

October 2023



**United Kingdom Cereal Pathogen Virulence Survey  
(UKCPVS)  
wheat yellow rust and brown rust:  
review of the 2022-23 season**

Amelia Hubbard and Charlotte F. Nellist  
NIAB, 93 Lawrence Weaver Road, Cambridge CB3 0LE

While the Agriculture and Horticulture Development Board seeks to ensure that the information contained within this document is accurate at the time of printing, no warranty is given in respect thereof and, to the maximum extent permitted by law, the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

Reference herein to trade names and proprietary products without stating that they are protected does not imply that they may be regarded as unprotected and thus free for general use. No endorsement of named products is intended, nor is any criticism implied of other alternative, but unnamed, products.

AHDB Cereals & Oilseeds is a part of the Agriculture and Horticulture Development Board (AHDB).

# 1 Wheat rusts

In the 2022–23 season, UKCPVS received relatively few yellow rust and brown rust samples. A largely wet spring hampered rust development in many parts of the UK.

Samples are bulked before being used in tests or stored. A sample subset is used in seedling differential tests, with the typical target subset based on 25 samples (for yellow rust and brown rust).

These tests include wheat accessions with known resistance genes to reveal the virulence genes each pathotype possesses (the virulence profile). The tests also help UKCPVS identify interesting/representative pathotypes for further screening. Each pathotype is also referred to as an isolate.

In these tests, not all RL varieties and candidates are tested. Additionally, sample variety information is based on the samplers' information (UKCPVS does not verify variety data).

# 2 Wheat yellow rust

In 2023, infected yellow rust material covered:

- 92 samples (187)
- 21 counties (27)
- 37 varieties + 1 unknown (52 + 4 unknown)

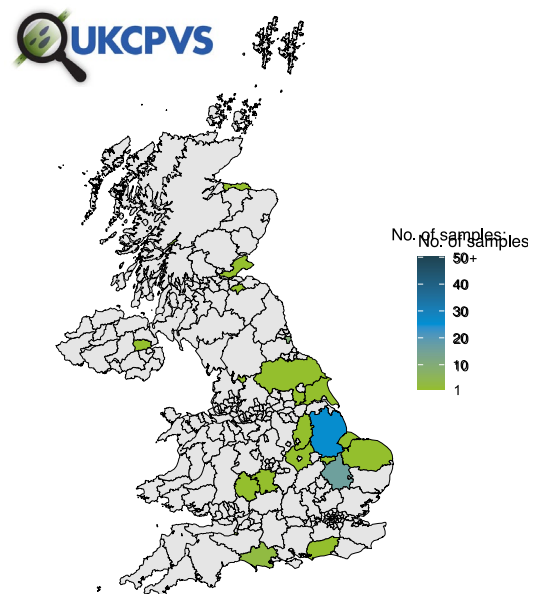
Most sampled variety = KWS Extase

2022 sample information is shown in brackets for comparison.

Due to the low number of brown rust samples, UKCPVS increased the number pathotyped for yellow rust in 2023 (from 25 to 36 isolates).

The wheat accessions used in the seedling differential tests were also streamlined (to remove duplicate resistance genes). This created capacity to screen a subset of RL varieties at this stage (based on UK area statistics and those associated with interesting results).

Yellow rust samples received up to 5th July 2023 2023  
Yellow rust samples received from the 2022 season



Most isolate x variety combinations showed resistance (R) at the seedling (young plant) stage (Table 1).

Table 1. Yellow rust isolate x variety combinations and resistance (R) and susceptibility (S) at the young plant stage

Isolate	Crusoe (9)	KWS Zealum (9)	LG Astronomer (9)	Mayflower (9)	Oxford (9)	RGT Saki (9)	Champion (8)	Graham (8)	KWS Extase (8)	Merit (8)	RGT Bairstow (8)	RGT Illustrious (8)	LG Illuminate (7)	LG Redwald (7)	Swallow (6)	Gleam (5)	SY Insitor (5)
23/001*	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	R	S
23/005	S	R	R	R	R	R	R	S	S	R	R	R	R	S	R	S	S
23/007	S	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S
23/008	S	R	R	R	R	R	R	S	S	R	R	R	R	S	R	R	S
23/011	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	R
23/015	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/021	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
23/022	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
23/023	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
23/026	S	R	R	R	R	R	R	S	S	R	R	S	R	R	R	R	R
23/027	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/030	R	R	R	R	R	R	R	R	R	S	S	R	S	R	R	R	R
23/031*	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
23/034	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
23/035	S	R	R	R	R	R	R	S	S	R	R	S	R	S	R	R	S
23/037	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
23/038	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/039	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/041	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/042	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/045	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/051	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
23/063	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	R	S
23/064	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/066	S	R	R	R	R	R	R	S	S	R	R	S	R	S	R	R	S
23/067	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
23/069	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
23/070	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
23/071	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/072	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/075	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	R
23/076	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
23/077	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
23/086*	S	S	R	R	R	R	R	S	S	R	R	S	R	S	R	S	S
23/089	S	S	R	R	R	R	R	R	S	R	R	R	R	R	R	S	R
23/092	R	S	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S

\* denotes a confirmed new pathotype. RL 2023/24 disease resistance ratings shown in brackets.

However, some combinations resulted in infection (S), including in varieties with high levels of adult plant stage resistance (RL 2023/24 ratings of either 8 or 9):

- Graham (30 isolates)
- RGT Illustrious (12 isolates)
- Crusoe (8 isolates)
- KWS Extase (8 isolates)
- KWS Zealum (3 isolates)
- Merit (1 isolate)
- RGT Bairstow (1 isolate)

The results reinforce previous findings that show the yellow rust population is extremely diverse. Three new pathotypes were also identified in 2023.

The survey also uses genetic information to determine the genetic group associated with each yellow rust isolate.

The red group continues to dominate samples – with 21/23 of samples in 2023 genotyped to this group. This group is extremely diverse, with a broad range of virulence profiles. The other two genotyped samples were from the pink and purple groups (which have been occasionally recorded at low levels over the past four years).

### 3 Wheat brown rust

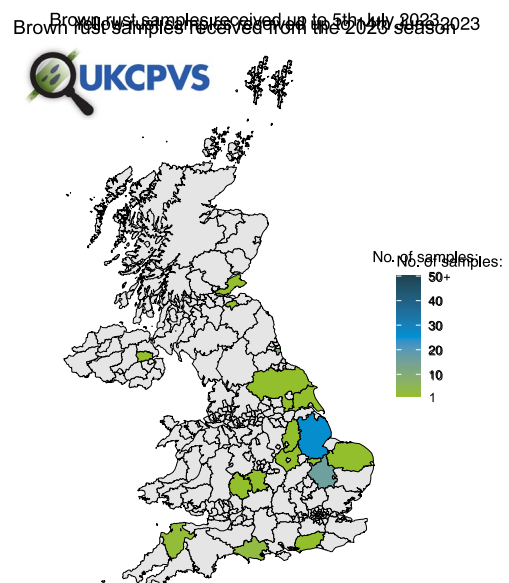
In 2023, infected brown rust material covered:

- 15 samples (28)
- 7 counties (8)
- 10 varieties (24)

Most sampled variety = Crusoe

2022 sample information is shown in brackets for comparison.

Eight out of 15 samples have been pathotyped (information for the other seven samples will be available later in the autumn). Brown rust samples are not genotyped.



The survey received three samples from Theodore, with high infection levels observed on this variety in Devon for a second consecutive year. Four isolates carry virulence to resistance gene *Lr24*. Three of these isolates infected Theodore and Warrior. Three isolates carry virulence to resistance gene *Lr28*.

All RL varieties tested were susceptible to three or more isolates (Table 2) at the young plant stage.

Table 2. Brown rust isolate x variety combinations and resistance (R) and susceptibility (S) at the young plant stage

Isolate	Skyfall (9)	Theodore (8)	Champion (8)	LG Astronomer (8)	KWS Dawson (7)	LG Prince (7)	Merit (7)	Cleam (6)	LG Illuminate (6)	LG Typhoon (6)	RGT Bairstow (6)	RGT Saki (6)	Costello (5)	KWS Brium (5)	KWS Palladium (5)	Swallow (5)	KWS Guium (3)
23/001	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
23/002	R	R	R	R	S	R	R	S	R	R	R	S	S	S	S	R	S
23/003	S	S	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
23/004	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
23/006	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
23/008	S	R	S	R	S	R	R	S	R	R	R	R	S	S	S	R	S
23/009	R	S	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
23/011	S	S	S	R	S	R	R	S	R	R	R	R	S	S	S	S	S

RL 2023/24 disease resistance ratings shown in brackets.

## 4 Further information

The UKCPVS 2023 annual report will include further information, including results from tests on the full panel of RL varieties and candidates at the young plant stage (based on five isolates).