world-class experience, skills and resources

DEVELOPING AN EARLY WARNING SYSTEM FOR WHEAT RUST

Three rust species infect wheat and are distributed globally:

Yellow (stripe) rust (*Puccinia striiformis* f.sp. *tritici*)	**Leaf (brown) rust** (*Puccinia triticina*)	**Stem (black) rust** *Puccinia graminis* f.sp. *tritic*)

These pathogens have a worldwide prevalence and potential for long distance spread. Invasions into new areas pose a serious threat to food security regionally and globally. NIAB is a partner in the European-wide RustWatch project, which is establishing a stakeholder driven early-warning system to improve preparedness and resilience to emerging rust diseases on wheat. Information gathered as part of the project includes:

Understanding pathogen biology and drivers

Figures 1 and 2 show the frequency distribution of yellow rust genetic groups. The Red Group [PstS10, Warrior(-)] has spread across Europe since 2013 and is the dominant genetic group across Europe.

Figure 1. Distribution of yellow rust genetic groups 2013-21

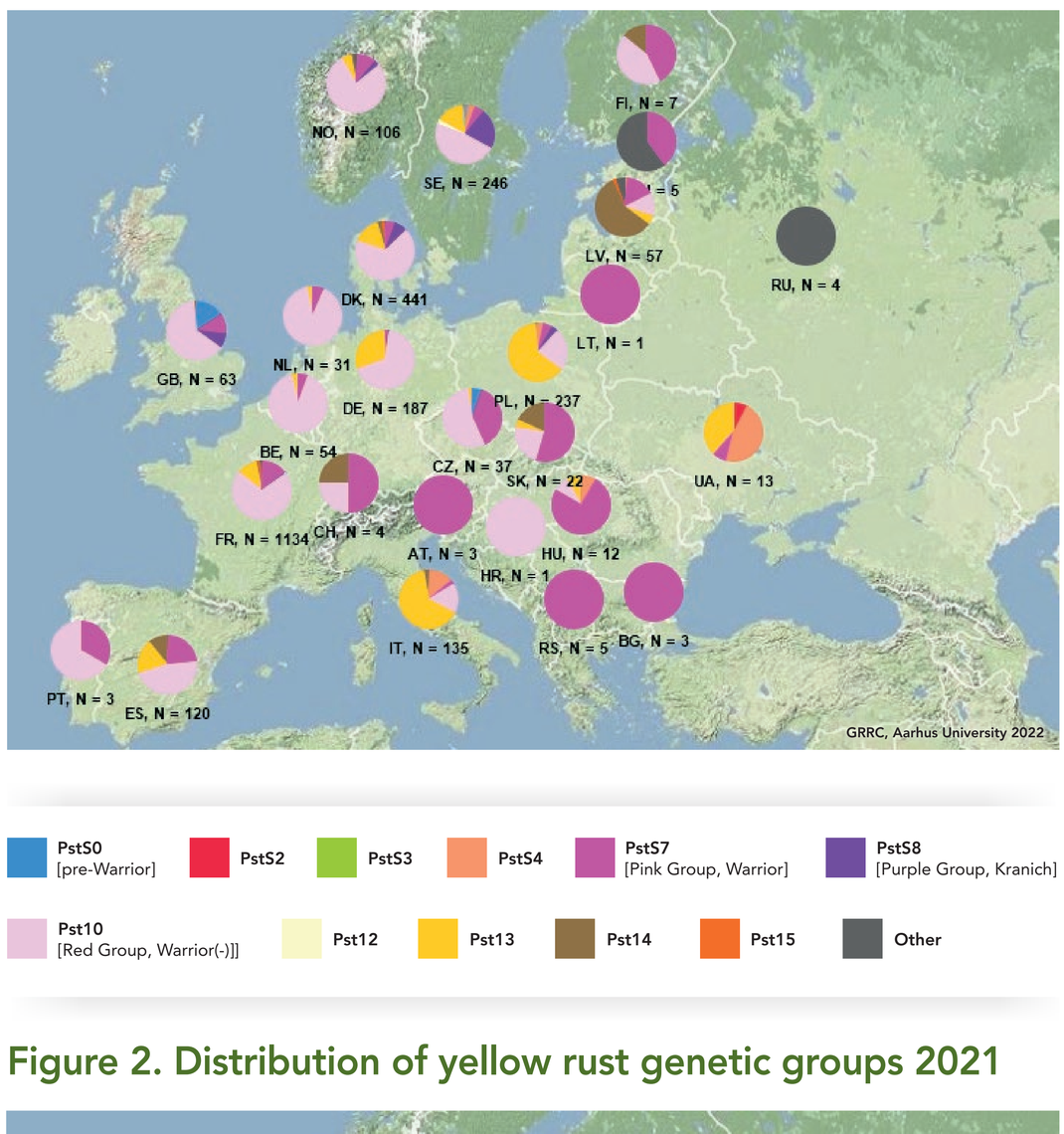
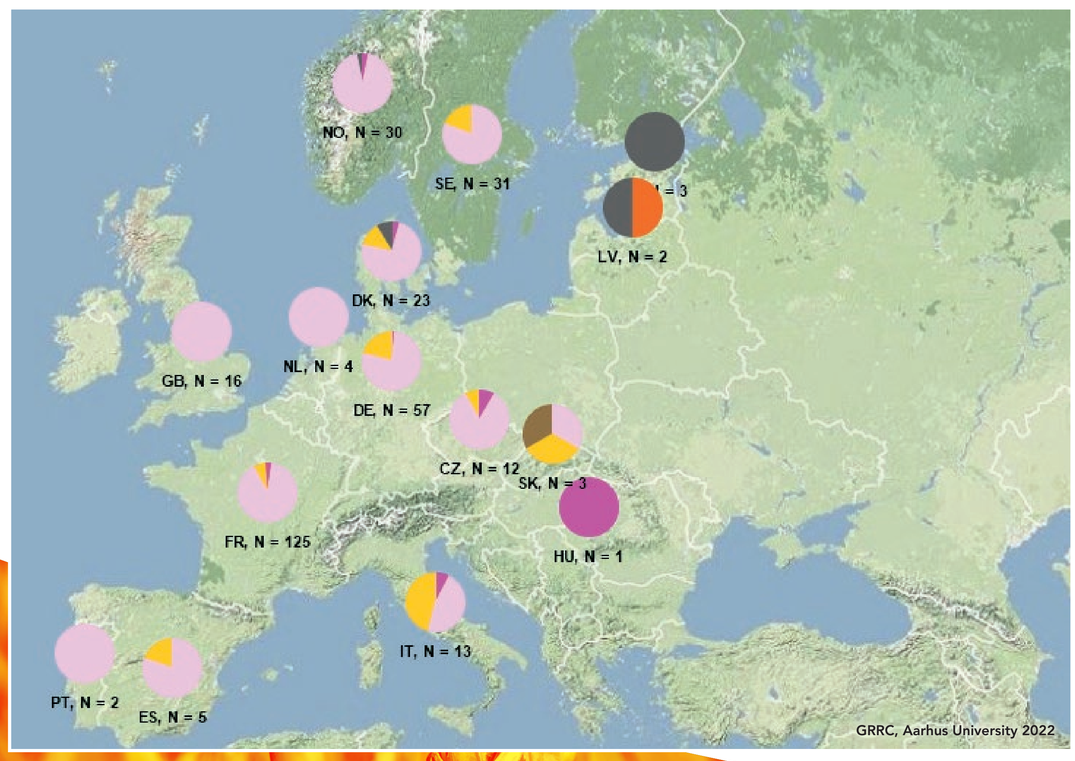


Figure 2. Distribution of yellow rust genetic groups 2021



Disease prevention by host resistance

Microscopy is used to distinguish initial adult plant resistance mechanisms involved in the pathogen-host interaction in around 240 wheat varieties.

Figure 3. Yellow rust elongating and infecting host cells

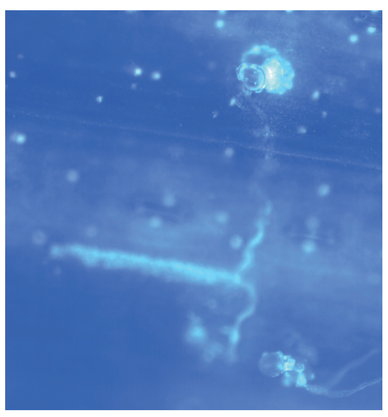
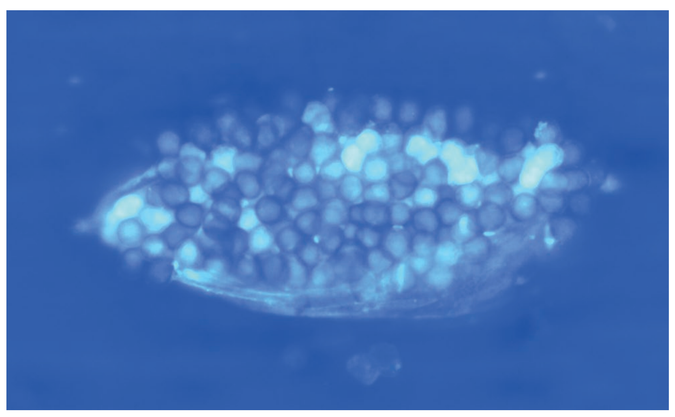


Figure 4. The formation of a yellow pustule



Stakeholder networks, shared facilities and case studies

Variety blends have been shown to reduce risk from yellow rust, with 22 trials over three years in Europe. 25% of the wheat area in Denmark was sown with blends in 2022. The next step will be to investigate whether pathogen populations evolve to be more complex on blends vs monoculture.

Figure 5. 2021 yellow rust scores (% infection) – NIAB, Cambridge

Variety	Untreated	Full fungicide programme	Reduced fungicide programme
Crusoe	0	0	0
KWS Zyatt	35	0	1
Skyfall	55	0.1	3
3-way blend	15	0.1	3

RUSTWATCH
WHEAT RUST EARLY WARNING

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773311. RustWatch engages 12 universities and research institutes, including NIAB, five agricultural advisory services and eight SMEs and industry organisations.