Rust management in the context of UK agronomy

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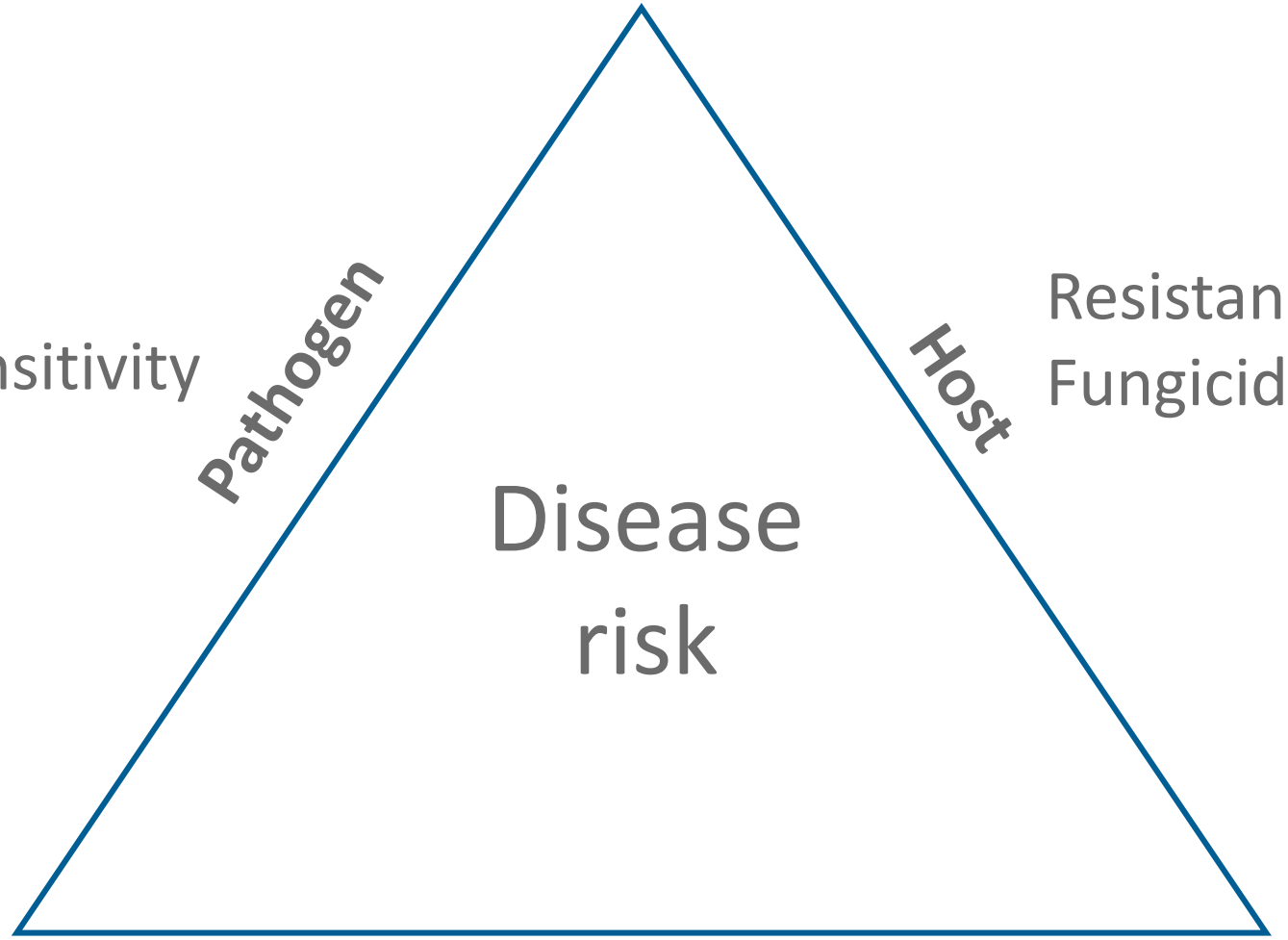
@allohexaploid @niabgroup

CEREALS & OILSEEDS

Virulence
Fungicide sensitivity



Resistance ratings
Fungicide requirements

Environment

Weather
Cultural controls
Attitude to risk

Factors affecting disease risk

Risk of the crop being exposed to infection

- Location
- Climate
- Previous crop
- Cultivation method
- Sowing date
- Variety choice (surrounding fields)

Ability of the crop to resist or tolerate infection

- Weather
- Variety choice (this field)
- Sowing date
- Nitrogen management / soil fertility
- Crop health

Prioritising according to risk

Drilling date and variety	Yellow rust 'watchlist' rating	Yellow rust RL resistance rating	Adjusting risk due to drilling date
Late-September sown KWS Extase	8*	8	-
Late-September sown Graham	7*	8	-
Mid-October sown Skyfall	3*	3	↑
Mid-October sown Crusoe	9*	9	↓
Late-October sown KWS Zyatt	4*	3	↑
Late-November sown LG Skyscraper	7*	7	↑
Late-November sown KWS Extase	8*	8	↑
Late-November sown Champion	8*	8	↑
Late-November sown Dawsum	9	9	↓

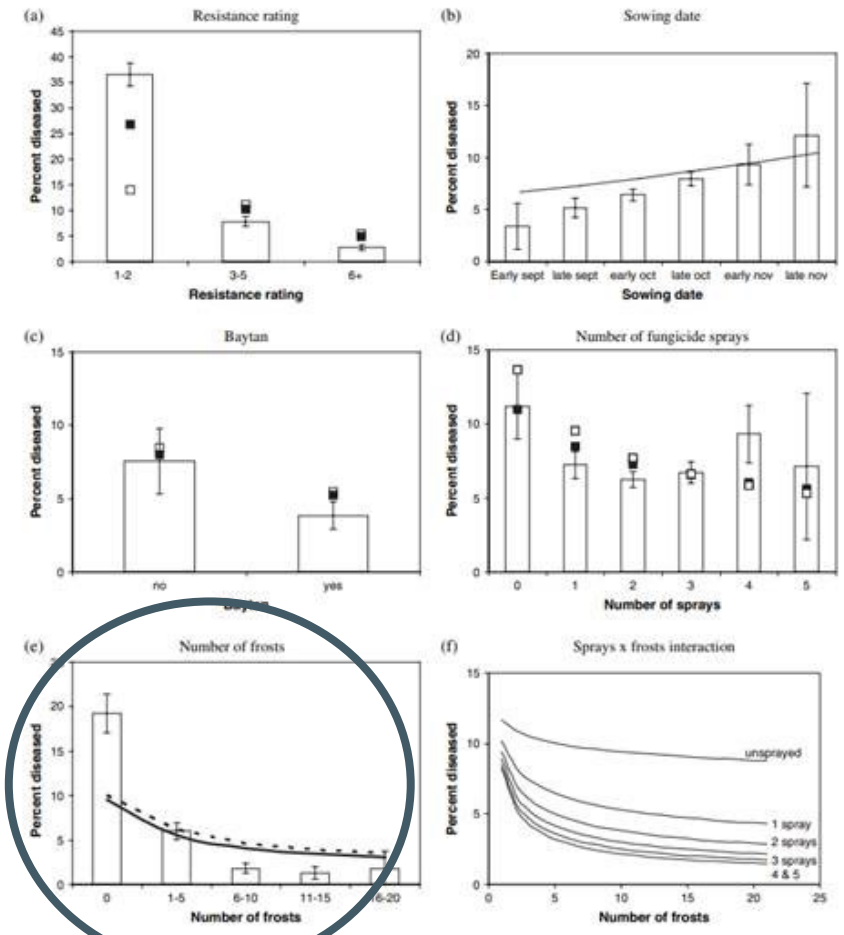
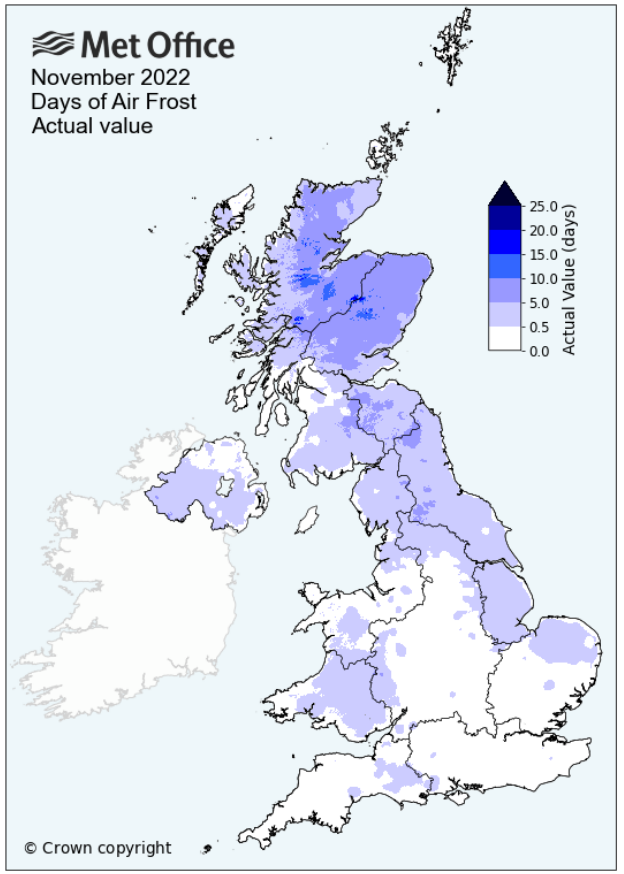
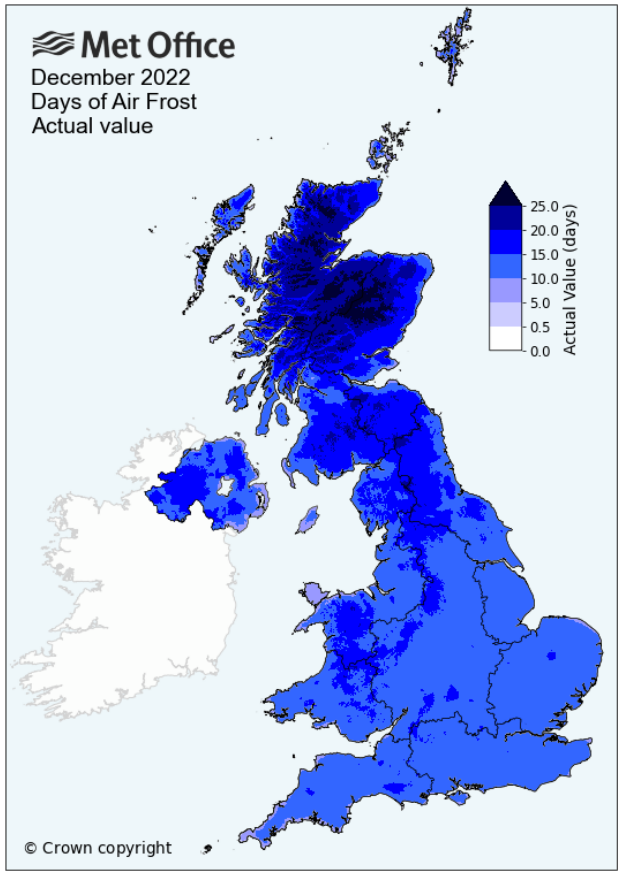


Figure 1 Observed and predicted values of disease incidence (percent crops affected) plotted for each of the fixed variables in the models. Bars show observed incidence plus approximate standard error. Predicted values are shown as solid lines or closed squares for Model 1, and as dashed lines or open squares for Model 2.





Weather effects

Wheat

Yellow rust

- Cold winters with several frosts below
- -5ºC reduce survival

Brown rust

- High temperatures in early summer
- Infection needs high humidity / leaf wetness

Mildew

- Warm, humid (but not wet) conditions

Barley

Yellow rust

- Cool, wet weather in spring before fungicides applied

Brown rust

- Warm, humid weather, ~ from April to June

Mildew

- Warm, breezy conditions with short periods of high humidity
- Temperatures >25ºC or rain inhibit disease

Agronomic impacts

Nitrogen

- Excessive nitrogen fertiliser / fertile sites favour mildew and to a lesser extent rusts

Micronutrients

- Several micronutrients (boron, copper and manganese) have a role within disease resistance in plants. For example, manganese deficiency increases mildew susceptibility

Trophic status of the pathogen

- Biotrophs thrive on living, healthy ‘well-fed plant’, necrotrophs (e.g. net blotch) thrive on stressed crops

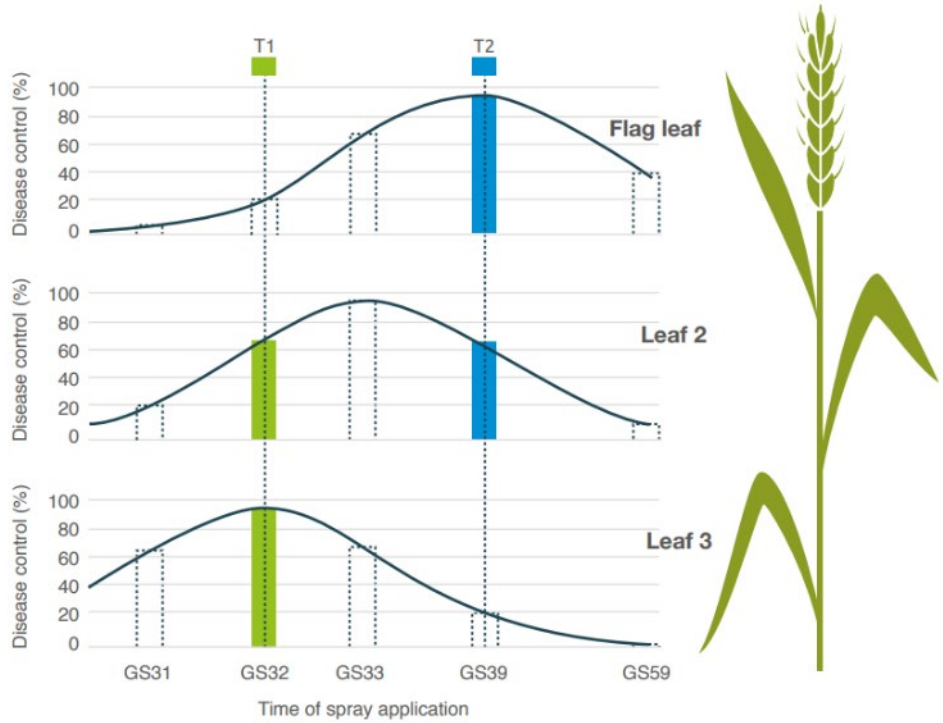
Fungicide timings

Latent periods

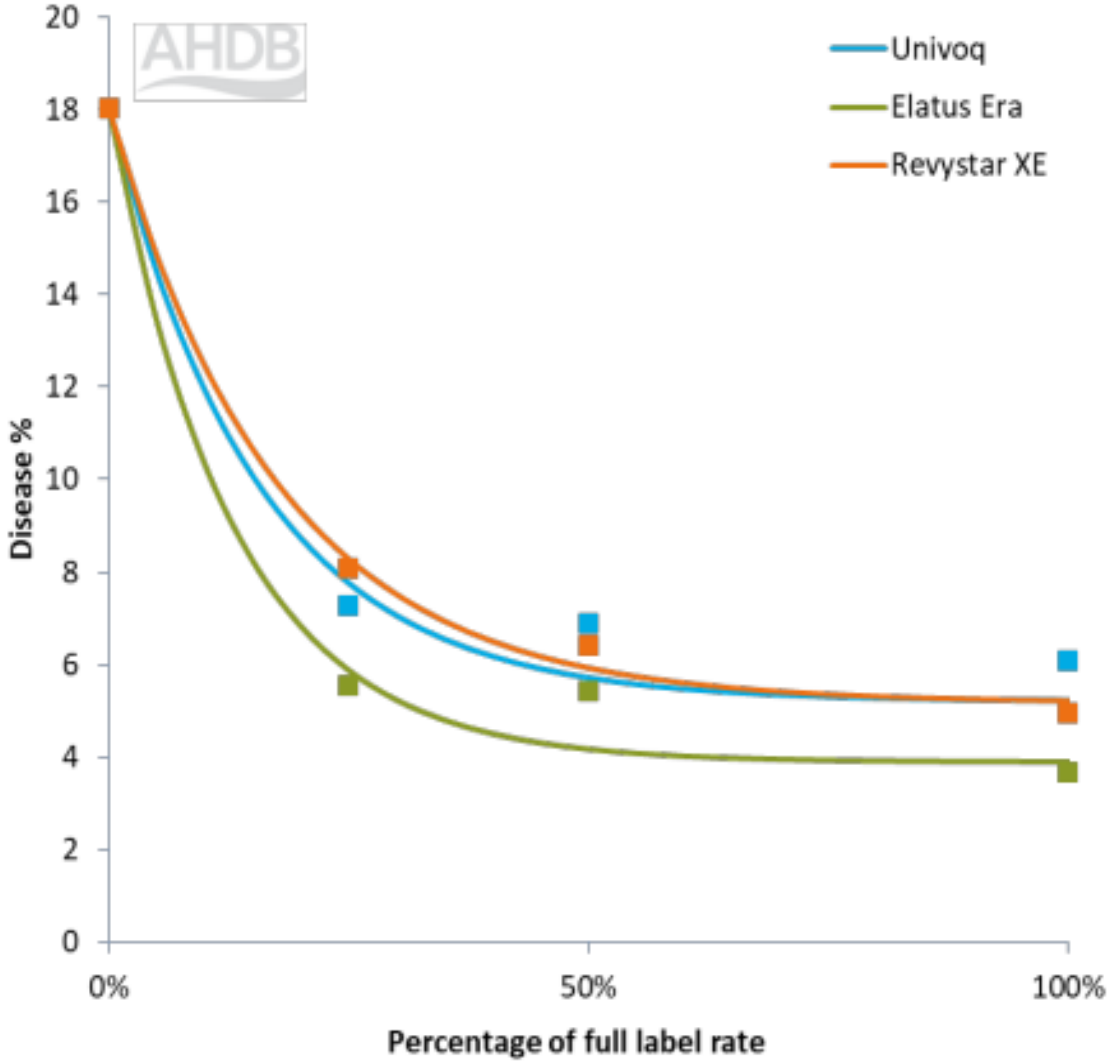
- Septoria 14–28 days. Up to 6 cycles in a season
- YR 10–12 days. Up to 12 cycles in a high-pressure season
- Brown rust and mildew 4–5 days
- Crops may be at risk at ‘T0’ or ‘T1.5’

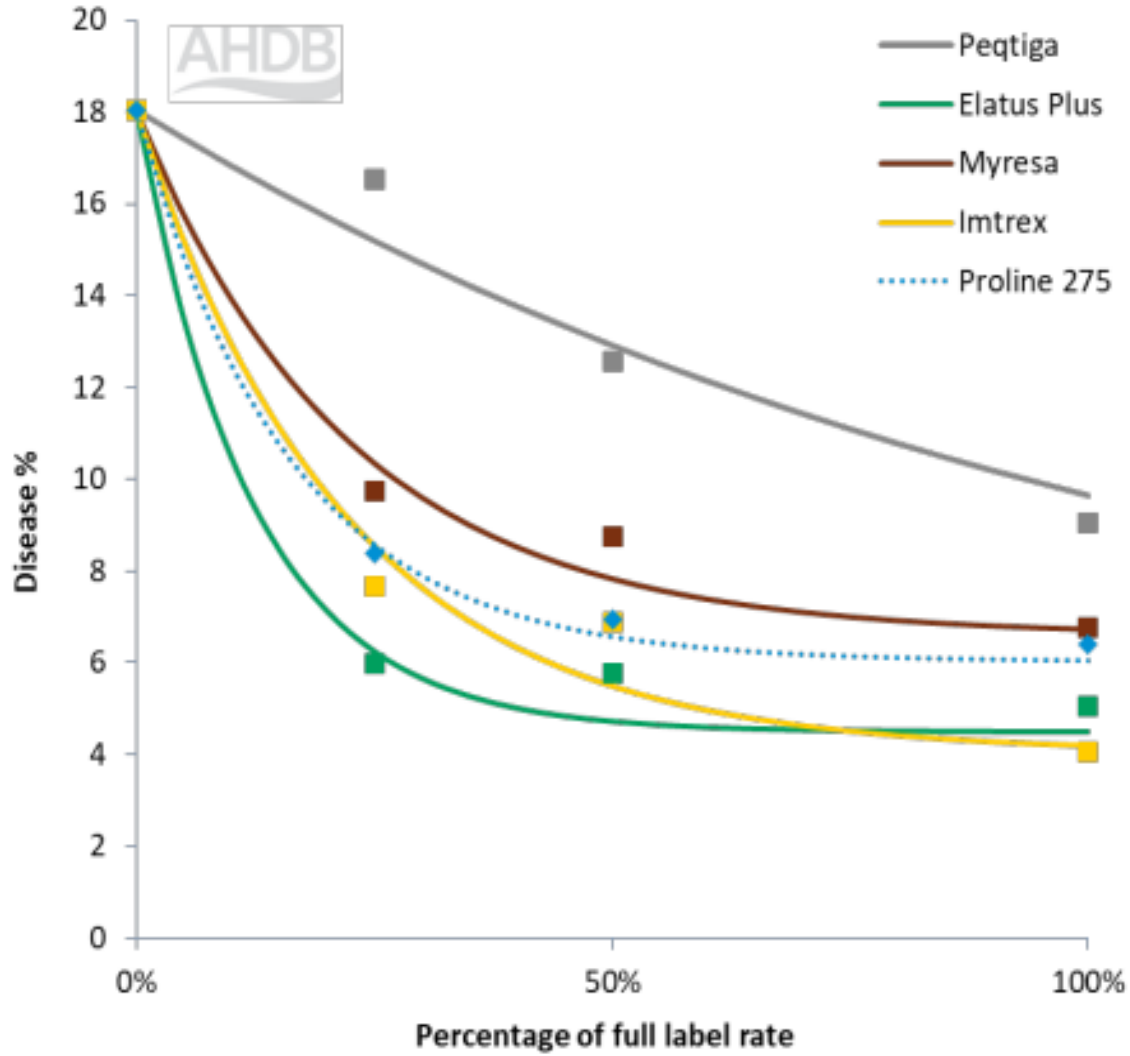
Treatment decisions must consider:

- Maximum number of applications per season
- Total dose
- Growth stage limitations
- Intervals between treatments
- Good FRAG compliance



Yellow rust 2020–22 (4 trials)





Product	Curative	Protectant	Persistence
Univoq	✓✓	✓✓	✓✓✓
Revystar XE	✓✓	✓✓	✓✓✓
Ascra Xpro	✓	✓✓	✓✓
Elatus Era	✓✓	✓✓✓	✓✓✓
Aviator			
Librax			
Triazole (older)	✓✓✓	✓✓✓	✓✓
Folpet/mancozeb		✓	✓

- For rusts, Elatus Era remains the most effective protectant and persistent product
- Tebuconazole remains the best eradicant

Further IPM approaches

- Variety mixtures to reduce or delay development of windborne diseases, especially in organic situations
- Intercropping, for example with legumes, can reduce disease pressure by dilution or acting as a physical barrier*
- Grazing?
- Where possible, these could contribute to an integrated approach

*Source: Zhang *et al.* 2019 European Journal of Plant Pathology

NIAB TAG Membership

KWS Zyatt untreated

KWS Zyatt full fungicide programme

KWS Zyatt in 4-way mix. Reduced-rate programme

KWS Zyatt in 4-way mixture. Untreated

IPM for yellow rust: assessing the risk

Risk of being exposed to infection and ability to resist infection

- Monitoring and surveillance tools
- Understanding the agronomic impacts of on-farm decisions
- Making good use of all the tools in the toolbox
  - Varieties (diversity *and* resistance ratings)
  - General agronomy matching situation to risk, no blueprint
  - Fungicide programmes – appropriate products at appropriate timings