 2020 will impact

# Fungicide performance 2019 update for oilseed rape

# Two new products, with existing actives, for OSR

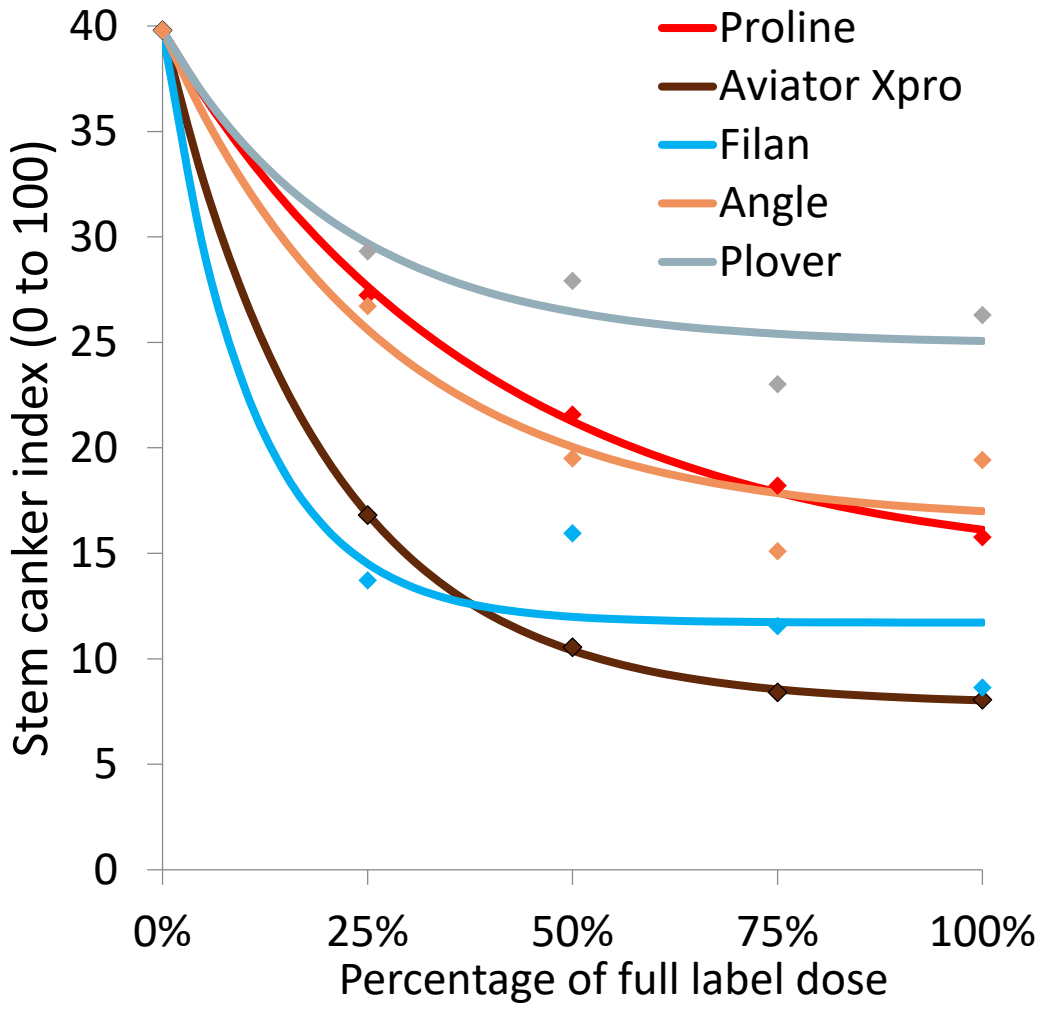
## Aviator Xpro

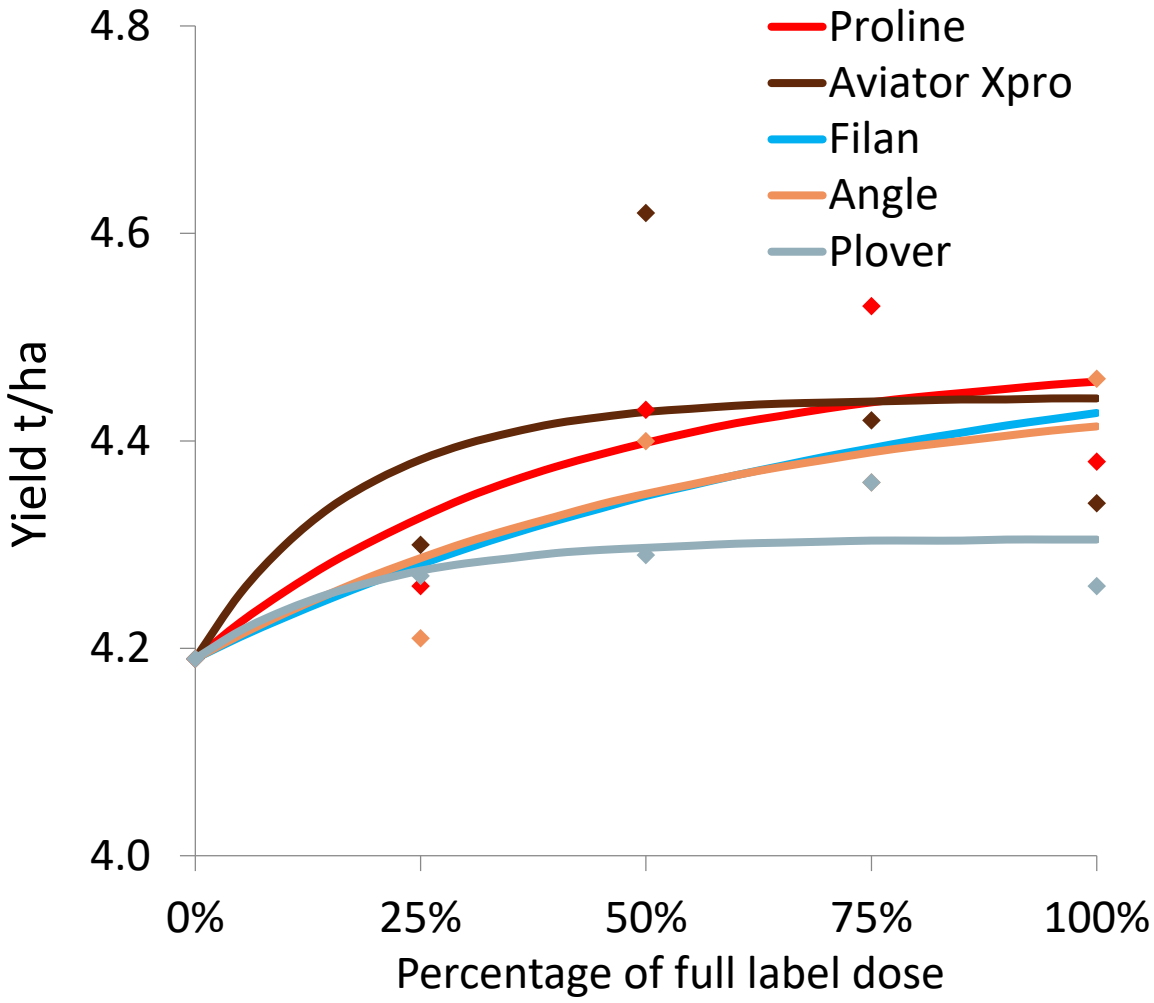
- 75g/l bixafen + 160g/l prothioconazole
- Maximum individual dose 1.0 l/ha
- Maximum of two applications per crop
- Can be applied up to 56 days before harvest
- Approved for control of:
    - Light leaf spot
    - Phoma stem canker
    - Sclerotinia control

## Angle

- 125g/l azoxystrobin + 125g/l difenoconazole
- Maximum individual dose 1.0 l/ha
- Maximum of two applications per crop
- Can be applied up to and including end of flowering
- Approved for:
    - Phoma stem canker reduction
    - Sclerotinia control (moderate control)

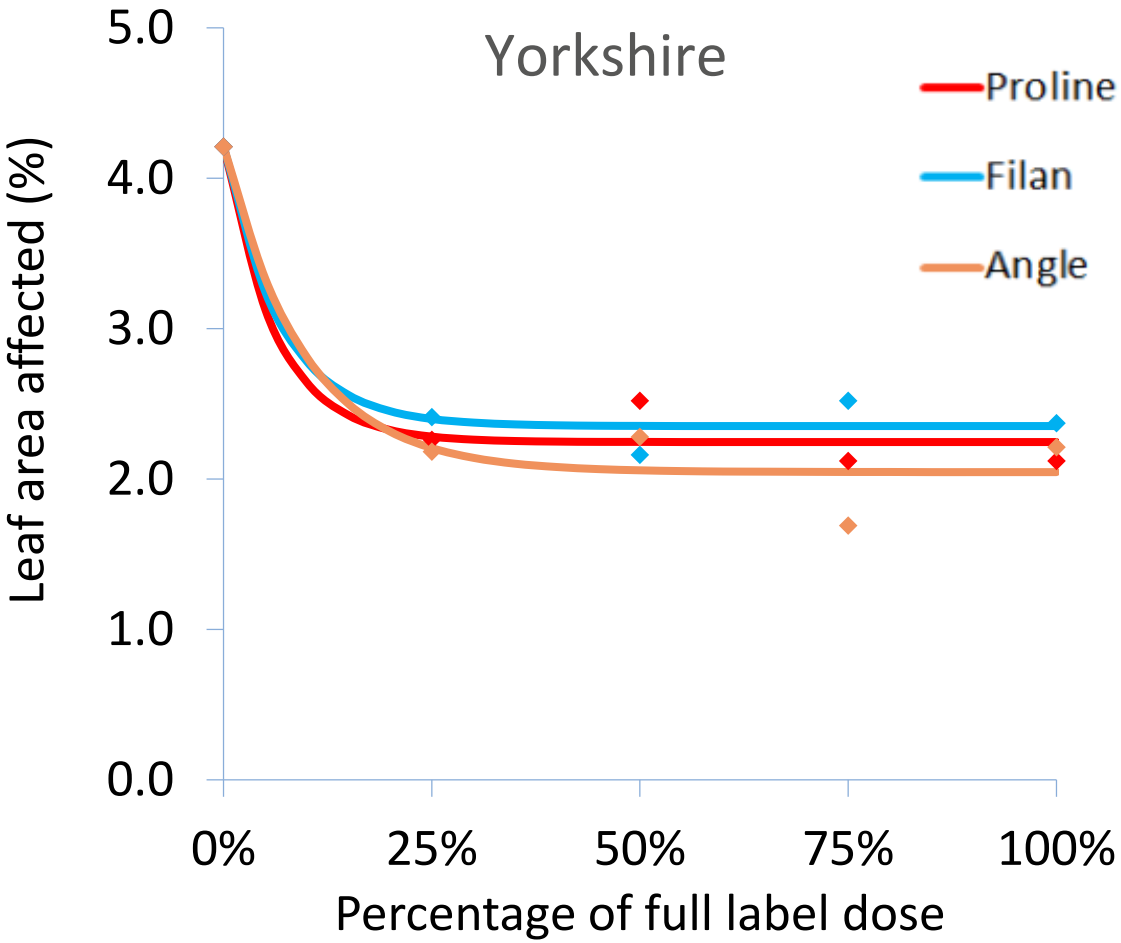
# Phoma stem canker 2018–19 (4 trials)

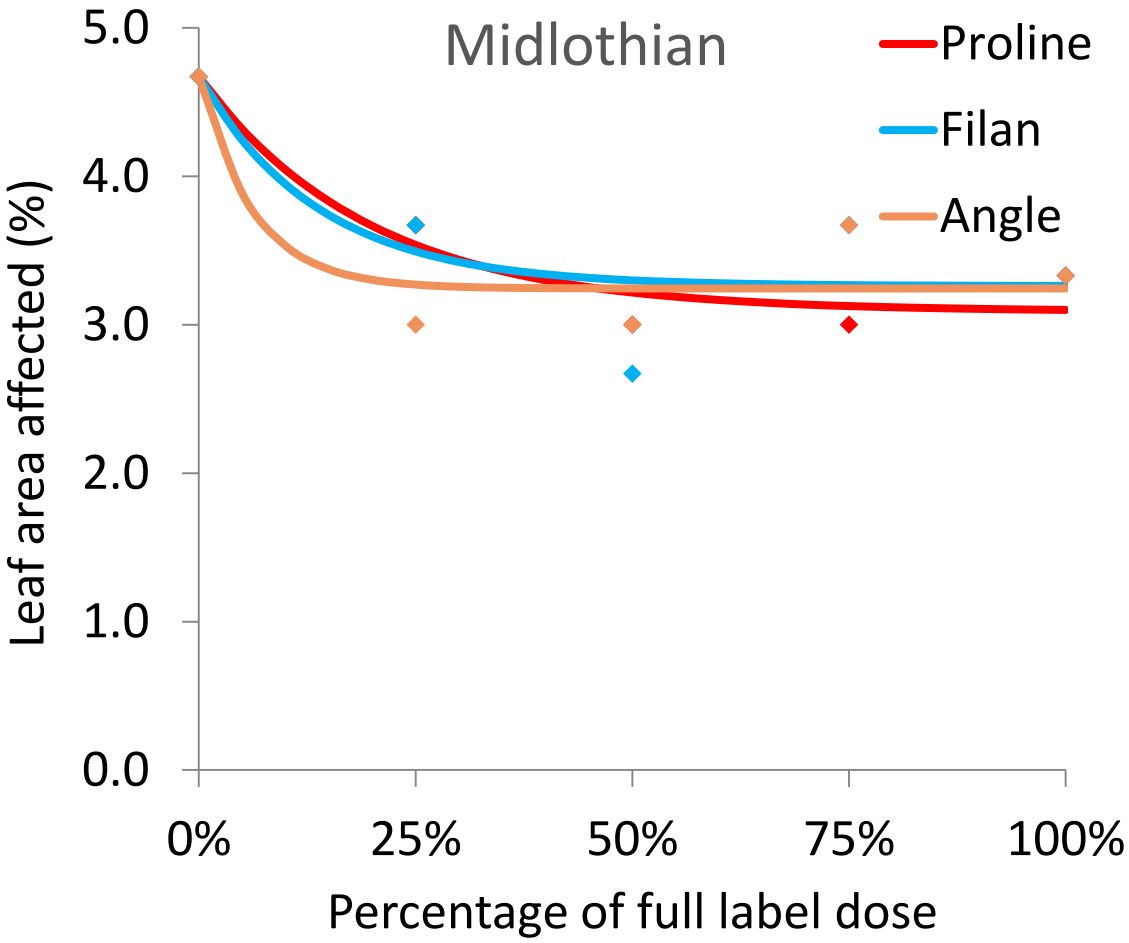



Four trials at Rosemaund, Herefordshire and Terrington, Norfolk.

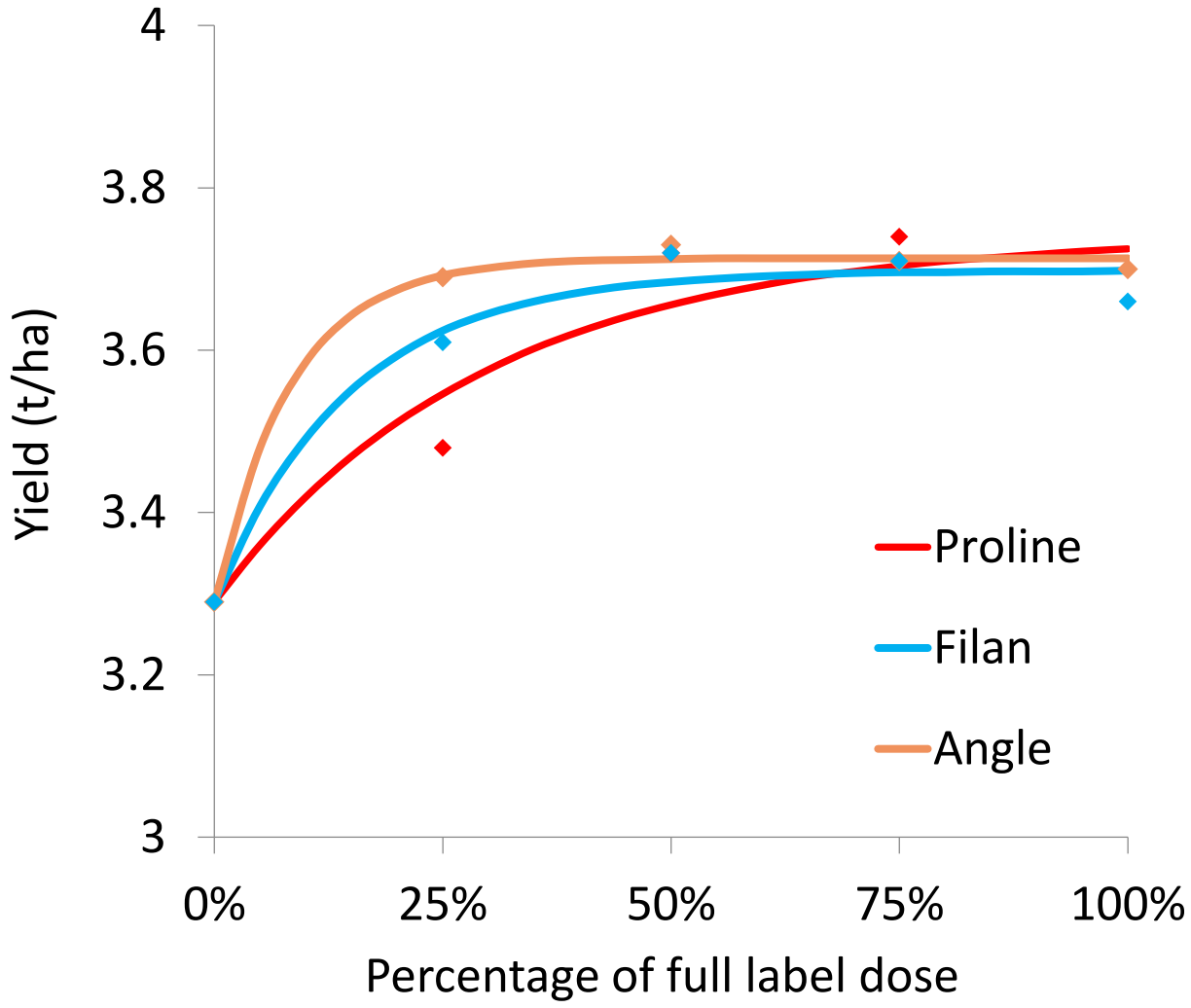
# Light leaf spot control 2019
## (March assessments)



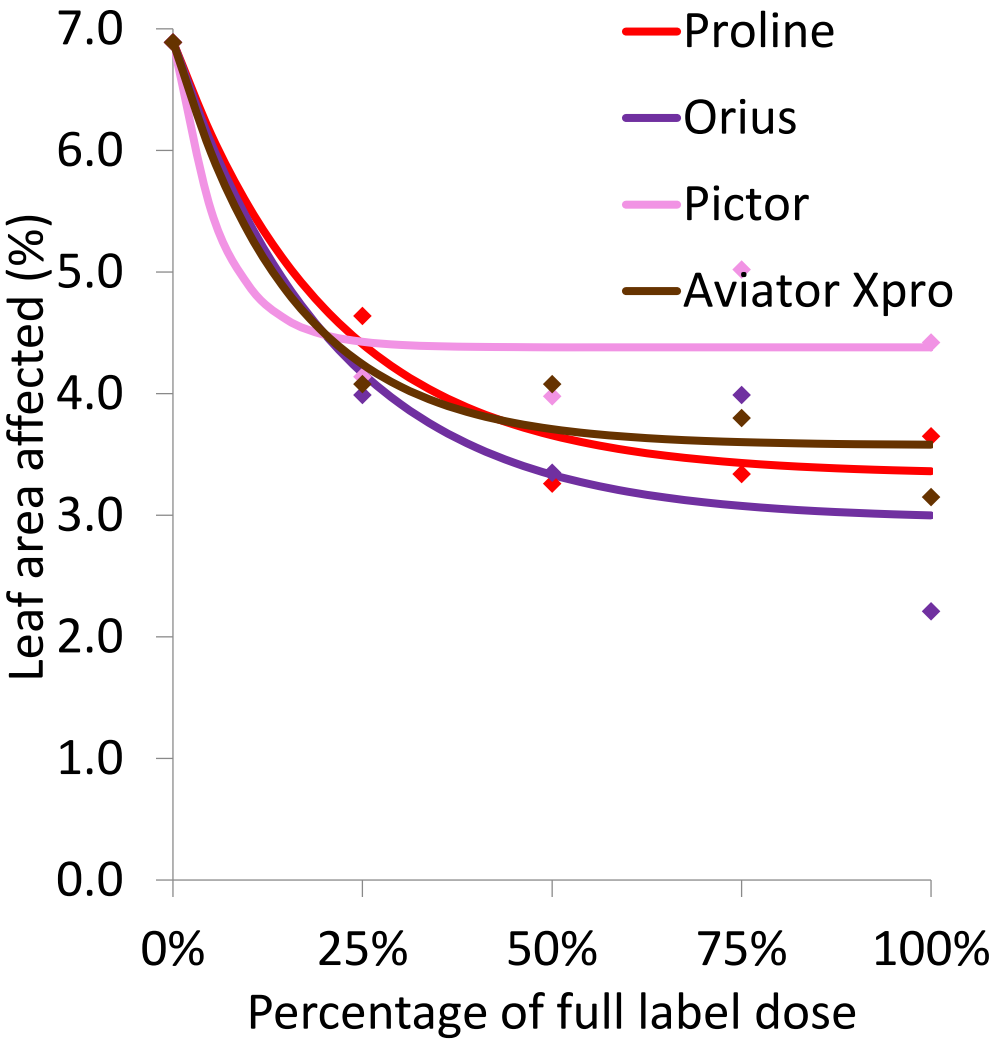



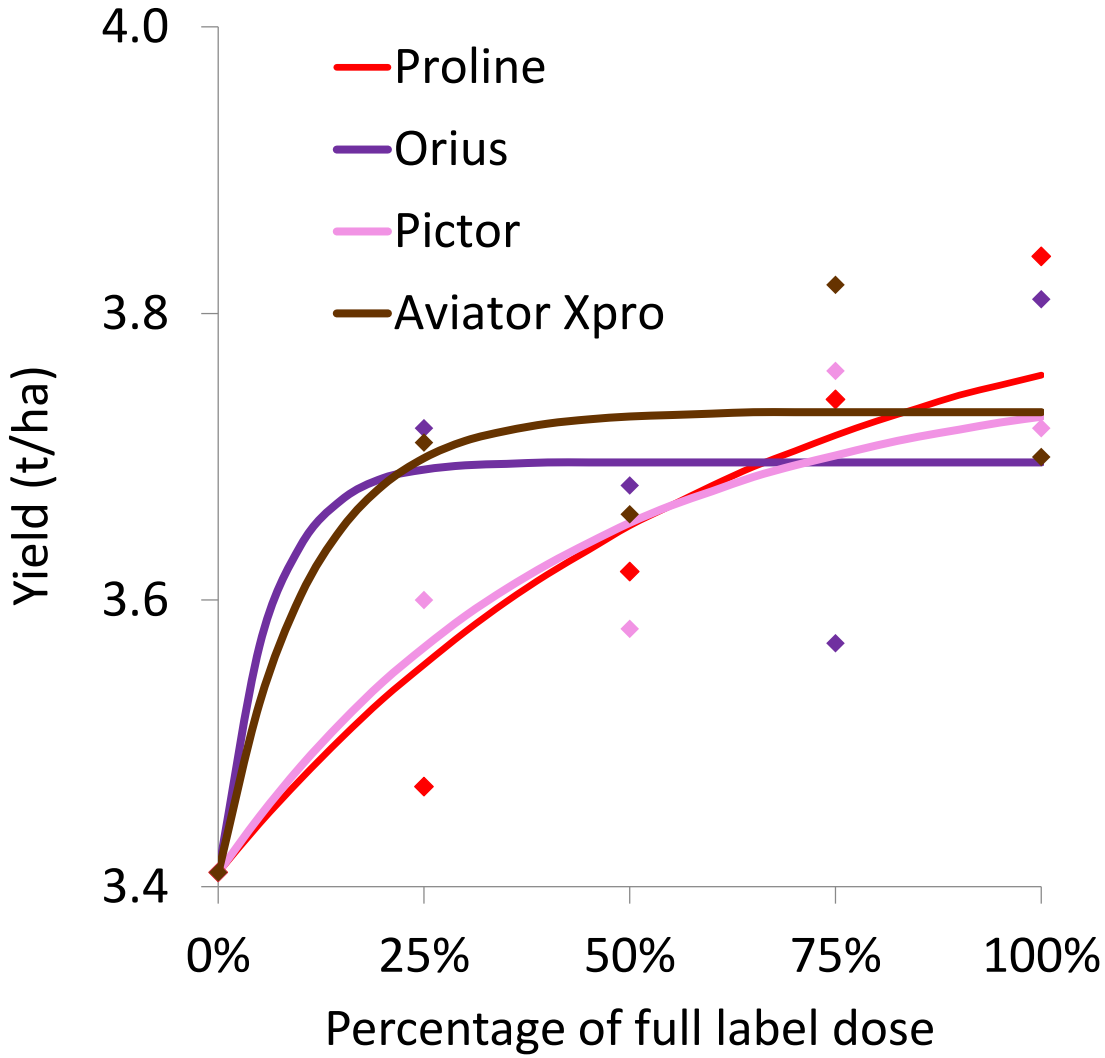

Note: Labels for Filan and Angle do not include control of light leaf spot

# Light leaf spot yields 2019 (2 trials)



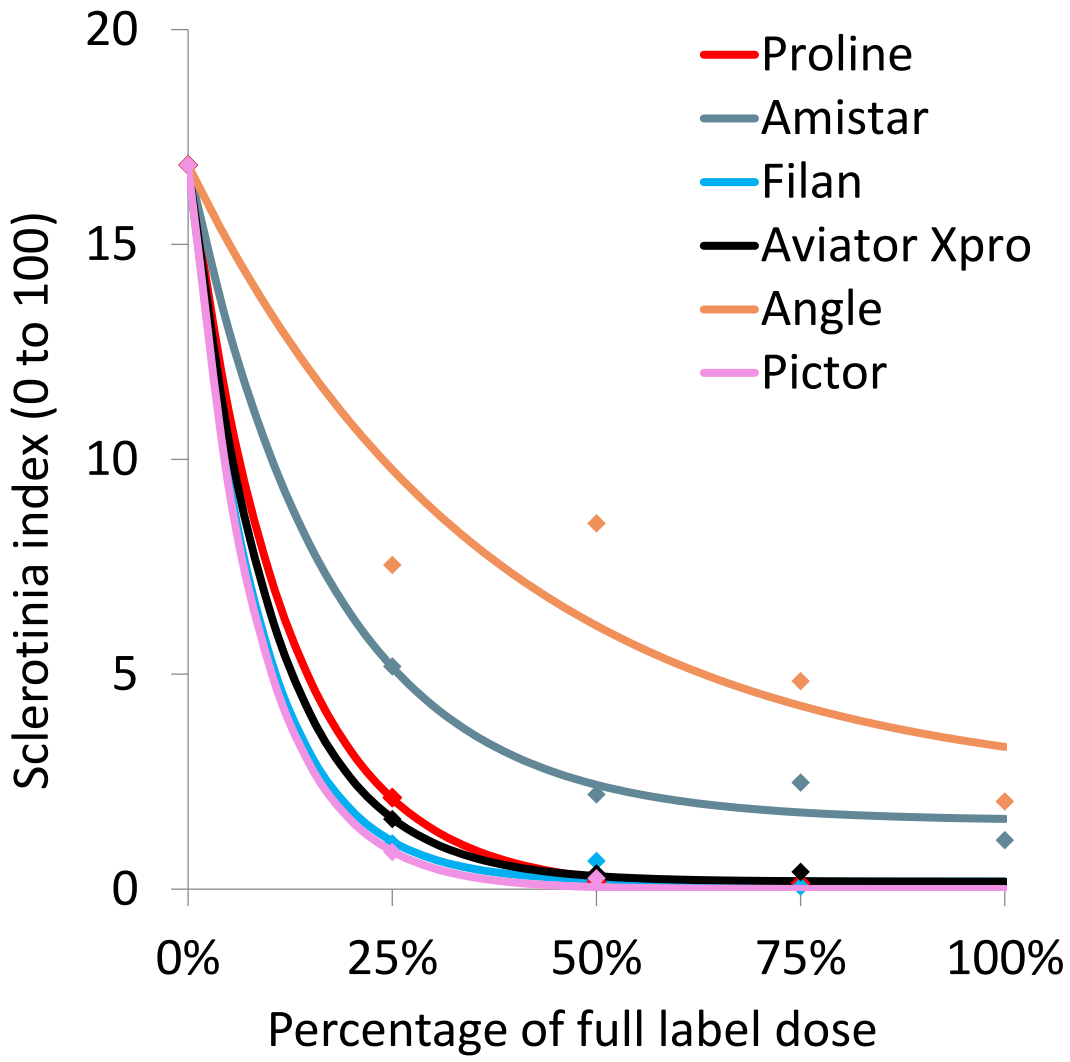
# Light leaf spot: disease and yield 2015–16 (5 trials)

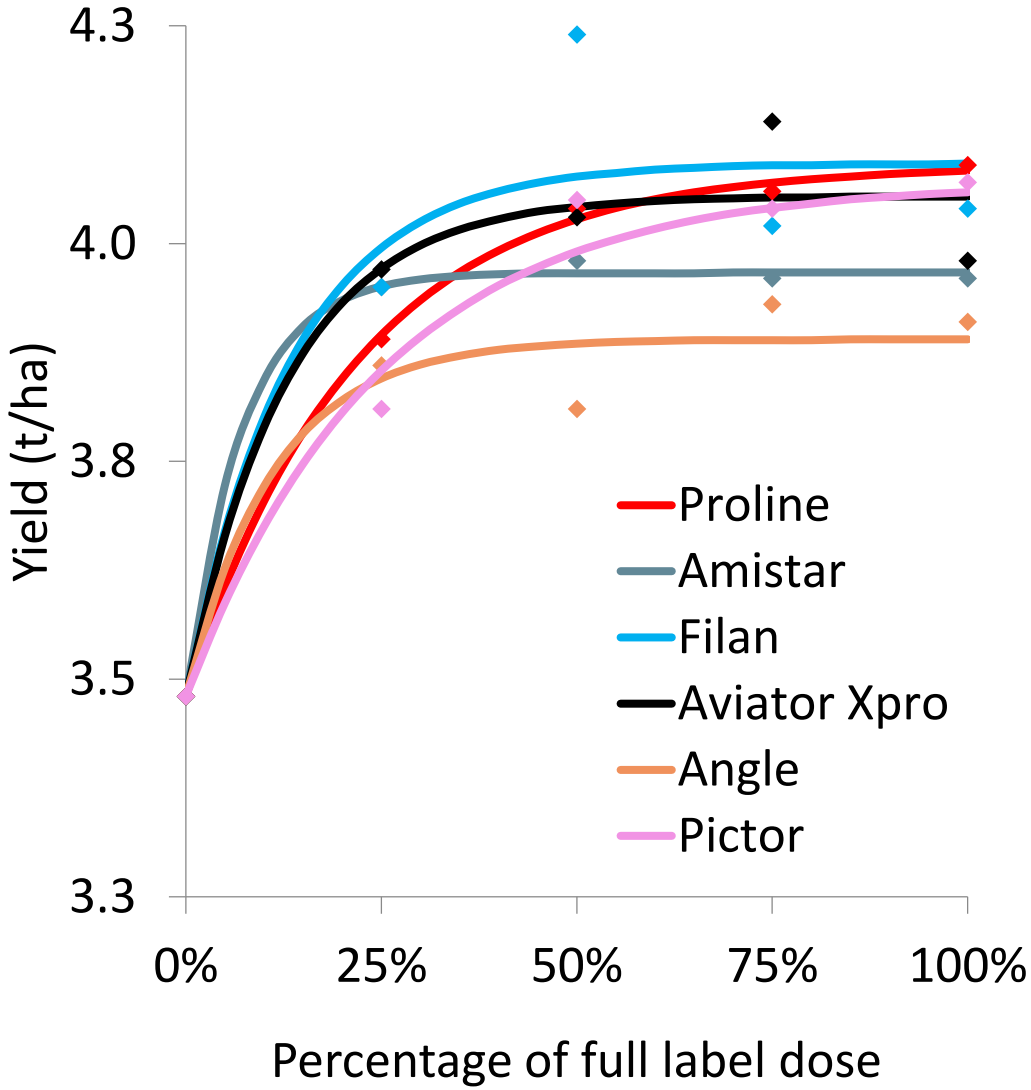



Trials based in Yorkshire and Midlothian

# Sclerotinia stem rot 2015–17 (4 trials)




Trials in Ceredigion and Herefordshire, single applications

# OSR summary 2019

## Phoma stem canker

- Azoles, SDHIs and strobilurins all have efficacy
- Two applications providing effective control

## Light leaf spot

- Early sown crops more at risk
- Significant yield benefits (~0.4t/ha) from control in 2019

## Sclerotinia stem rot

- Products containing prothioconazole or boscalid lead
- Azoxystrobin also effective

# Acknowledgements

Catherine Harries, AHDB
Stuart Knight, NIAB
Faye Ritchie, ADAS
Fiona Burnett, SRUC
Simon Edwards, Harper Adams University
Bart Fraaije, Rothamsted Research
Steven Kildea, Teagasc

Funding from AHDB and Teagasc

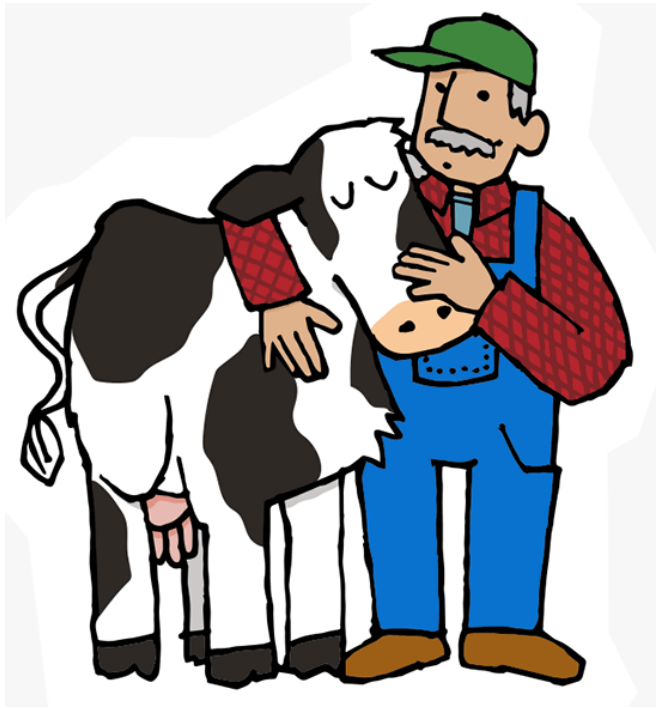
# PANEL SESSION

## Stuart Knight and Sean Burns, AHDB

February 2020

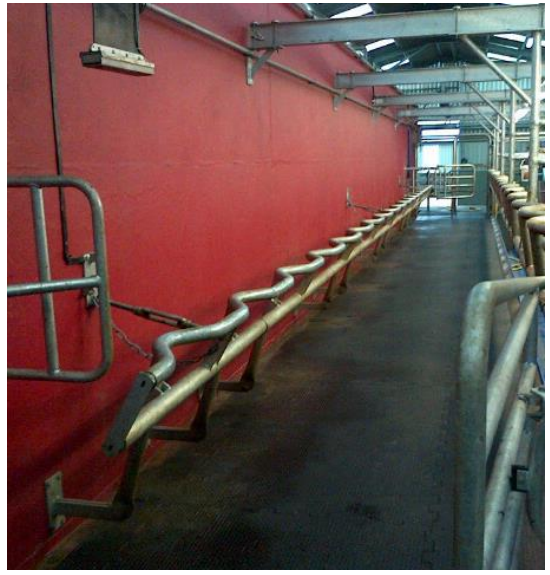
# Working with a Norfolk (or Suffolk) dairy farmer

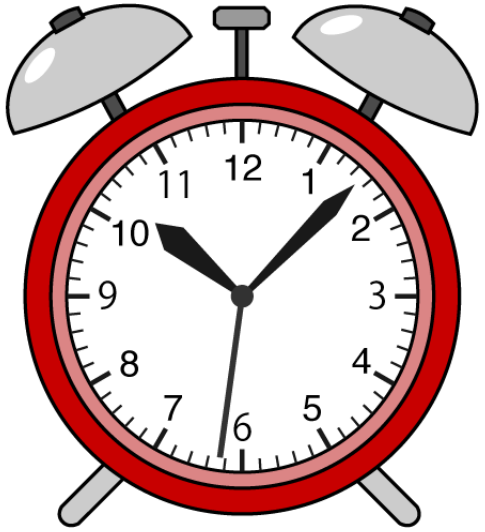
Shirley Macmillan

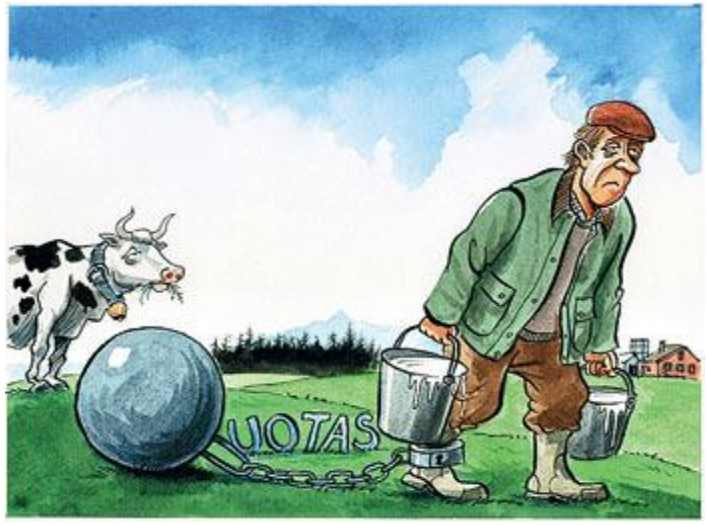


# 60

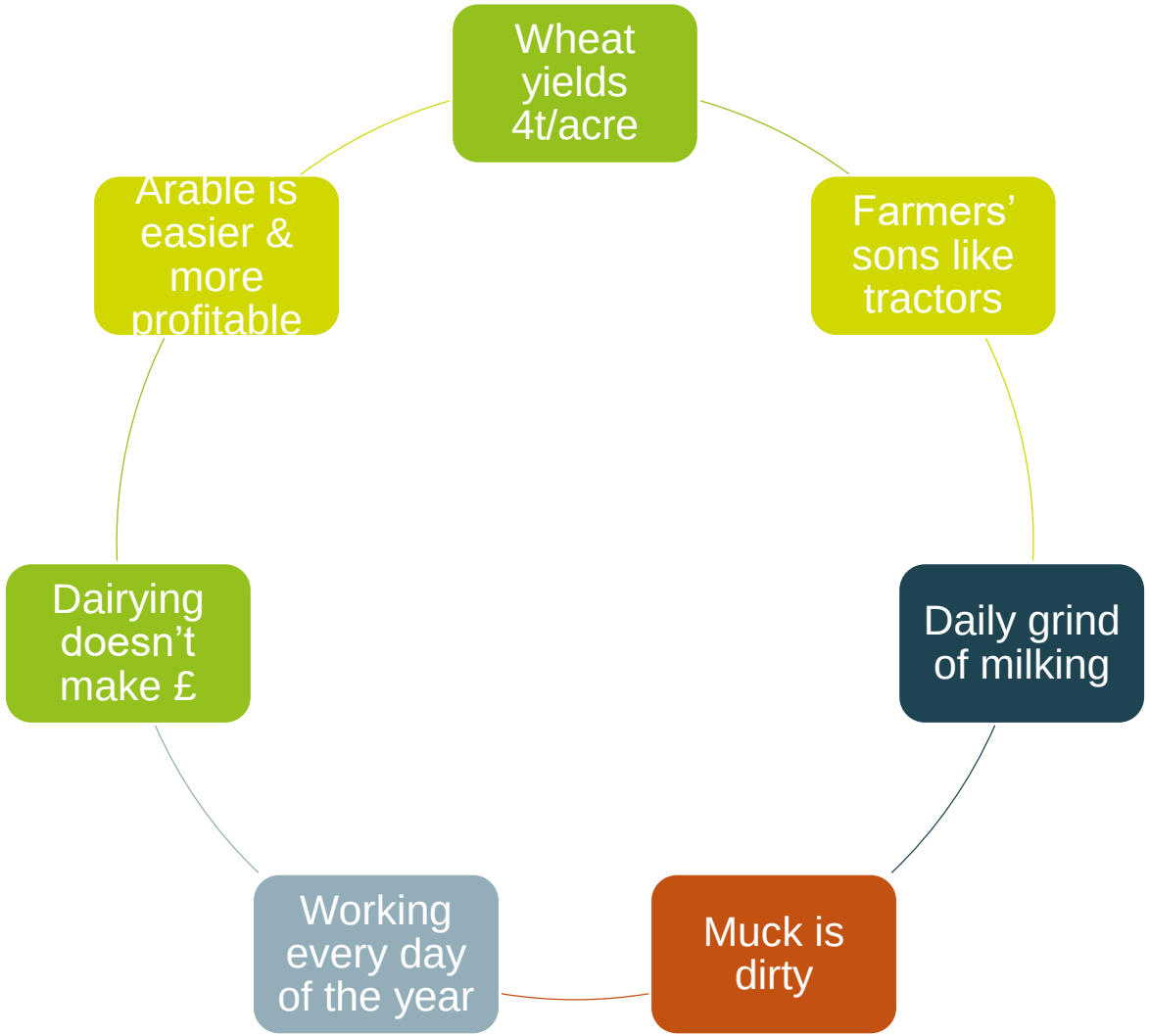
# Why did many East Anglians give up dairying?





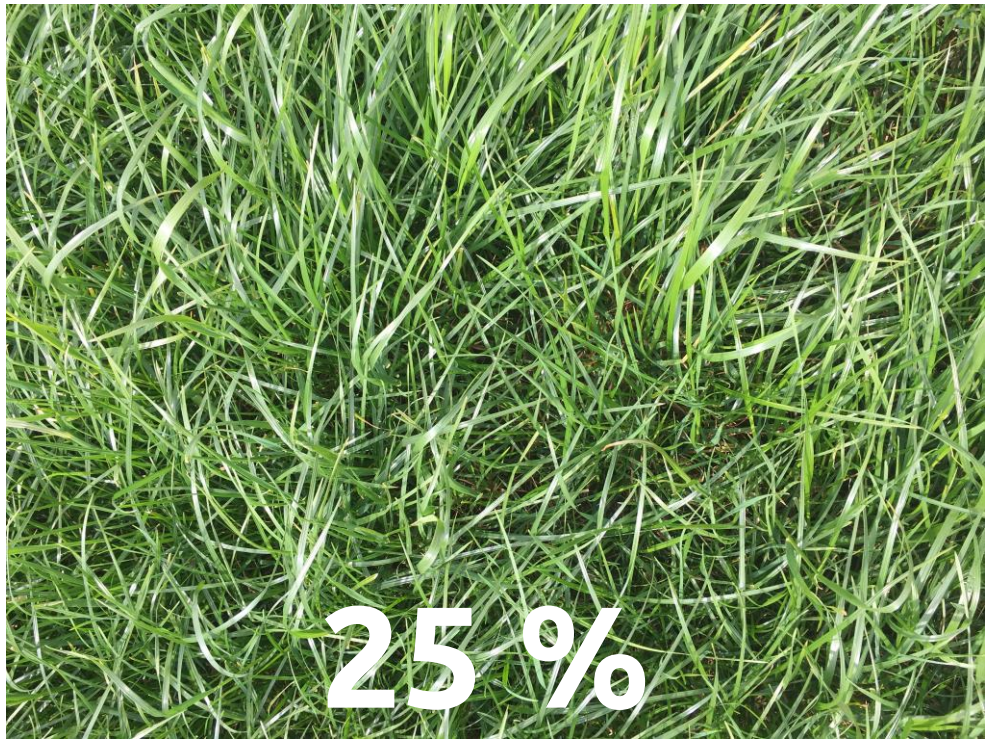




# Perception or fact?



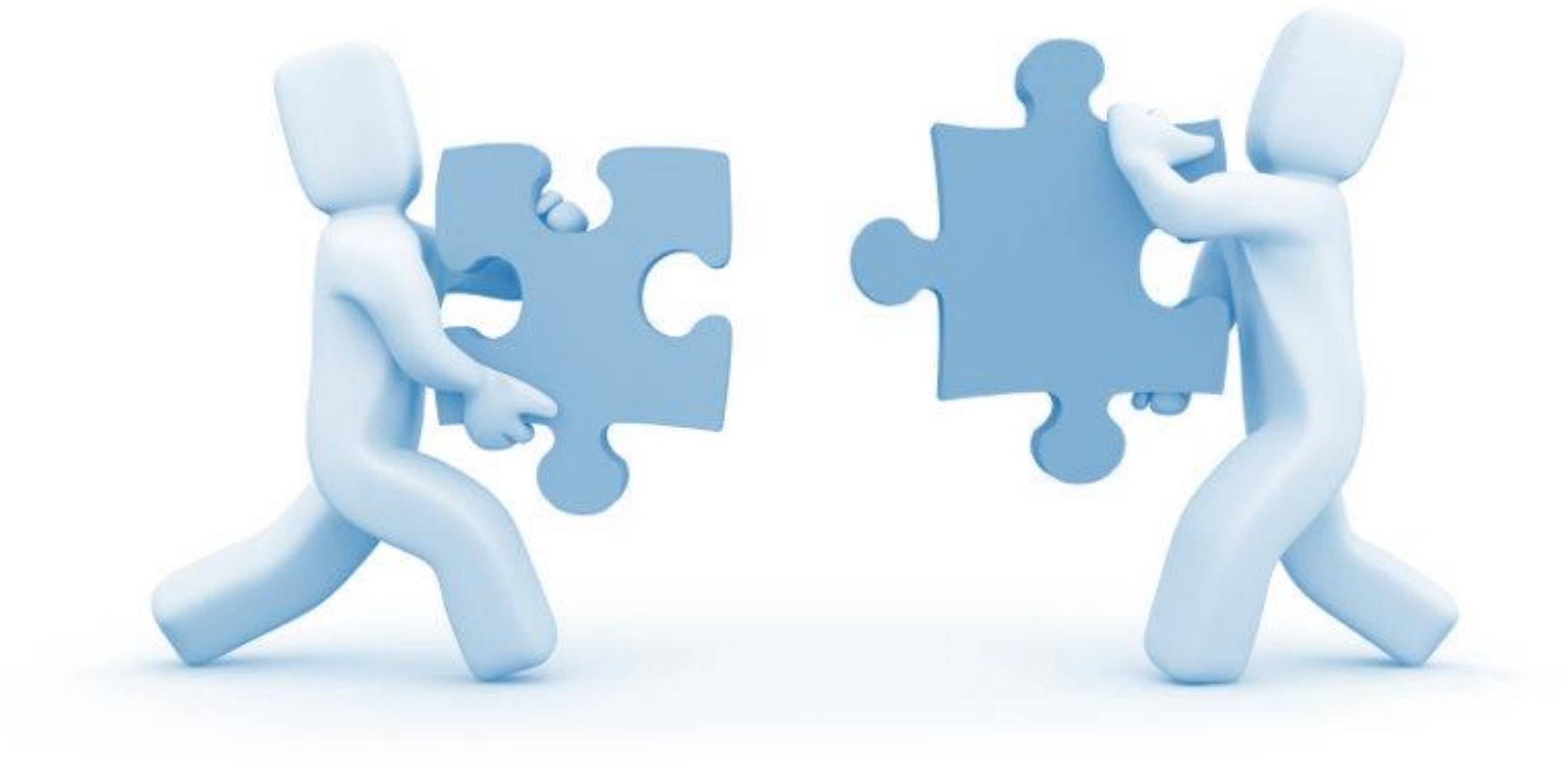

78%


22%


25 %


14


1. Straw availability
2. Getting rid of muck/ slurry
3. Growing enough forage crops
4. Herd expansion
5. Land availability
6. Protein-self sufficiency
Issues facing dairy farms in East Anglia



# Put a value on muck!

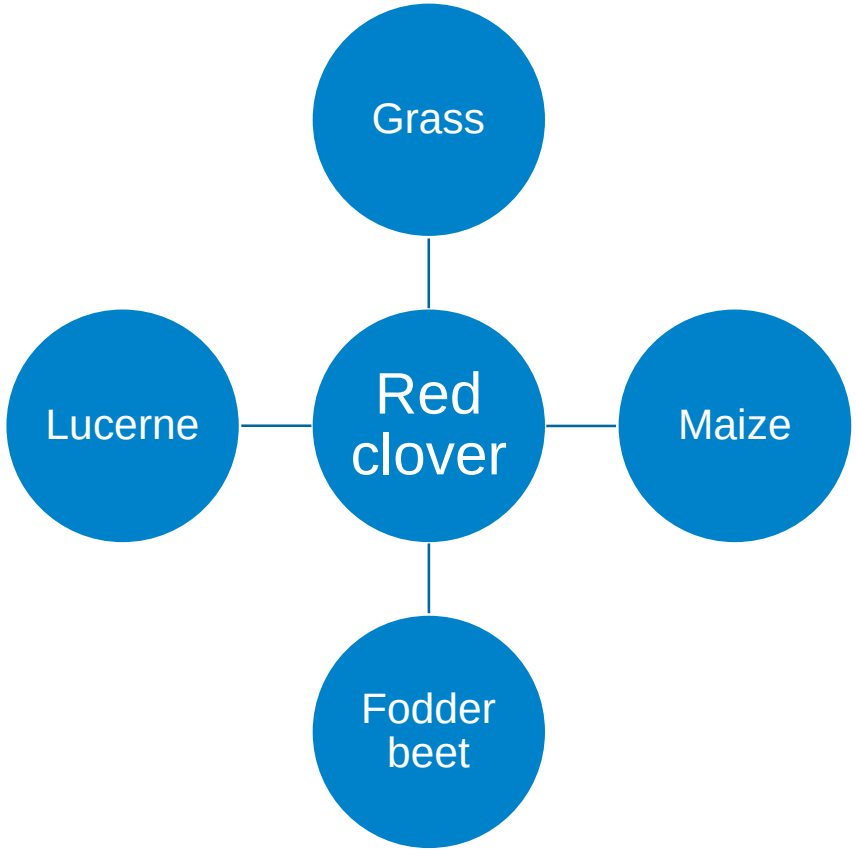
- Farmbench says FYM worth £8.19/tonne in NPK
- Norfolk dairy farmer calculates: 1 tonne of straw (= 3 round bales) in cow yard creates 3 tonnes of muck

Straw costed at £42/tonne

= £42 ÷ 3

= 1 tonne of muck is worth at least £14 + soil conditioning

# Contract grow crops




# Outwinter on crops

- Dry cows
- Heifers
- Expand milking platform

# Expansion, Joint Ventures, new dairy farm

# Key take home messages

**Network**

- Speak to a dairy farmer
- Buying groups
- Consultants
- Someone in the pub

**Research**

- Crops for your land
- Potential markets
- £ benefit
- Contact forage seeds companies

**Use AHDB**

- Podcast Ben Stroud
- Joint Ventures, Outwintering
- Livestock in Arable Rotation
- Talk to Teresa!


‘Inspiring our farmers, growers
and industry to succeed in a
rapidly changing world’

# Closing comments

## Richard Ling, Diss Monitor Farm

# Rookery Farm

- **Farming:** <400ha – 286ha owned, 120ha contract farmed
- **Soils:** Sandy loam, sandy clay loam and loamy sands
- **Cropping:** W.wheat, W.beans, S.barley, OSR and S.beans
- **Labour:** Richard, Gary, Dick, Maureen and Rebecca.
- **Cultivations:** Managed approach LDS to plough
- **Beef finishing unit**
- **Diversification:** Self storage business, business lets

# Diss MF First Year

## Headland Management





## Labour and Machinery review



## Manure Management


# Take home lessons for the season ahead….

# Further Information

CEREALS & OILSEEDS

# Milling Wheat Conference


**Date:** Thursday 27 February 2020

**Location:** Huntingdon Marriott

**Time:** 10:00 – 15:30

Cereal Quality Survey, markets, nitrogen, ergot, supply chain and YEN Wheat Quality Award

# Use your resource….

cereals.ahdb.org.uk

Monitor Farms, Strategic Farms, Business Groups

Webinars and AHDB Podcasts

Ask the question…

# Thank you!

# Enjoy lunch and safe journey home.

@AHDB_Cereals - @CerealsEA - #monitorfarm – Podcast – teresa.meadows@ahdb.org.uk – 07387 015465