The future of fungicides

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Cereal Diseases

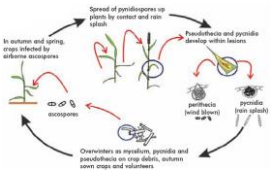
Diseases have the potential to significantly reduce the quality and quantity of Irish cereal yields

Outline

1. **The why?**
   - Why are cereal diseases so prevalent in Ireland?
   - Why the reliance on fungicides for control?
2. **The what?**
   - What's actually working?
   - What's coming down the line for disease control?
3. **The how?**
   - How do we use fungicides to maximise return (and longevity)?

Why so prevalent?

Septoria tritici blotch



The Pathogen: *Z. tritici*

- Evolved for mild damp conditions
  - Extremely adaptable
    - Polycyclic

The Host: Wheat

- Mostly susceptible varieties

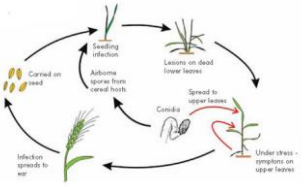
The Environment: Ireland

- Wet, wet, wet
- Winter cropping?

https://cereals.ahdb.org.uk/cereal-disease-encyclopedia/

Why so prevalent?

Ramularia leaf spot



The Pathogen: *R. collo-cygni*

- Evolved for mild damp conditions
  - Extremely adaptable
    - Polycyclic

The Host: Barley

- Mostly susceptible varieties

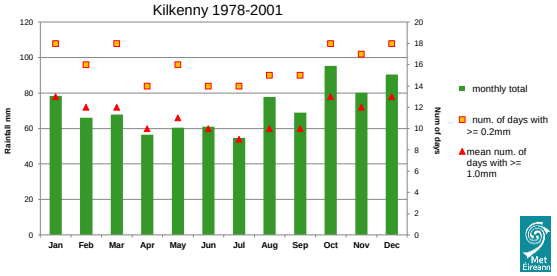
The Environment: Ireland

- Wet, wet, wet
  - ????

https://cereals.ahdb.org.uk/cereal-disease-encyclopedia/

Not just about how much rain falls

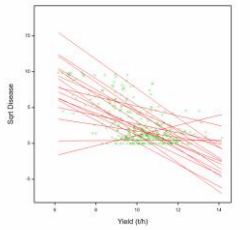
Kilkenny 1978-2001



Some form of precipitation on over >50% of days in each year

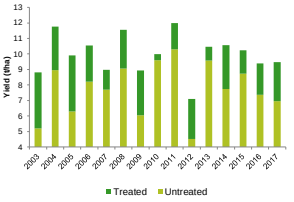
Fungicides – Diseases = Yield

Relationship between yield and disease



- 19 trials with 2 applications (2008-2017)
- Significant relationship *P*<0.001
- 79.2% variance accounted for

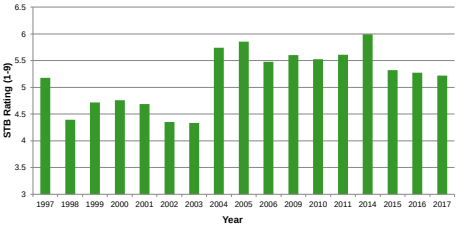
In most seasons fungicides provide >25% yield increase



- Teagasc CTL dataset 2003-2017
- Significant yield increases P<0.001

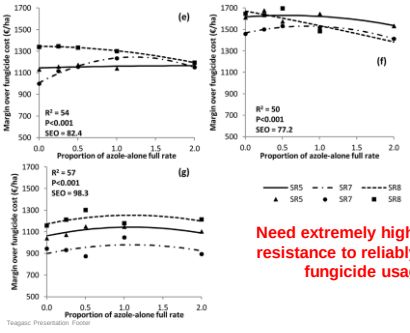
Improving varietal resistance

Majority of wheat grown in Ireland is moderately susceptible to STB



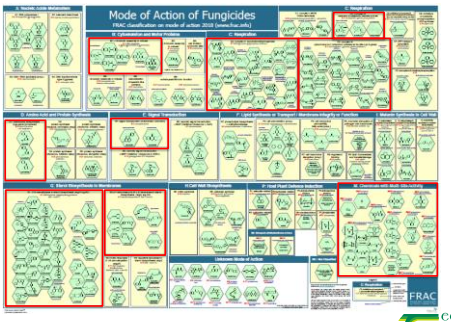
Based on annual STB rating x seed availability

Continued reliance on fungicides



Need extremely high varietal resistance to reliably reduce fungicide usage

We rely on diminishing number of actives



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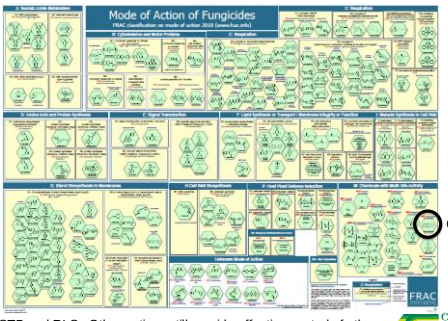
Even less providing effective control!*



*Based on STB and RLS. Other actives still provide effective control of other diseases such as net blotch, rust, etc.

What's driving these changes?

Usage = Resistance
Fungicides have a limited life span

Almost inevitable resistance will emerge

REGULATIONS

REGULATION (EC) No 1107/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC

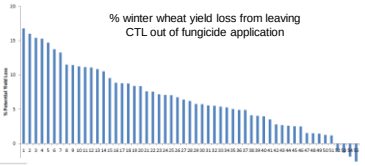
1107/2009 will have impacts – not really felt at farm level yet

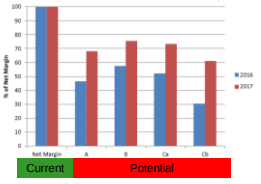
Impact of resistance!

Knockbeg 7th July 2017

Loss of CTL – potential problem?

- Direct comparisons 2016 & 2017
- Significant yield losses in absence of CTL
- -2.6 – 16.8% yield loss

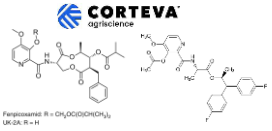




Even where fungicide programmes are adjusted (increased rates/alternative multi-sites), potential yield losses will impact net margins*

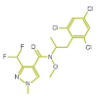
Future actives

CORTEVA agriscience



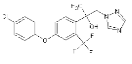
Inatreq™ (2020) **Adavelt™ (2024?)**

syngenta



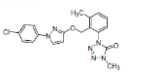
Adepidyn ™ (2022?)

BASF



Revysol® (2020)

BASF SUMITOMO CHEMICAL



Pavecto® (2022)

What's driving these changes?

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Almost inevitable resistance will emerge

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1107/2009 will have impacts – not really felt at farm level yet

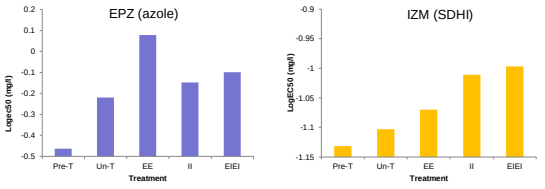
Delaying the inevitable is important

Usage = Resistance
Fungicides have a limited life span

Almost inevitable resistance will emerge

Extremely expensive to actually bring new molecules to farmers
=
Need to protect what we have

Mixing different MoA



Need to ensure each component equally effective

Extending the life of new modes of action (2017-2021)

Dooley et al. (2016) Pest Mang Sci

Optimising how we use them

Treatment combinations

Trt	Leaf 4	Leaf 3	Leaf 2	Leaf 1	Ear
1	+	+	+	+	+
2	+	+	+	-	+
3	+	+	-	+	+
4	+	+	-	-	+
5	+	-	+	+	+
6	+	-	+	-	+
7	+	-	-	+	+
8	+	-	-	-	+
9	-	+	+	+	+
10	-	+	+	-	+
11	-	+	-	+	+
12	-	+	-	-	+
13	-	-	+	+	+
14	-	-	+	-	+
15	-	-	-	+	+
16	-	-	-	-	+
17	-	-	-	-	-

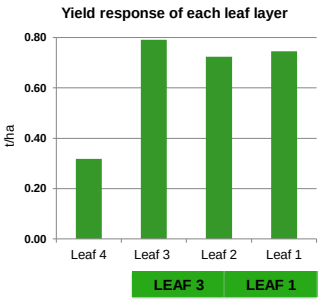
Objective

- What leaf layers important for yield?
- How best to achieve disease control on these leaves?

Methods

- 6 site seasons in 2016 & 2017
- Combinations of leaf applications
- 2016: CTL 1.0 l/ha
- 2017: Elatus Era 0.8 & CTL1.0 l/ha

Optimising application timing



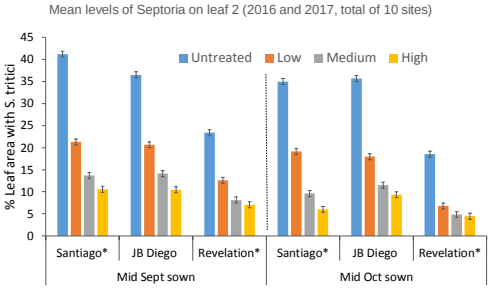
- Contribution of L1, 2 & 3 similar when in "programme"
- L4 showed lowest contribution
- Variation between sites due to infection events

Optimising agronomic practises (IPM)

Combining agronomy, variety and chemistry to maintain control of septoria tritici in wheat

- Three varieties with different Septoria susceptibility
- Two sowing dates
- Two seeding rates
- Four fungicide treatments:

We can used agronomy to our advantage



*Santiago = Cordiale
*Revelation = Rockefeller

Acknowledgements

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KT Staff (Advisors)