UKCPVS Stakeholder Event 2024

UKCPVS Reports from the 2023 Season

January 2024

CEREALS & OILSEEDS

UKCPVS Stakeholders Meeting 2024

- Introduction – *Charlotte Nellist* (Project Leader)
- Data from 2023 – *Amelia Hubbard*
  - Wheat Yellow Rust (and questions)
  - Wheat Brown Rust (and questions)
- Improvements/Plans for 2024 – *Charlotte Nellist*
- Sampling in 2024 – *Charlotte Nellist*
- Take Home Messages – *Charlotte Nellist*

- Questions – *Charlotte Nellist/Amelia Hubbard*

About the Survey

- UKCPVS – **UK Cereal Pathogen Virulence Survey**, established in 1967 following an outbreak of yellow rust on the previously resistant variety Rothwell Perdix
  - *Aims to identify changes in pathogen populations and detect new races that may have an adverse effect on cereal production in the UK*
- Farmers, agronomists, trials staff, breeders and researchers send in infected leaf samples
- Funded by AHDB and APHA

AHDB

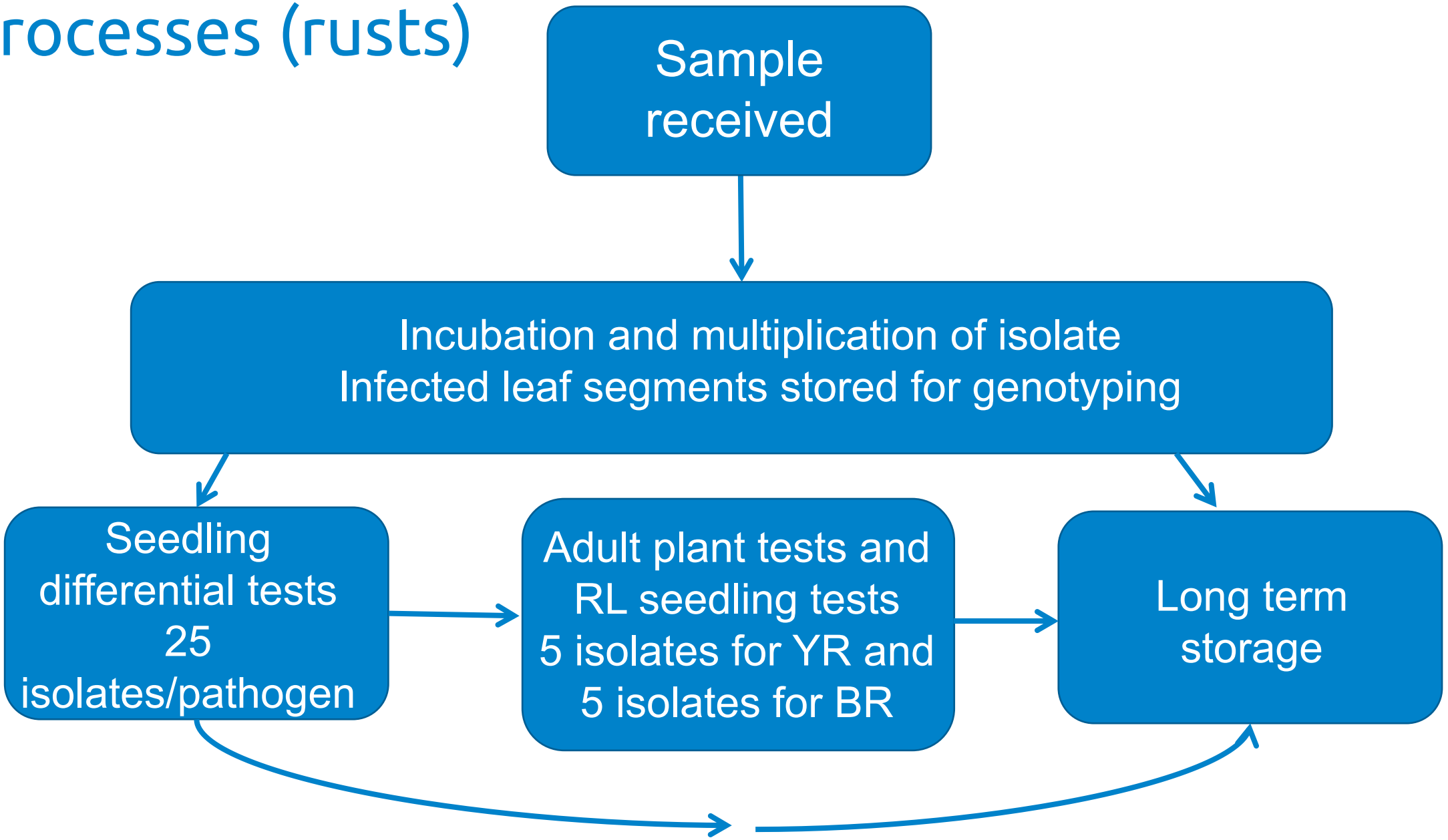
Animal & Plant Health Agency

UKCPVS – Pathogens Surveyed in 2023

Puccinia striiformis f.sp. *tritici* (*Pst*), also known as wheat yellow rust or stripe rust

Puccinia triticina, also known as wheat brown rust or leaf rust

Processes (rusts)



Seedling Differential Tests

WYR Differential Cultivar	Resistance Gene
Chinese 166	*Yr1*
Kalyansona	*Yr2*
Vilmorin 23	*Yr3+*
Hybrid 46	*Yr4*
Heines Kolben	*Yr2, Yr6*
Avocet x Yr7	*Yr7*
Compair	*Yr8*
Kavkaz x 4 Fed	*Yr9*
Avocet xYr15	*Yr15*
Avocet x Yr17	*Yr17*
Carstens V	*Yr32*

virulence profile = pathotype

Lists the virulence genes the isolate carries and any additional test cultivars infected at seedling stage

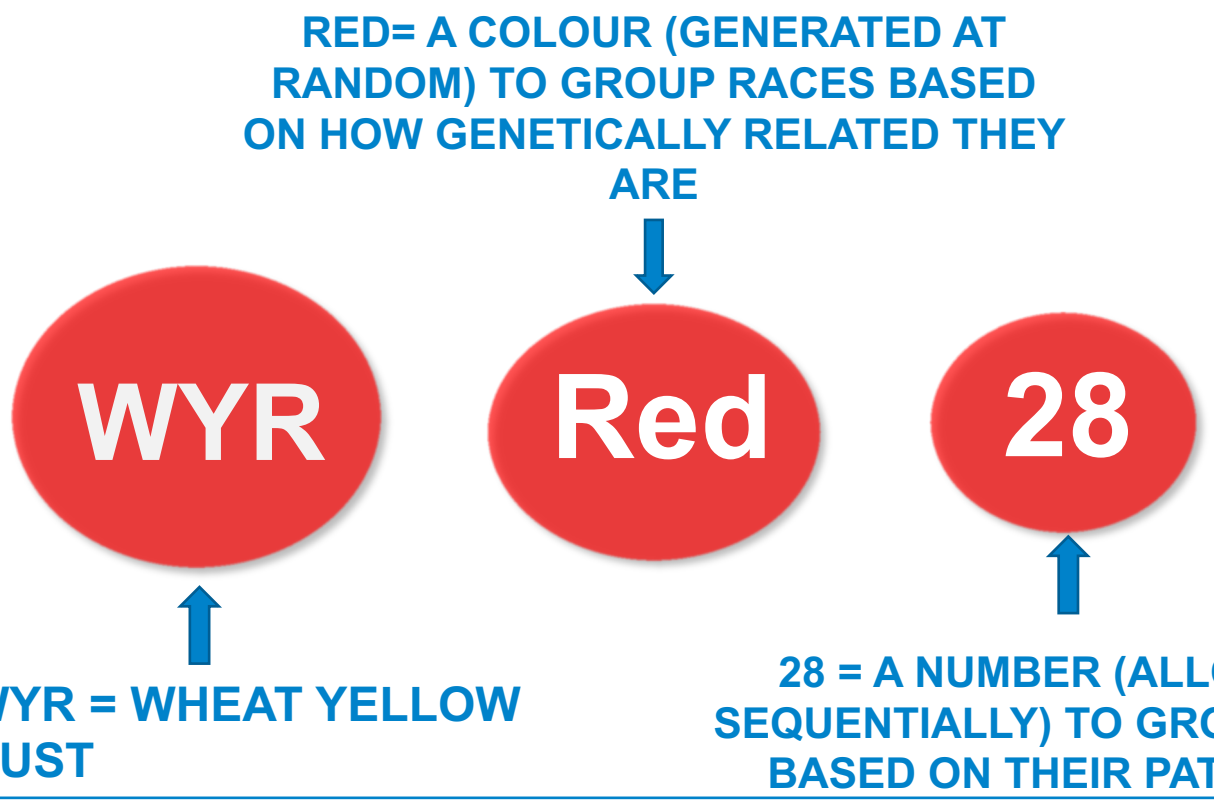
1,2,3,4,6,7,9,17,25,32,Re,Sp,Ro,So,Ca,Ap

Virulence genes

Additional cultivars

WYR Race Naming System: Colours and Numbers

How to decode the race naming system



→ Red 28 isolates have the pathotype 1,2,3,4,6,7,9,17,25,32,Re,Sp,Ro,So,Ca,St,Ap,Ev

UKCPVS Pipeline - YR & BR

Samples Received

Reviving and bulking isolates

25 isolates

Differential Seedling Tests
Growth room

Determines pathotype of isolate on characterised and uncharacterised resistances (differentials), choose interesting/representative pathotypes for further screening

5 isolates

RL + Candidates Seedling Tests
Growth room

RL Young Plant Rating

RL + Candidates Adult Plant Trials
Field

Used to validate the Watch List

Summer 2022 | **Autumn 2022** | **Spring of 2023** | **Summer of 2023**

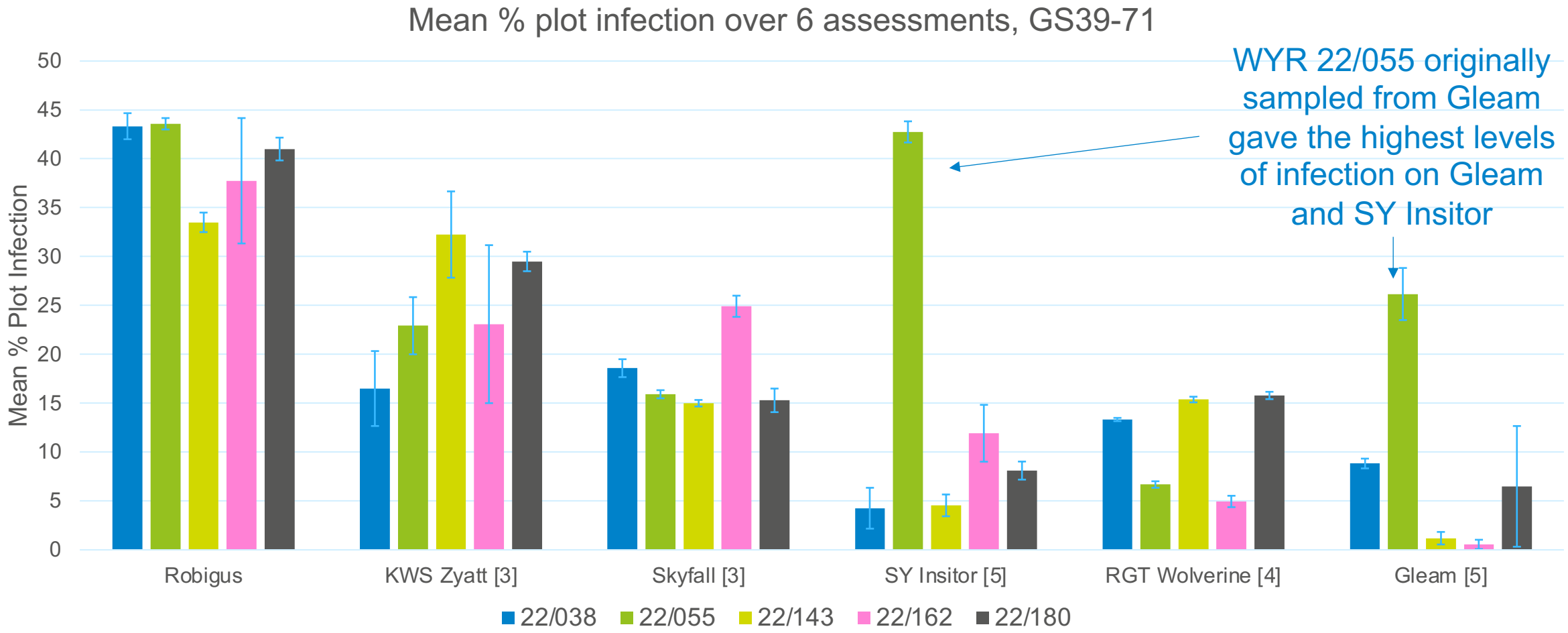
Wheat Yellow Rust

Amelia Hubbard

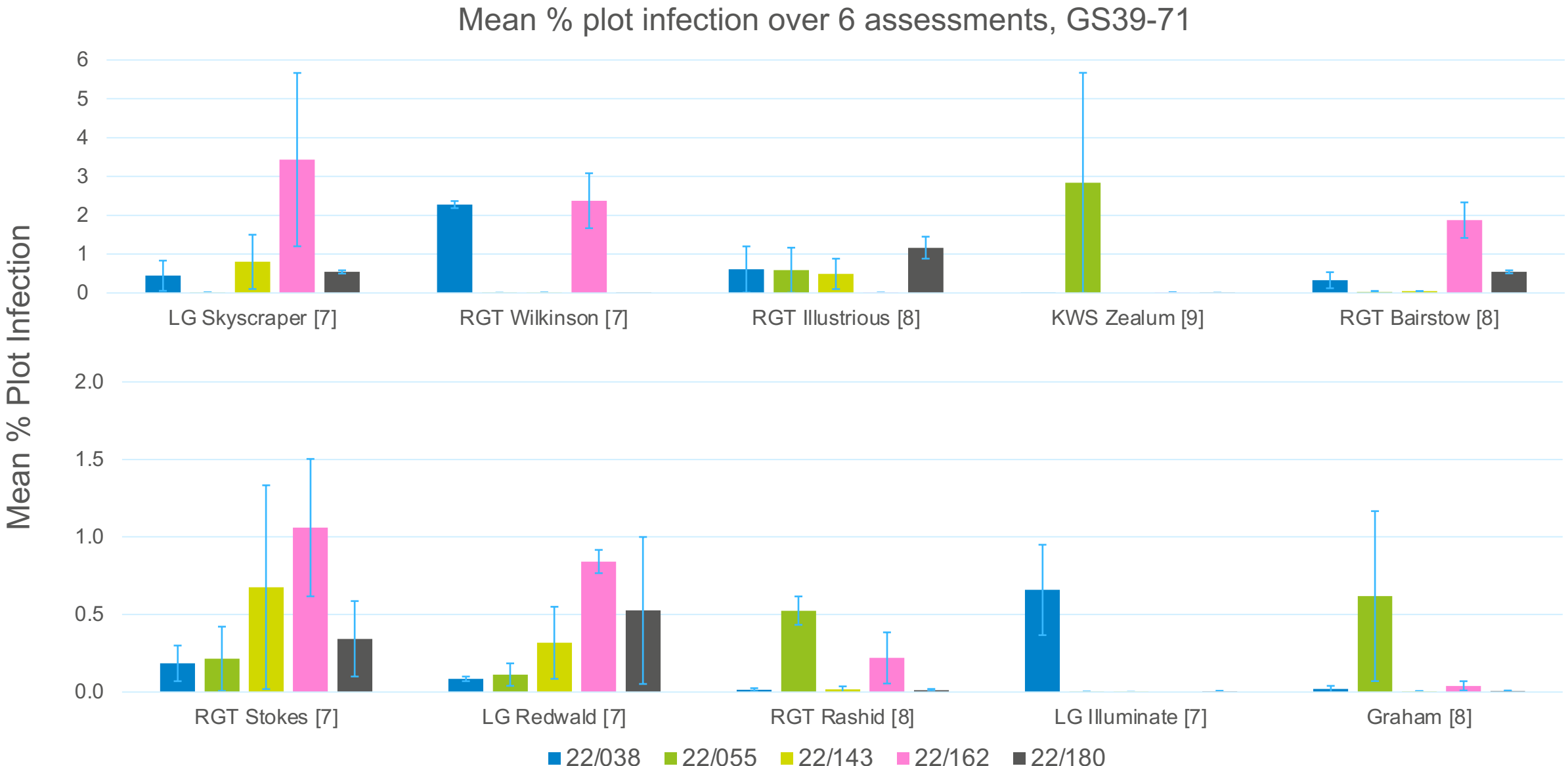
Wheat Yellow Rust - Adult Plant Trials 2023

Isolate	Location	Host Variety	Pathotype
22/038	Norfolk	Costello	1,2,3,4,6,7,9,17,25,32,Re,Sp,Ro,So,Wa,St,Ap,Ev
22/055	Devon	Gleam	1,2,3,4,6,7,9,17,25,32,Sp,Ro,So
22/143	Norfolk	Mayflower	1,2,3,6,7,9,17,25,(32),Sp,Ro,So,Ca,St,Ap
22/162	Lincs	KWS Siskin	1,2,3,4,6,7,9,17,25,32,Re,Sp,Ro,So,Wa,Ca,St,Kr,Ap,Cr
22/180	Cambs	Theodore	1,2,3,4,6,7,9,17,25,32,Re,Sp,Ro,So,Wa,Ca,St,Ap

WYR Adult Plant Trials



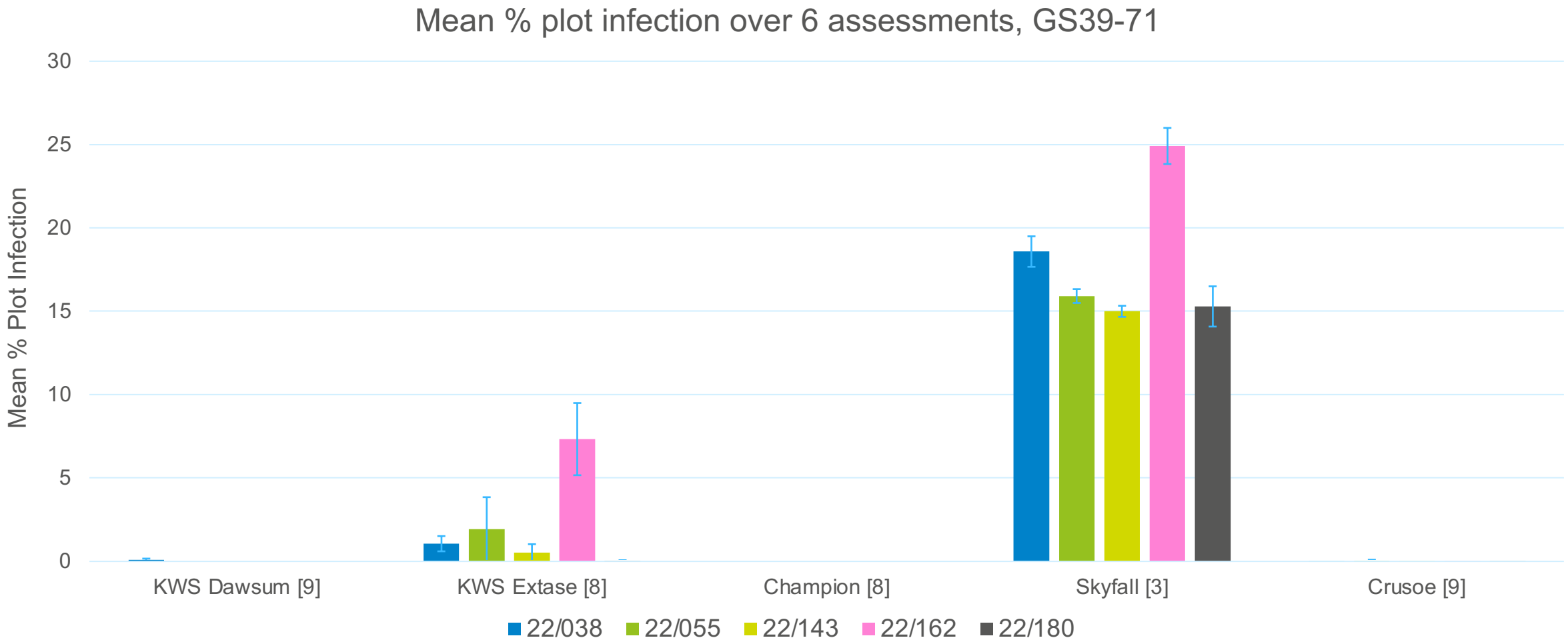
WYR Adult Plant Trials



Top 5 Most Widely Grown Varieties

Winter Wheat (United Kingdom) Weights Certified 2023	
Variety Name	**%**
KWS Dawsum	19.6
KWS Extase	14.7
Champion	8.9
Skyfall	6.5
Crusoe	6.2

WYR



WYR Adult Plant Trials

Resistant to all five isolates at AP stage (excluding candidates)
0.0% over 6 assessments

Champion [8]	LG Astronomer [9]
Costello [9]	LG Prince [8]
KWS Bruim [9]	LG Typhoon [9]
KWS Cranium [9]	Mayflower [9]
KWS Guium [9]	Merit [8]
KWS Palladium [9]	Oxford [9]
KWS Ultimatum [9]	RGT Saki [9]


October 2023

AHDB
CEREALS & OILSEEDS

United Kingdom Cereal Pathogen Virulence Survey
2023 Annual Report

Amelia Hubbard and Charlotte F. Nellist

NIAB, 93 Lawrence Weaver Road, Cambridge, CB3 0LE

Full results in 2023 UKCPVS Annual Report

RL Candidates- How did they perform?

(in terms of their YR resistance)

AHDB 2023 RL Candidates	Previous/ proposed name	Variety ID	YR rating, harvest 2023	WYR Individual Isolate AP trial Mean % Plot Infection				
				22/038	22/055	22/143	22/162	22/180
Selected as potential bread-making varieties								
LG Partridge	LGWU177	3120	-	11.80	6.50	7.50	6.50	0.30
SY Cheer	SY120623	3134	8	0.00	0.00	0.00	0.20	0.00
KWS Dragum	KWSW411	3147	9	0.00	0.00	0.00	0.00	0.00
Selected as potential biscuit-making varieties								
Bamford	EW8768	3099	8	0.30	0.00	0.00	0.00	0.00
Almara	SEWC148	3111	8	0.10	0.00	0.00	0.00	0.00
LG Grendel	LGWU186	3129	9	0.00	0.00	0.00	0.00	0.00
LG Arkle	LGWU188	3131	9	0.00	0.00	0.00	0.00	0.00
KWS Skateum	KWSW422	3158	-	0.00	0.00	0.00	0.00	0.00
Selected as potential feed varieties								
Blackstone	EW81055	3106	9	0.00	0.00	0.00	0.00	0.00
LG Beowulf	LGWU182	3125	9	0.00	0.00	0.00	0.00	0.30

Take Home Messages - WYR Adult Plant Trials

- Most susceptible RL variety in trials was KWS Zyatt [3]
- KWS Zealum [9] saw infection in one trial by the end of the season
- KWS Dawsum [9] – most widely grown variety – was resistant (just a hint of YR with WYR 22/038)
- Many of the RL and RL candidates were resistant to all five isolates
- Candidates that have been added to the Recommended List for 2024/25 performed well in our trials

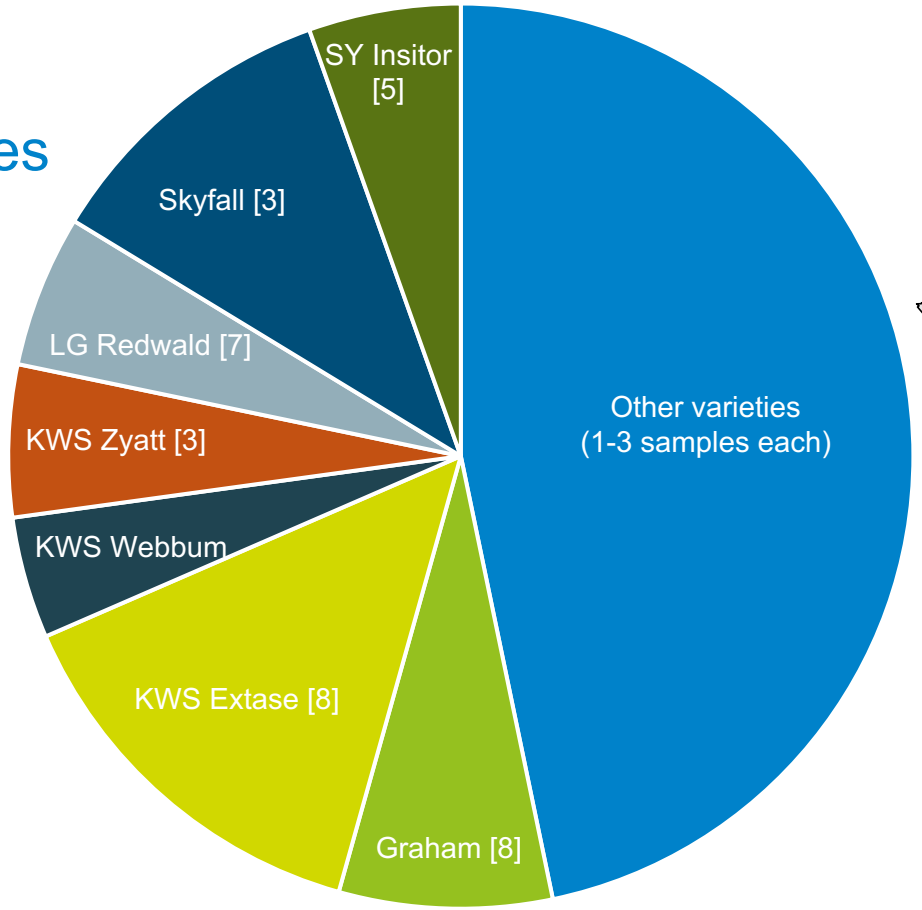
2023 WYR Samples Received

✓92 samples

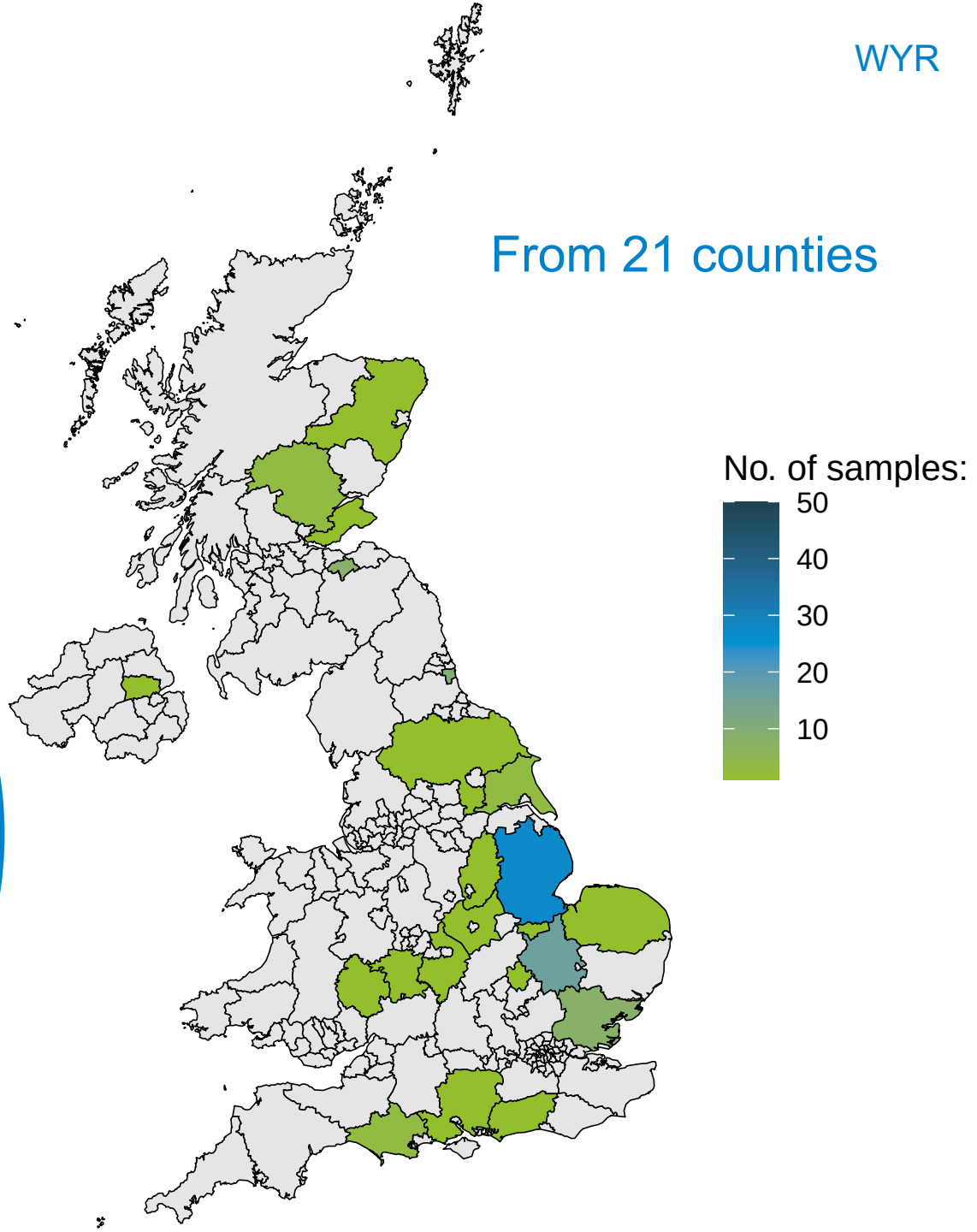
- Weather not conducive to rust development in 2023

From 37 varieties

- + 1 unknown



From 21 counties



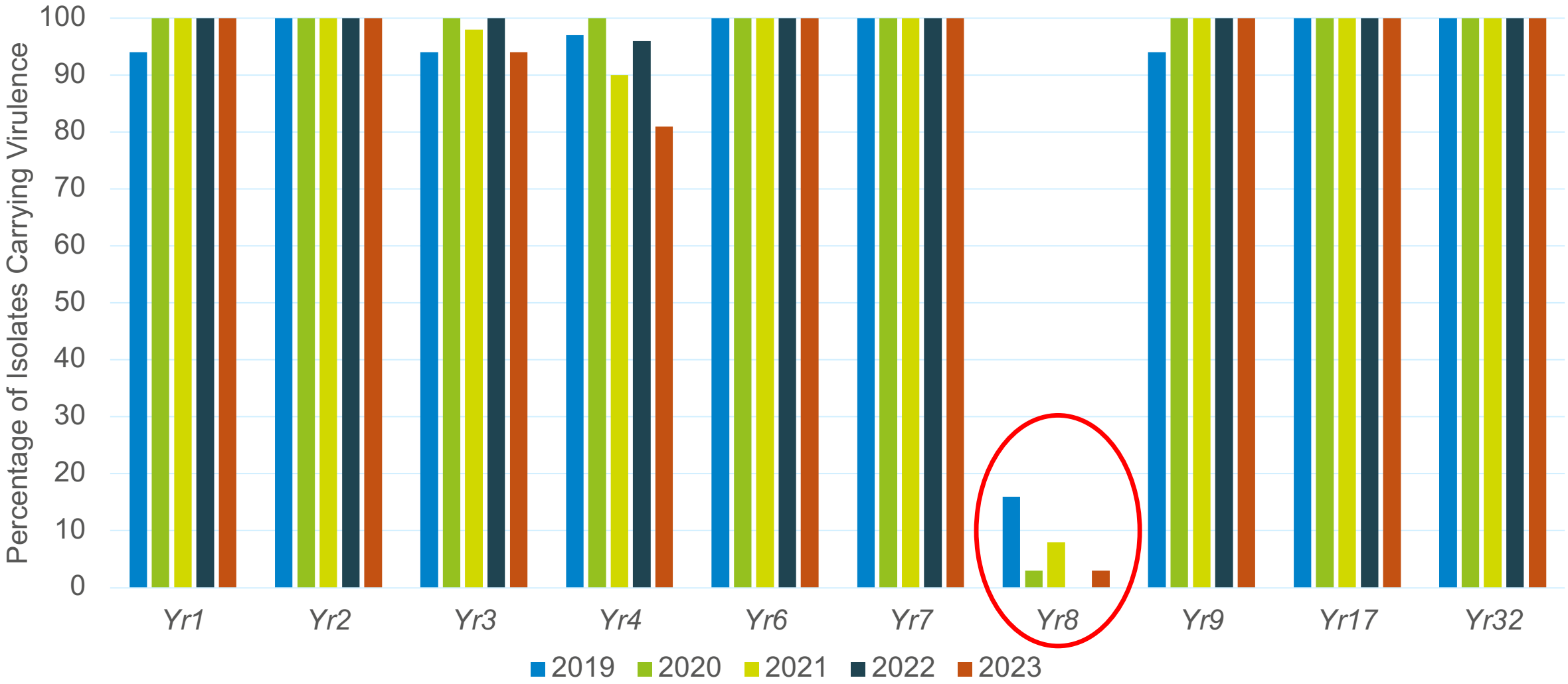
WYR Seedling Differential Tests

- 36 isolates selected for seedling differential tests based on host variety, location, any interesting notes that accompanied the sample and % area grown of the host

Isolate code	Host variety	Location
23-001	KWS Zyatt	Lincolnshire
23-005	KWS Extase	Lincolnshire
23-007	KWS Extase	East Yorkshire
23-008	KWS Extase	West Sussex
23-011	Bamford	Tyne and Wear
23-015	Graham	Tyne and Wear
23-021	Skyfall	Cambridgeshire
23-022	KWS Dawsum	Lincolnshire
23-023	LG Redwald	Cambridgeshire
23-026	Crusoe	Cambridgeshire
23-027	Skyfall	Cambridgeshire
23-030	LG Astronomer	Nottinghamshire
23-031	KWS Dawsum	Herefordshire
23-034	KWS Extase	Worcestershire
23-035	Crusoe	Lincolnshire
23-037	LG Redwald	Fife
23-038	Graham	Norfolk
23-039	Graham	Cambridgeshire

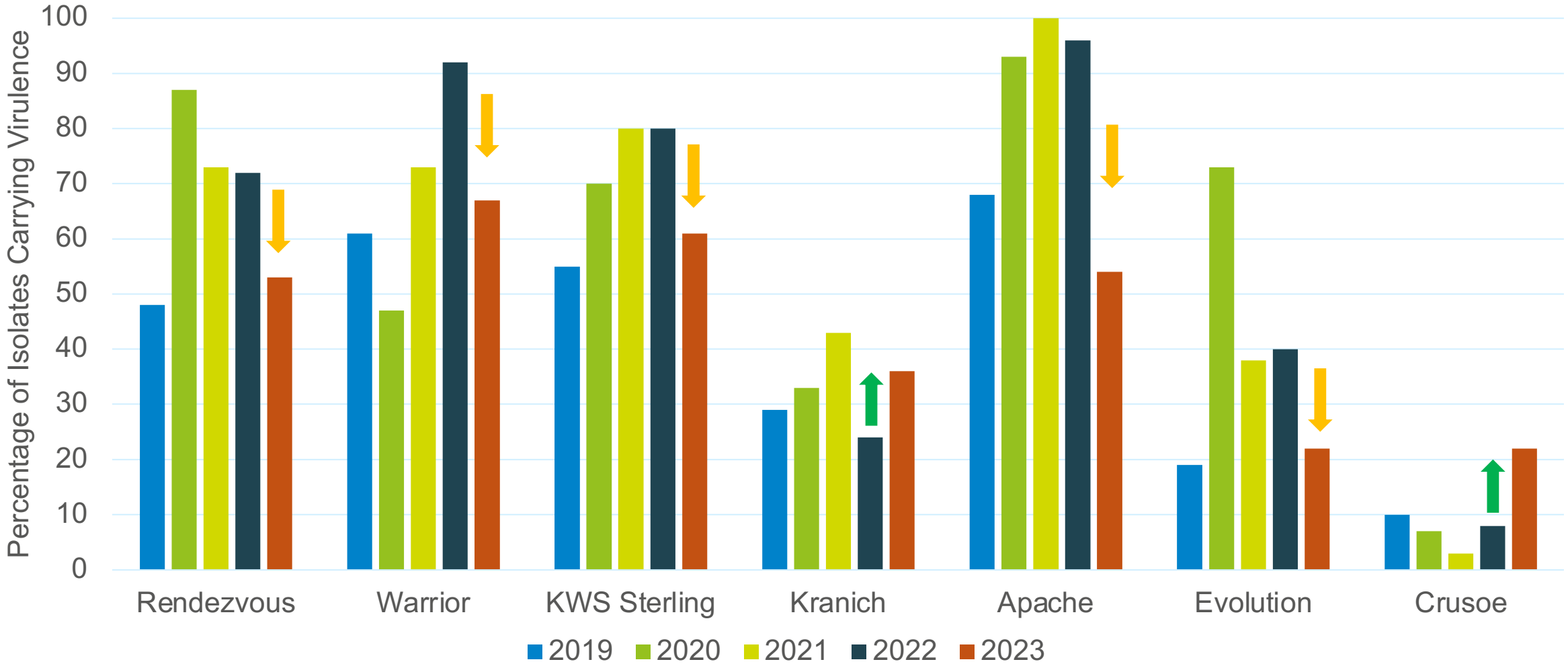
Isolate code	Host variety	Location
23-041	Gleam	Dorset
23-042	Graham	Dorset
23-045	LG Typhoon	Lincolnshire
23-051	RGT Wilkinson	Lincolnshire
23-063	Mayflower	Lincolnshire
23-064	LG Redrum	Cambridgeshire
23-066	LG Skyscraper	Cambridgeshire
23-067	SY Insitor	Midlothian
23-069	KWS Zyatt	East Yorkshire
23-070	SY Insitor	Hampshire
23-071	Gleam	Perthshire
23-072	Graham	Perthshire
23-075	Skyfall	Lincolnshire
23-076	Skyfall	Bedfordshire
23-077	Paragon	Essex
23-086	KWS Brium	Midlothian
23-089	KWS Extase	Midlothian
23-092	LG Astronomer	Midlothian

2023 WYR Seedling Differential Tests – *Yr* genes



No virulence detected for *Yr5, Yr10, Yr15* and *Yr24*

2023 WYR Seedling Differential Tests – additional cultivars



WYR Pathotypes Found in 2023

Genetic Group	Common Pathotypes	% Frequency
Red	1,2,3,4,6,7,9,17,32,Sp,Wa	14
Red or Pink	1,2,3,4,6,7,9,17,32,Re,Sp,Wa,St,Kr,Ap,Cr	14

Genetic Group	New Pathotypes	% Frequency
Not classified	1,2,3,6,7,8,9,17,32,Re,Sp,St	3
Red	1,2,3,4,6,7,9,17,32,Re,Sp,Wa,St,Kr,Cr	3
Purple	1,2,3,4,6,7,9,17,32,Re,Sp,Wa,St,Kr,Ap,Cr,Ev	3 or 6
Red	1,2,6,7,9,17,32,Sp	6

2023 WYR Seedling Tests – RL subset

- ✓ Tested 36 isolates on a subset of RL varieties
- Highlights the diversity in the UK's YR population
- 83% isolates infected Graham [8]
- 22% infected Crusoe [9] and KWS Extase [8]
- 8% infected KWS Zealum [9]
- 3% infected Merit [8], RGT Bairstow [8] and LG Illuminate [7] – isolate genotyped as Red
- Swallow resistant to all 36 isolates despite its moderate disease rating [6]
- https://ahdb.org.uk/news/early-yellow-rust-data-highlights-pathogen-diversity

VARIETY	Costello	Crusoe	KWs Cranium	KWS Dawsum	KWS Palladium	KWS Siskin	KWS Zealum	LG Astronomer	LG Typhoon	Mayflower	Oxford	RGT Saki	Champion	Graham	KWS Extase	Merit	RGT Bairstow	RGT Illustrious	LG Illuminate	LG Redwald	Swallow	Gleam	SY Insitor
2023 RL RATING / ISOLATE	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8	8	7	7	6	5	5
WYR23/001	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	R	S
WYR23/005	R	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	S	R	S	S
WYR23/007	R	S	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S
WYR23/008	R	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	S	R	R	S
WYR23/011	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	R
WYR23/015	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/021	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
WYR23/022	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
WYR23/023	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
WYR23/026	R	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	R	R	R	R	R
WYR23/027	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/030	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	R	S	R	R	R	R
WYR23/031	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
WYR23/034	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
WYR23/035	R	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	R	S	R	R	S
WYR23/037	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
WYR23/038	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/039	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/041	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/042	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/045	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/051	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
WYR23/063	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	R	S
WYR23/064	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/066	R	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	R	S	R	R	S
WYR23/067	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
WYR23/069	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S
WYR23/070	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S
WYR23/071	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/072	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/075	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	R
WYR23/076	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
WYR23/077	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	S	S
WYR23/086	R	S	R	R	R	R	S	R	R	R	R	R	R	S	S	R	R	S	R	S	R	S	S
WYR23/089	R	S	R	R	R	R	S	R	R	R	R	R	R	R	S	R	R	R	R	R	R	S	R
WYR23/092	R	S	R	R	R	R	S	R	R	R	R	R	R	S	R	R	R	S	R	S	R	S	S

How UKCPVS results feed into RL

- Data from UKCPVS now included in “Yellow rust (young plant)” data – r or s

AHDB RECOMMENDEDLISTS

Winter wheat 2024/25

AHDB RECOMMENDED

	KWS Zyatt	SY Cheer	Skyfall	Crusoe	RGT Illustrious	KWS Extase	KWS Ultimatum	KWS Palladium	Mayflower	Bamford	RGT Wilkinson	KWS Brium	RGT Rashid	Almara
End-use group	UKFM Group 1					UKFM Group 2				UKFM Group 3				
Scope of recommendation	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	E	N
Variety status		NEW	C			C				NEW		•		NEW
Fungicide-treated grain yield (% treated control)														
United Kingdom (11.0 t/ha)	99	97	96	95	95	101	101	100	97	106	100	100	99	99
East region (10.9 t/ha)	98	97	96	95	95	101	101	99	97	105	101	100	100	98
West region (11.2 t/ha)	99	98	96	96	96	102	101	101	97	107	99	99	98	99
North region (11.3 t/ha)	97	[98]	95	94	94	99	101	99	96	[105]	99	100	98	[102]
Untreated grain yield (% treated control)														
United Kingdom (11.0 t/ha)	71	84	66	75	82	93	90	90	91	92	83	80	78	87
Disease resistance														
Mildew (1–9)	7	[8]	6	7	6	7	7	8	7	[6]	7	7	3	[6]
Yellow rust (1–9)	3	7	3	8	7	7	9	9	9	7	7	9	8	8
Yellow rust (young plant)	s	-	s	s	s	s	r	r	r	-	s	s	r	-
Brown rust (1–9)	7	6	9	3	5	6	6	5	6	6	5	5	5	6
Septoria tritici (1–9)	6.3	6.0	5.8	6.3	5.9	7.4	6.5	7.3	8.9	6.7	5.5	5.7	6.1	6.0
Eyespot (1–9)	6@	4	6@	5	6@	4	6	6	5@	6@	6@	5	5	4
Fusarium ear blight (1–9)	6	[7]	7	7	6	6	6	6	6	[5]	6	6	7	[6]
Orange wheat blossom midge	-	-	R	-	-	-	-	-	-	-	-	-	R	R
Agronomic features														
Resistance to lodging without PGR (1–9)	8	8	8	7	8	7	6	8	6	7	8	8	8	6
Resistance to lodging with PGR (1–9)	8	7	7	8	9	8	7	8	7	7	8	7	8	7
Lodging without PGR (%)	1	1	1	2	1	3	6	2	6	3	1	2	2	6
Lodging with PGR (%)	1	3	3	2	0	2	4	2	4	4	1	4	2	3
Straw length without PGR (cm)	86	91	87	84	91	92	87	85	90	90	84	93	87	86
Straw length with PGR (cm)	76	82	78	77	81	86	77	78	83	83	78	85	80	79
Ripening (days +/- Skyfall)	0	+1	0	+1	+1	-1	+1	-1	0	+1	+2	+2	+3	+1

https://ahdb.org.uk/young-plant-resistance-to-wheat-yellow-rust

Yellow rust (young plant)

- Young plant data is generated from UKCPVS seedling data (5 isolates) and RL trial data before ear emergence
- Anything susceptible to one isolate in UKCPVS tests becomes ‘s’ – susceptible
- If no isolates overcome the resistance, ‘r’ – resistant

➢ Varieties susceptible to multiple isolates are likely to be liable to problems in the field at the young plant stage and should be a priority for monitoring

VARIETY / 2024/25 RL RATING / ISOLATE	Costello	KWS Cranium	KWS Dawsum	KWS Palladium	KWS Zealum	LG Typhoon	Mayflower	Champion	Crusoe	LG Astronomer	Oxford	RGT Bairstow	RGT Rashid	LG Skyscraper	RGT Stokes	RGT Wilkinson	Gleam	RGT Wolverine	KWS Zyatt	Skyfall
2024/25 RL RATING	9	9	9	9	9	9	9	8	8	8	8	8	8	7	7	7	5	4	3	3
Yellow rust young plant*	r	r	r	r	s	r	r	r	s	r	r	s	s	s	r	s	s	s	s	s
23/001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	S
23/007	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	S	S	S
23/008	R	R	R	R	R	R	R	R	S	R	R	R	R	S	R	S	R	S	S	S
23/030	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	R	S	S	S
23/086	R	R	R	R	S	R	R	R	S	R	R	R	R	R	R	S	S	R	S	S

*Data not published yet

WYR

Young Plant Resistance (latest results*)

Susceptible (to one or more isolates)

Crusoe	RGT Rashid
Gleam	RGT Wilkinson
Graham	RGT Wolverine
KWS Extase	Skyfall
KWS Zealum	SY Insitor
KWS Zyatt	*Frenzy*
LG Redwald	*KWS Equipe*
LG Skyscraper	*KWS Arnie*
RGT Bairstow	*LG Shergar*
RGT Illustrious	*LG Rebellion*

Resistant (to all 5 isolates)

Almara	KWS Skateum		
Bamford	KWS Ultimatum	*Blackbird*	*KWS Vibe*
Blackstone	LG Astronomer	*DSV 321113*	*LG Henri*
Bolinder	LG Beowulf	*Energy*	*Memphis*
Champion	LG Typhoon	*KWS Beste*	*RGT Goldfinch*
Costello	Mayflower	*KWS Flute*	*RGT Hexton*
KWS Cranium	Oxford	*KWS Mongoose*	*Riley*
KWS Dawsum	RGT Stokes	*KWS Newbie*	*Roma*
KWS Dragum	SY Cheer	*KWS Scope*	*Rufus*
KWS Palladium	Theodore	*KWS Solitaire*	*SY Monza*

*5 isolates from 2023 Survey tested on full set of RL and RL candidates, Dec 2023

Genotyping of WYR

Aim: Conduct routine genotyping of wheat yellow rust isolates using results from Diane Saunders' (JIC) Field Pathogenomics project and the MARPLE pipeline to categorise isolates into the different genetic groups

NIAB WYR genotyping:

- 24 isolates genotyped from 2019
- 24 isolates genotyped from 2020
- 48 isolates genotyped from 2021
- 24 isolates genotyped from 2022
- 23 isolates genotyped from 2023

Field Pathogenomics

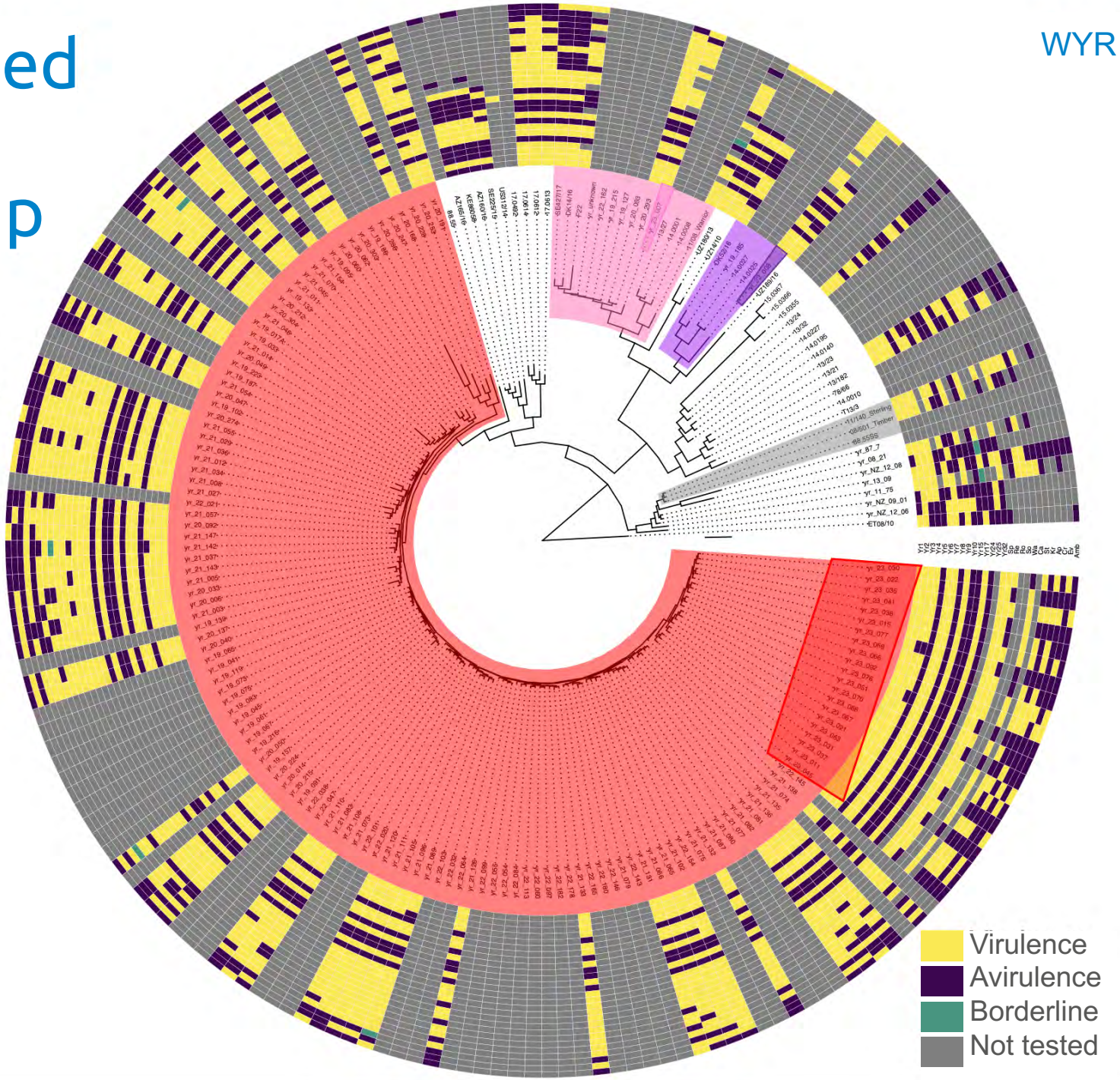
Genomics-based pathogen surveillance

Helen Bates and Anne Webb

Majority of UK genotyped isolates (2019-2023) belong to the Red Group

WYR

- MARPLE genotyping analysis separates isolates into genetic groups
- Red Group has dominated for the past 5 years
- 2023 – 23 isolates genotyped. 21 isolates belong to Red Group, one isolate in Pink Group and one in Purple Group
- Broad range of virulence profiles within the Red Group



2023 Wheat Yellow Rust Summary

- Varieties generally performed as expected in AP field trials
- Many of the 2023/24 RL varieties were resistant to all isolates at AP stage
- 92 samples received in 2023
- One isolate with virulence for *Yr8*
- No virulence detected for *Yr5, Yr10, Yr15* and *Yr24*
- Most common pathotypes 1,2,3,4,6,7,9,17,32,Sp,Wa

  1,2,3,4,6,7,9,17,32,Re,Sp,Wa,St,Kr,Ap,Cr
- Genotyping: 21 Red Group isolates, one Pink Group isolate and one Purple Group isolate

Any Questions?

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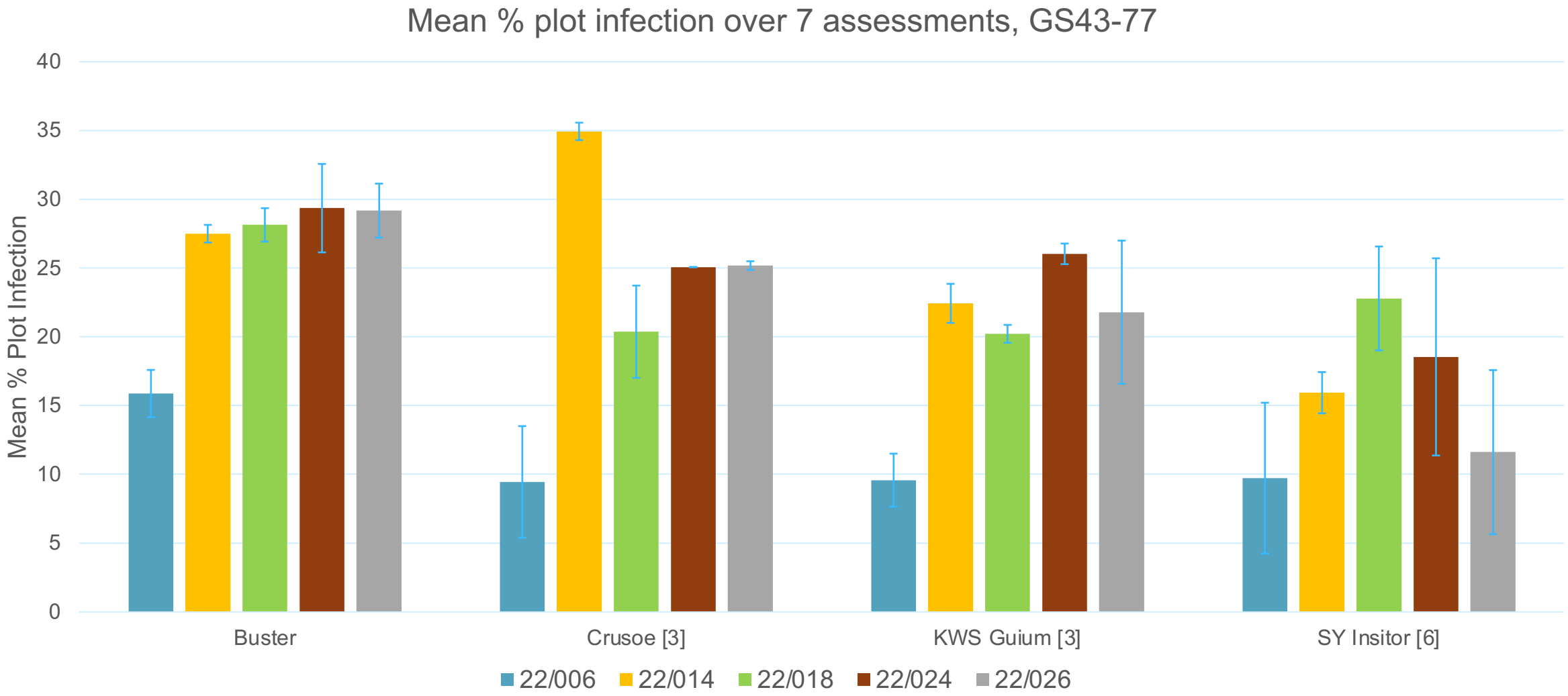
Wheat Brown Rust

Amelia Hubbard

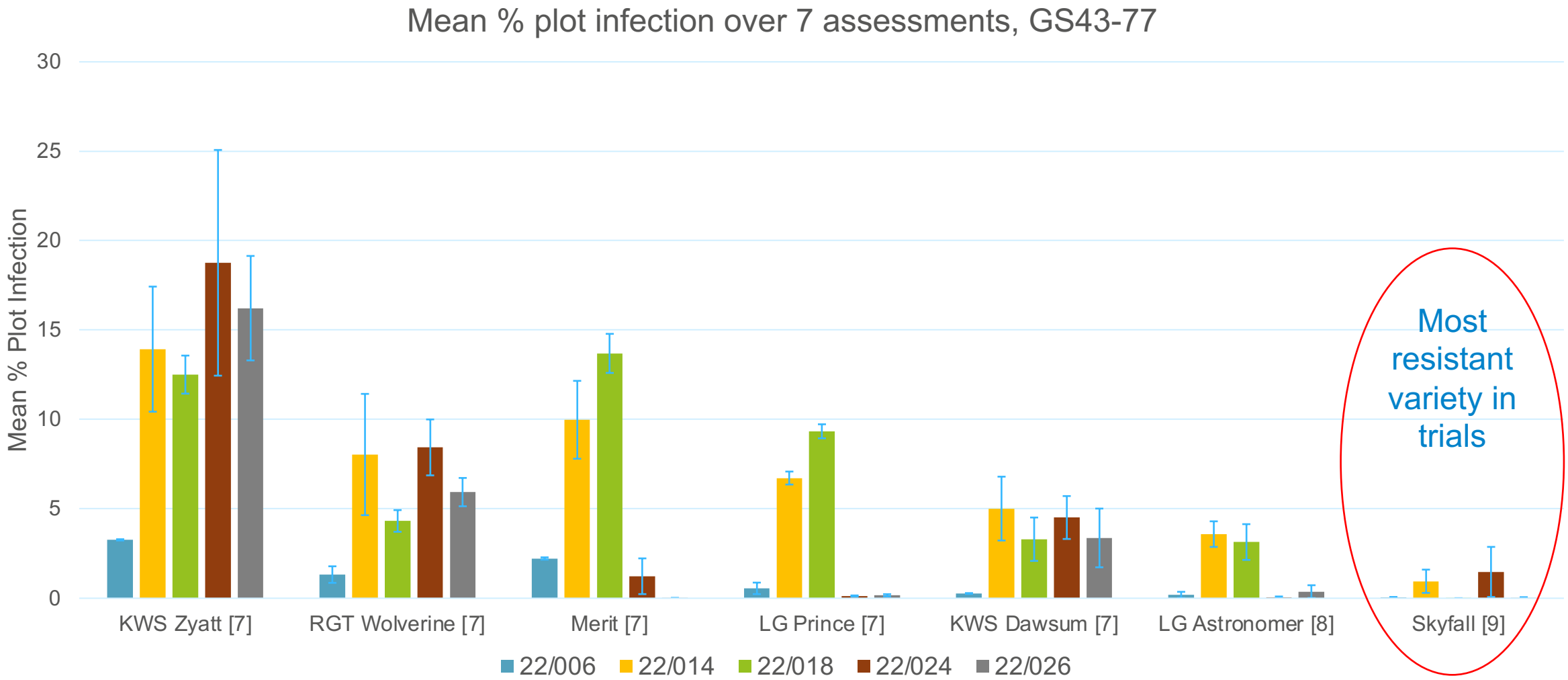
Wheat Brown Rust - Adult Plant Trials 2023

Isolate	Location	Host Variety	Pathotype
22/006	Cambs	KWS Siskin	1,2c,3a,3bg,3ka,10,13,14a,15,16,17,20,26,28,37,Cr
22/014	Cambs	Crusoe	1,3a,3bg,3ka,10,13,14a,15,16,17,20,23,26,28,37,Cr
22/018	Norfolk	Oxford	1,3ka,10,13,14a,15,16,17,26,28,37,Cr
22/024	Dorset	Theodore	1,3a,3bg,3ka,10,13,14a,15,16,17,20,23,24,26,37,Cr
22/026	Northants	Mayflower	1,3a,3bg,3ka,10,13,14a,15,16,17,26,37,Cr

WBR Adult Plant Trials

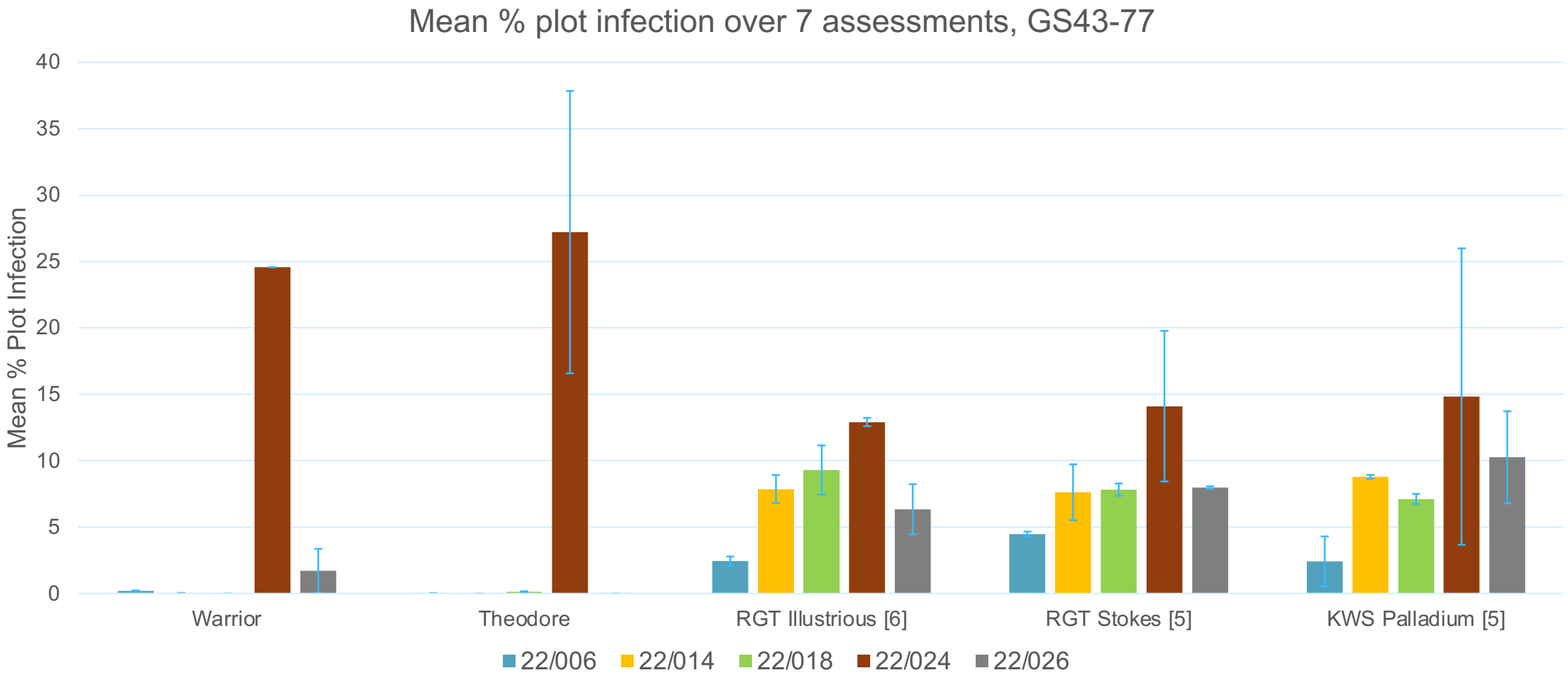


WBR Adult Plant Trials



WBR Adult Plant Trials

Lr 24 isolate – WBR 22/024



RL Candidates- How did they perform?

(in terms of their BR resistance)

AHDB 2023 RL Candidates	Previous/ proposed name	Variety ID	BR rating, harvest 2023	WBR Individual Isolate AP trial Mean % Plot Infection				
				22/006	22/014	22/018	22/024	22/026
Selected as potential bread-making varieties								
LG Partridge	LGWU177	3120	-	4.00	7.30	12.50	16.30	15.60
SY Cheer	SY120623	3134	5	2.90	10.10	5.30	9.90	16.20
KWS Dragum	KWSW411	3147	5	6.20	12.90	17.20	14.90	18.40
Selected as potential biscuit-making varieties								
Bamford	EW8768	3099	6	0.60	6.90	13.90	7.80	11.60
Almara	SEWC148	3111	6	0.30	10.00	11.00	0.00	0.00
LG Grendel	LGWU186	3129	6	1.60	4.60	4.40	19.00	15.10
LG Arkle	LGWU188	3131	5	3.10	6.90	6.40	10.70	12.10
KWS Skateum	KWSW422	3158	-	0.70	7.00	12.60	0.80	0.10
Selected as potential feed varieties								
Blackstone	EW81055	3106	5	2.70	9.70	5.20	12.60	11.70
LG Redrum	LGWU180	3123	5	5.20	19.60	11.90	20.80	18.50
LG Beowulf	LGWU182	3125	5	5.60	12.60	16.60	15.00	14.70
Bolinder	EWQ0377	3142	6	3.20	6.90	14.80	7.30	7.00

Some very low infection levels seen with some of the isolates

22/006 trial had overall lower levels

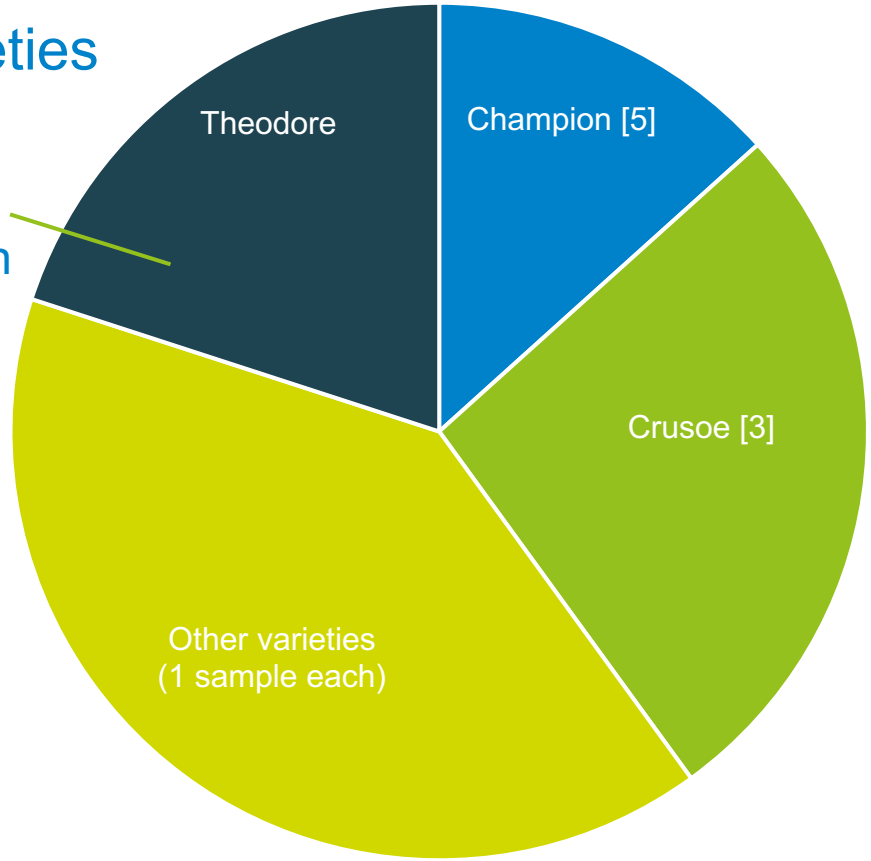
Take Home Messages – WBR Adult Plant Trials

- Most susceptible RL variety in trials was Crusoe [3]
- Most resistant RL variety was Skyfall [9]
- LG Astronomer [6] and KWS Dawsum [7] also performed well
- *Lr24* isolate WBR 22/024 infected Warrior and Theodore at adult plant stage
- Candidate variety Almara - no infection (0.0%) with two of the isolates tested at AP stage

2023 WBR Samples Received

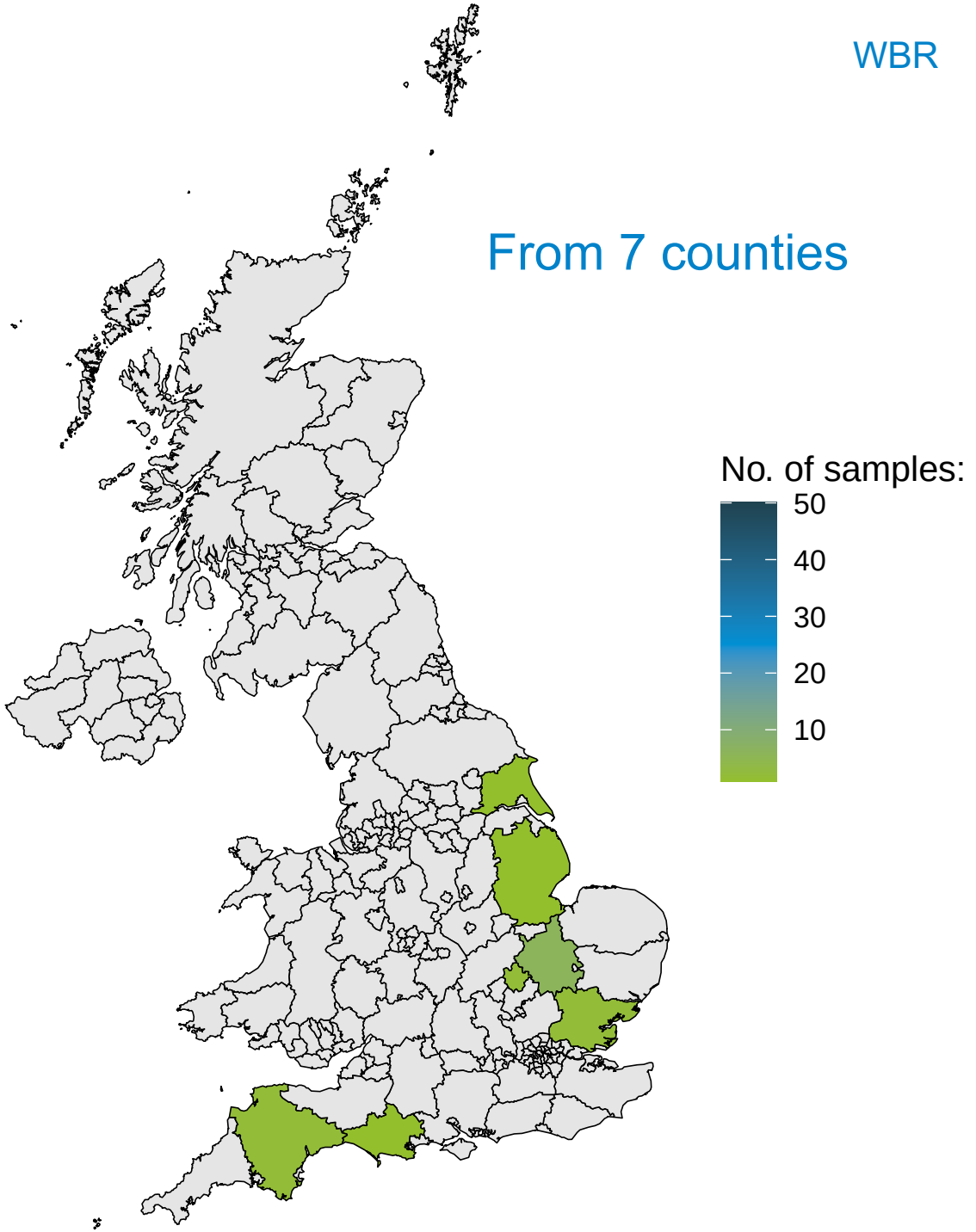
✓15 samples

From 10 varieties



East Yorkshire, Dorset & Devon

From 7 counties

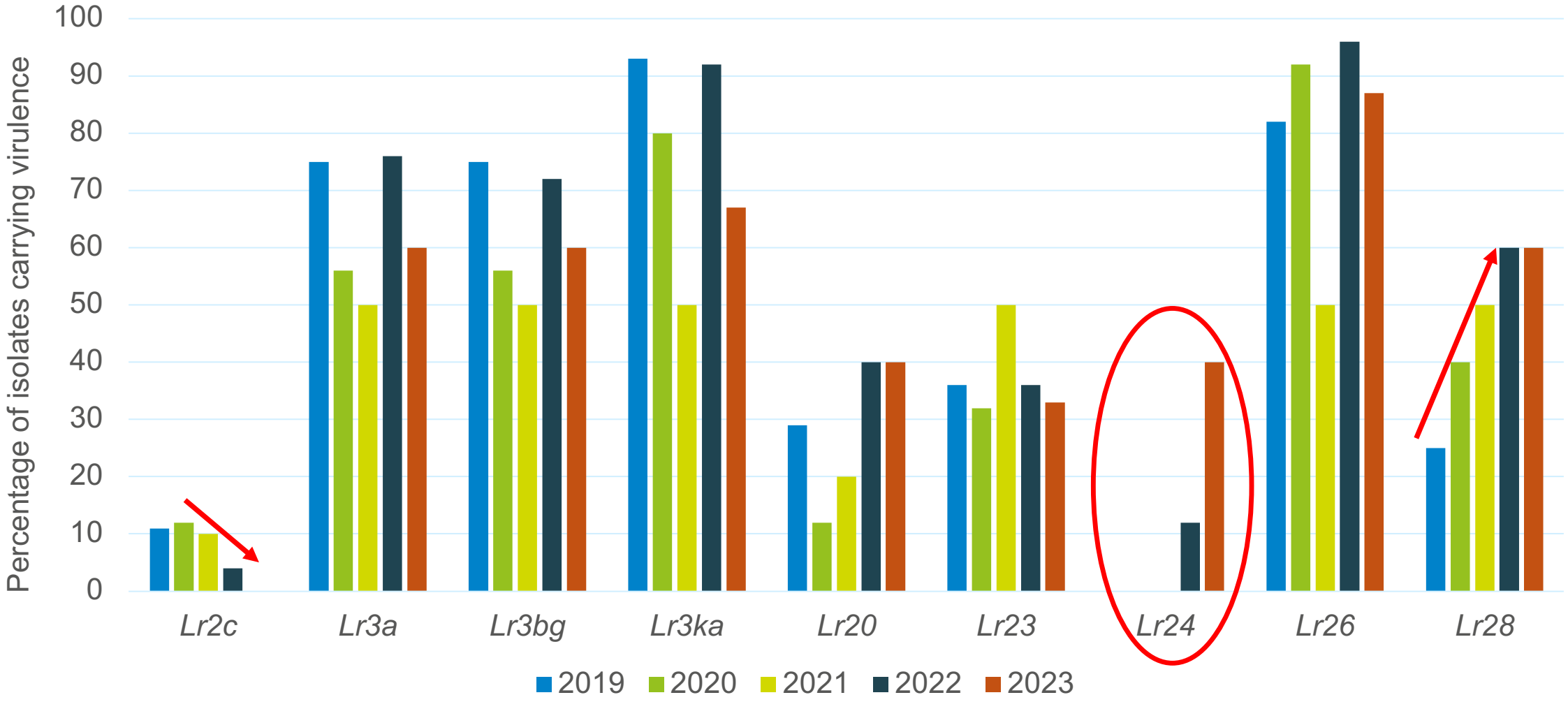


WBR Seedling Tests

- Funded to test 50 yellow rust and brown rust isolates in total
- ➢All 15 brown rust isolates selected for seedling differential tests

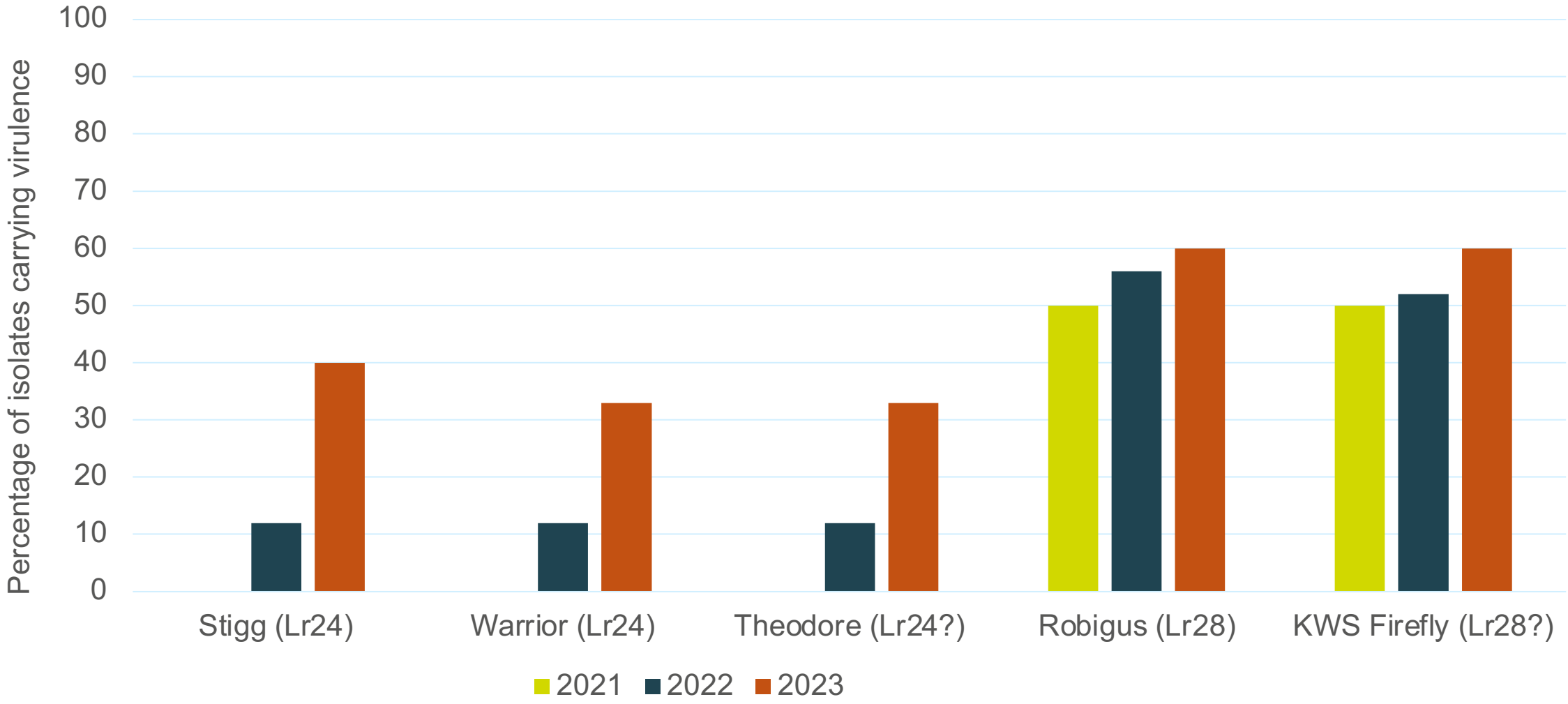
Isolate code	Host variety	Location
23/001	R12117	Lincolnshire
23/002	KWS Zealum	Cambridgeshire
23/003	Theodore	East Yorkshire
23/004	KWS Guium	Cambridgeshire
23/005	Champion	Cambridgeshire
23/006	RGT Rashid	Cambridgeshire
23/007	Merit	Cambridgeshire
23/008	Crusoe	Cambridgeshire
23/009	Theodore	Dorset
23/010	Crusoe	Bedfordshire
23/011	Crusoe	Bedfordshire
23/012	Theodore	Devon
23/013	Mayflower	Devon
23/014	Champion	Essex
23/015	Crusoe	Essex

2023 WBR Seedling Differential Tests – *Lr* genes



No virulence detected for *Lr2a, Lr2b* or *Lr2c*

2023 WBR Seedling Differential Tests – additional cultivars



WBR Pathotypes Found in 2023

Common Pathotypes	% Frequency
1,3a,3bg,3ka,10,13,14a,15,16,17,26,28,37,Cr	27
1,3a,3bg,3ka,10,13,14a,15,16,17,20,23,24,26,37,Cr	20

New Pathotypes	% Frequency
1,10,13,14a,15,16,17,20,23,26,37,Cr	7
1,10,13,14a,15,16,17,20,26,28,37,Cr	7
1,10,13,14a,15,16,17,24,26,37,Cr	7
1,3ka,10,13,14a,15,16,17,24,26,28,37,Cr	7
1,3a,3bg,3ka,10,13,14a,15,16,17,20,24,(26),28,37,Cr	7

2023 WBR Seedling Tests – RL subset

- ✓ 15 isolates tested on a subset of RL varieties
- ➢ All RL varieties tested in this subset were susceptible to 5 or more isolates at the seedling stage

VARIETY / 2023 RL RATING / ISOLATE	Theodore	Skyfall	Champion	LG Astronomer	KWS Dawsum	LG Prince	Merit	Gleam	LG Illuminate	LG Typhoon	RGT Bairstow	RGT Saki	Costello	KWS Brium	KWS Palladium	Swallow	KWS Guium
		9	8	8	7	7	7	6	6	6	6	6	5	5	5	5	3
WBR23/001	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/002	R	R	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
WBR23/003	S	S	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
WBR23/004	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/005	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/006	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/007	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/008	R	S	S	R	S	R	R	S	R	R	R	R	S	S	S	R	S
WBR23/009	S	R	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
WBR23/010	S	S	S	R	S	R	R	S	R	S	R	S	S	S	S	S	S
WBR23/011	S	S	S	R	S	R	R	S	R	R	R	R	S	S	S	S	S
WBR23/012	S	S	R	R	S	R	R	S	R	R	R	R	S	S	S	R	S
WBR23/013	R	R	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S
WBR23/014	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
WBR23/015	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

WBR

Young Plant Resistance (latest results*)

Susceptible
(to one or more isolates)

Almara
Bamford
Blackstone
Bolinder
Champion
Costello
Crusoe
Gleam
Graham
KWS Cranium
KWS Dawsum
KWS Dragum
KWS Extase
KWS Palladium
KWS Skateum
KWS Ultimatum
KWS Zealum
KWS Zyatt
LG Astronomer
LG Beowulf
LG Redwald
LG Skyscraper
LG Typhoon
Mayflower
Oxford
RGT Bairstow
RGT Illustrious
RGT Rashid
RGT Stokes
RGT Wilkinson
RGT Wolverine
Skyfall
SY Cheer
SY Insitor
Theodore
Blackbird
DSV 321113
Energy
Frenzy
KWS Arnie
KWS Beste
KWS Equipe
KWS Flute
KWS Mongoose
KWS Newbie
KWS Scope
KWS Solitaire
KWS Vibe
LG Henri
LG Shergar
LG Rebellion
Memphis
RGT Hexton
Riley
Roma
Rufus
SY Monza

*5 isolates from 2023 Survey tested on full set of RL and RL candidates, Dec 2023

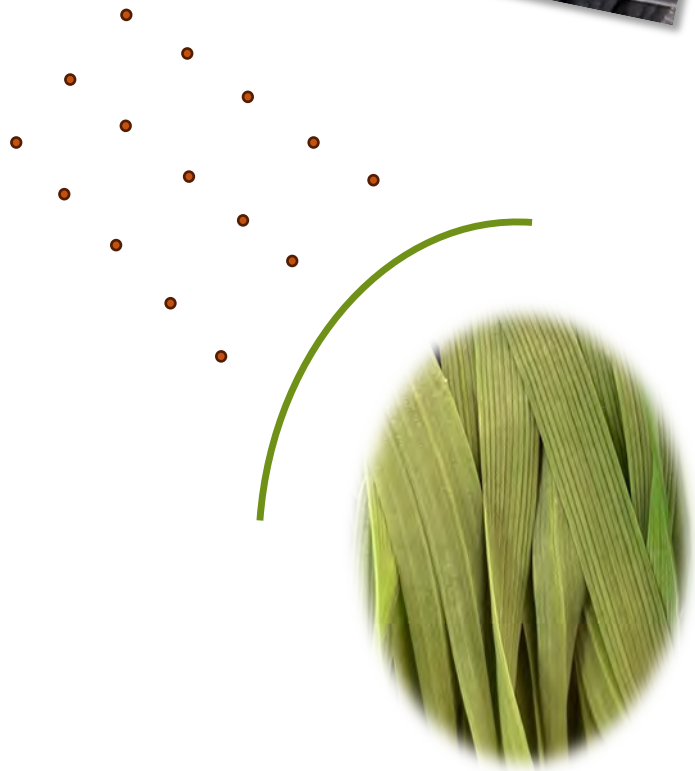
WBR

Young Plant Resistance (latest results*)

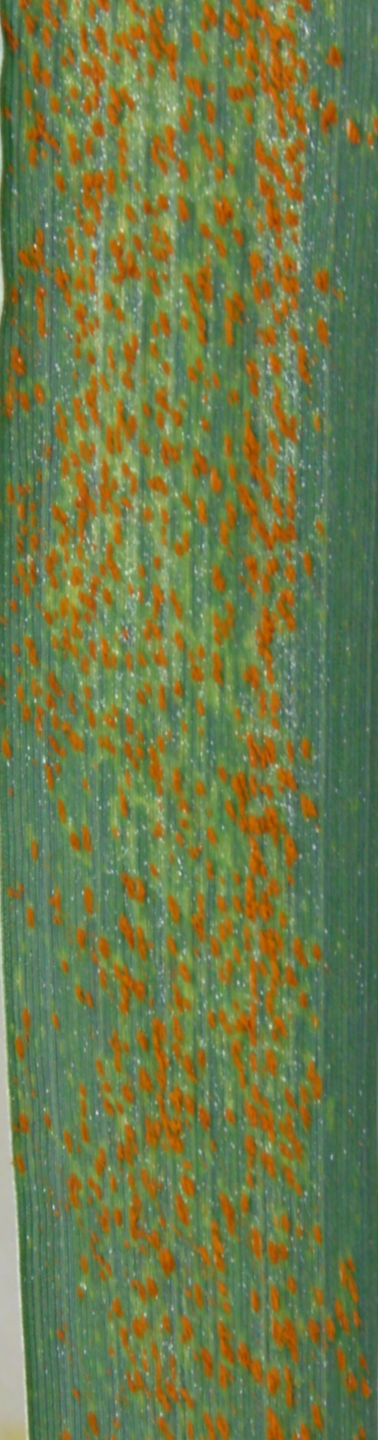
One variety was resistant to all 5 isolates tested on the full RL+ candidates

Resistant (to all 5 isolates)

RGT Goldfinch
(RW42109)



*5 isolates from 2023 Survey tested on full set of RL and RL candidates, Dec 2023



2023 Wheat Brown Rust Summary

- Varieties performed as expected in adult plant trials based on RL rating
- 15 samples received
- 100% of the isolates carried virulence for *Lr1, Lr10, Lr13, Lr14a, Lr15, Lr16, Lr17,* and *Lr37*
- Virulence for *Lr24* increased to 40%
- A prevalent pathotype was detected in 2023 samples

  1,3a,3bg,3ka,10,13,14a,15,16,17,26,28,37,Cr
- Five new pathotypes were identified in 2023
- All but one of the RL and RL candidates are susceptible at seedling stage
- Candidate variety RGT Goldfinch resistant at seedling stage to 5 isolates from 2023 survey

Any Questions?

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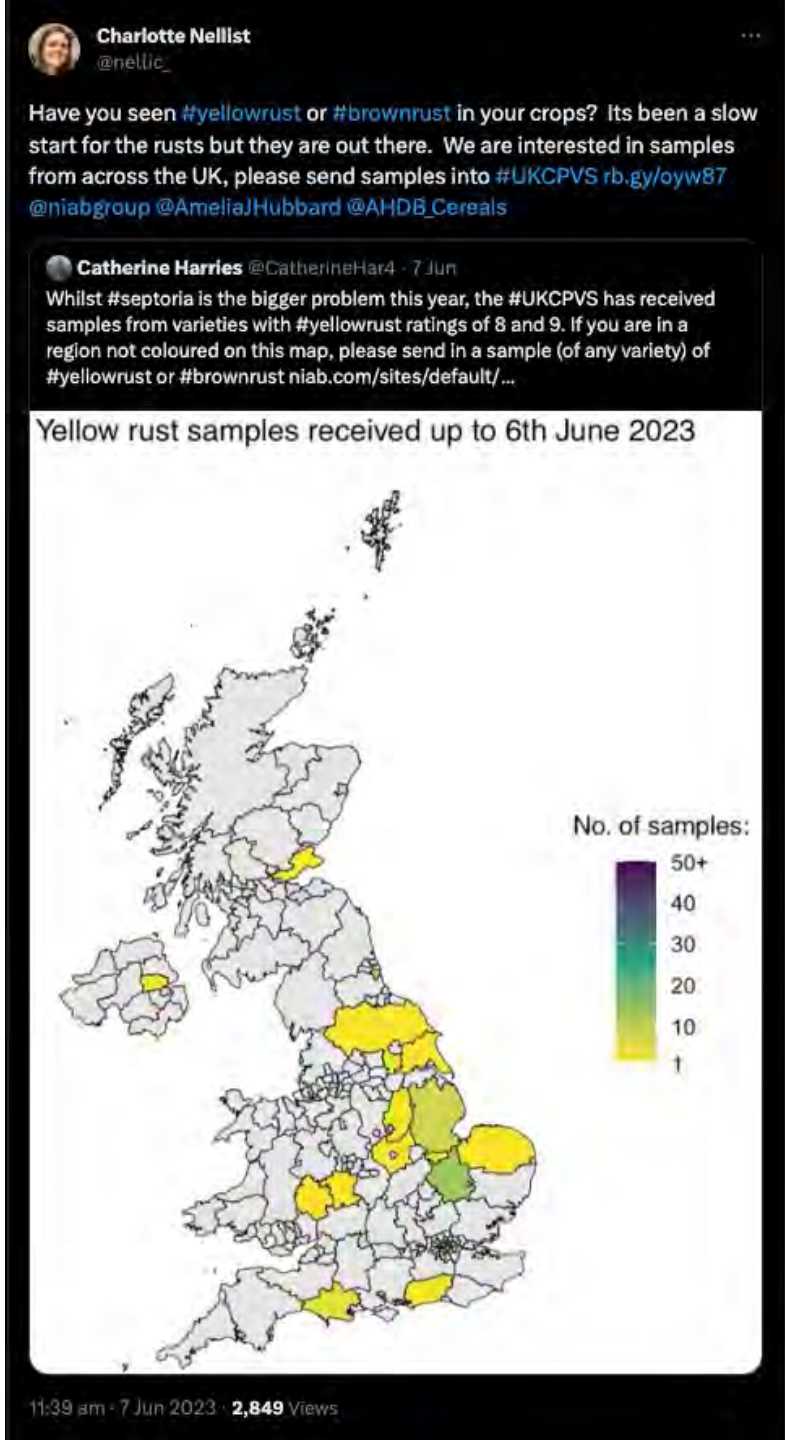
| *amelia.hubbard@niab.com*

Improvements/Plans for 2024

Charlotte Nellist

Faster Service

- In-season sample data updates, including heat map of sample locations
  - Check X (Twitter) and AHDB's website for in-season updates
- 2023 subset of RL varieties included in initial round of seedling differential tests
- In season RL+ Candidates seedling tests planned for 2024 aiming to have information ready for first edition of following years' RL booklet
- Earlier Stakeholders Meeting and dissemination of results



AHDB Watch Lists

- Introduced for YR in 2021 and BR in 2023
- Flag unusual levels of disease observed in some trials, compared to the average across all trials
- Extra layer of information provides a valuable warning of a potential change in the UK's rust race structure
- Orders varieties based on their disease levels in the 3 worst trials for each variety (for the specified trial year)
  - Highly resistant
  - Medium resistant
  - Low resistant

Watch Lists 2024/25

- Updated in January or February (due to be released soon)
- Most varieties performed in line with their main RL rating

Varieties flagged:

- YR (limited data in 2023)
  - KWS Brium, LG Arkle, Crusoe, KWS Zealum, LG Astronomer, LG Redrum and Bamford
- BR
  - Theodore, Mayflower and RGT Saki

Plans for 2024

- UKCPVS not performing rust adult plant trials in 2024
- Testing more isolates on the full set of RL and RL candidates
- In–season reporting (where possible)

Wheat and Barley Powdery Mildew

- Wheat and barley powdery mildew survey not conducted in 2023
- No reports/unusual sightings to indicate any major changes in wheat mildew population
- AHDB - Some susceptibility seen in spring barley *mlo* varieties in Scotland

➢ UKCPVS looking at a small selection of BPM isolates in 2024 to investigate this

Sampling in 2024

Charlotte Nellist

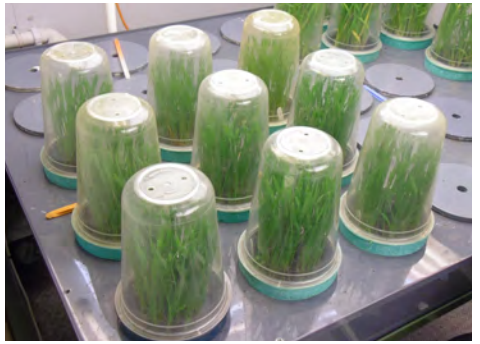
Sampling in 2024

- A big thank you to everyone who sends in samples – we know how busy the disease season can be and we really appreciate your time and effort in helping us with the Survey

- Every sample is important to us and each one is treated the same regardless of host variety. We make every effort to give each sample the best chance of survival and aid successful spore multiplication

- We couldn't run such a successful Survey without you –

Thank you!



How are your samples used?

- ✓UKCPVS provides isolates for RL/VL inoculated trials → disease ratings
- ✓UKCPVS seedling (young plant) data included in RL lists to give another layer of information
- ✓Used by Breeders to screen breeding lines → future commercial resistant varieties
- ✓AgChem and biocontrol research → trialling new products
- ✓Research studies → research projects, PhD studies, and on-going collaboration with other research institutes, investigating the complexities of the pathogen at molecular level
- ✓Participation in European projects – without your samples the UK wouldn't have such a good resource and valuable input
- ✓Long-term storage for future research

Oat Crown Rust Samples Required

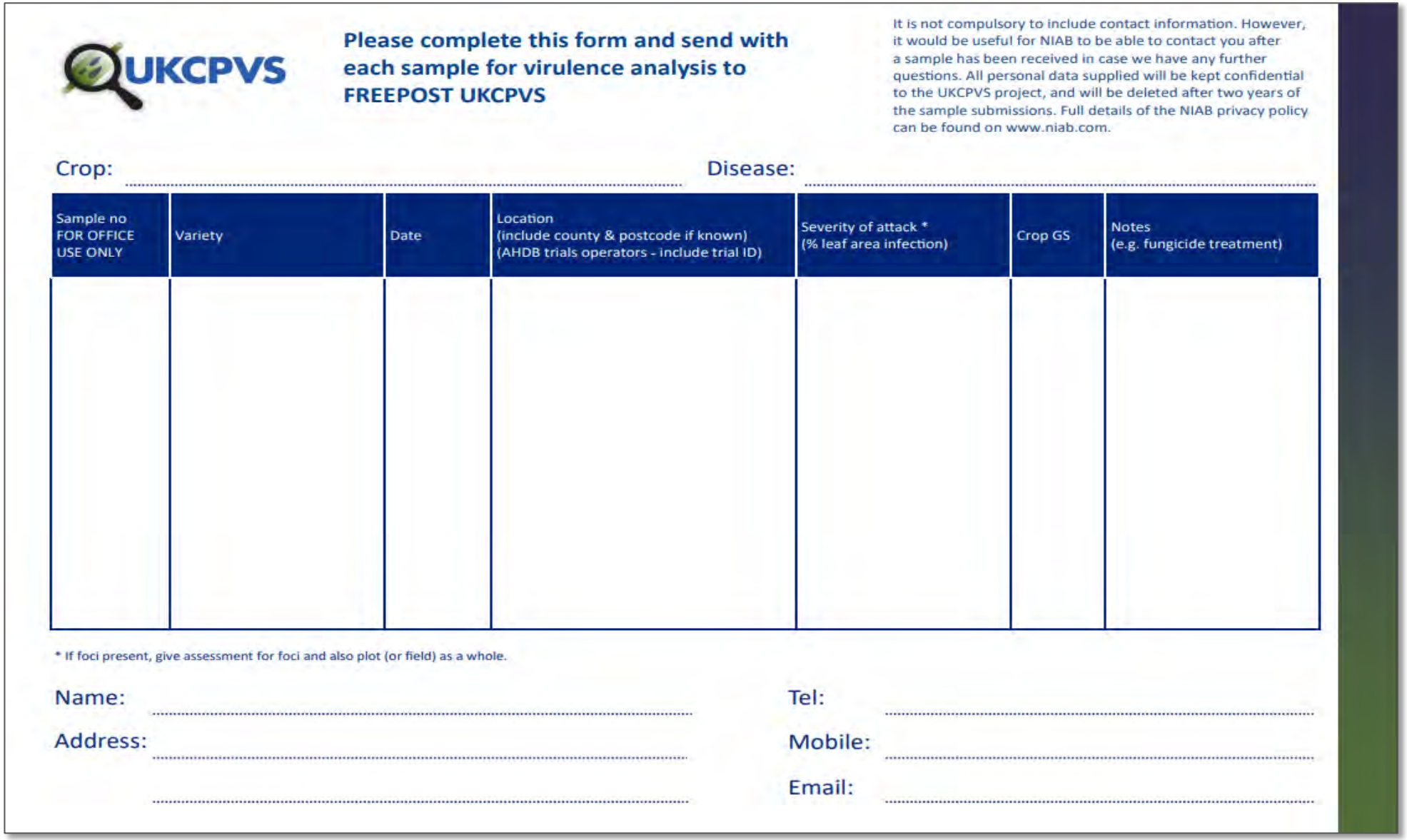
We are seeking some new oat crown rust isolates to update the isolates we use for RL inoculated trials

Please send to:

FREEPOST UKCPVS

UKCPVS Sampling Sheet

https://niab.com/research/agricultural-crop-research/research-projects/uk-cereal-pathogen-virulence-survey



UKCPVS

Please complete this form and send with each sample for virulence analysis to FREEPOST UKCPVS

It is not compulsory to include contact information. However, it would be useful for NIAB to be able to contact you after a sample has been received in case we have any further questions. All personal data supplied will be kept confidential to the UKCPVS project, and will be deleted after two years of the sample submissions. Full details of the NIAB privacy policy can be found on www.niab.com.

Crop: ..... Disease: .....

Sample no FOR OFFICE USE ONLY	Variety	Date	Location (include county & postcode if known) (AHDB trials operators - include trial ID)	Severity of attack * (% leaf area infection)	Crop GS	Notes (e.g. fungicide treatment)

* If foci present, give assessment for foci and also plot (or field) as a whole.

Name: .....

Address: .....

.....

Tel: .....

Mobile: .....

Email: .....

Sampling and P&P (wheat YR and wheat BR)

- Place leaf samples directly in a paper envelope, please do not use polythene bags
- Send sample along with copy of sampling sheet – the more info the better – to:
-

FREEPOST UKCPVS

- If using a stamp please send first class or next day delivery to:

UKCPVS, NIAB Park Farm, Villa Road, Impington, Cambs, CB24 9NZ

https://www.niab.com/research/agricultural-crop-research/research-projects/uk-cereal-pathogen-virulence-survey for sampling sheet and more details

Take Home Messages

Charlotte Nellist

UKCPVS Take Home Messages

- Yellow rust: No major varietal breakdowns, population remains diverse
  - Majority of samples coming from KWS Extase
  - One isolate carried virulence for *Yr8*
  - Red Group dominates population
- Brown rust:
  - Virulence for *Lr24* rose to 40%
  - Candidate variety RGT Goldfinch resistant to 5 isolates at seedling stage

- Refer to AHDB RL 2024/25 for resistance ratings (young plant and adult) and AHDB Watchlist when making your variety choices
- Have the confidence to reduce fungicide use on resistant varieties
- Pathogen populations are dynamic and diverse, keep a close eye on all varieties and spray if needed
- Monitor any unusual sightings and send a sample to UKCPVS

Further Information

- UKCPVS Annual Reports

  https://ahdb.org.uk/ukcpvs

- Recommended Lists and Press Releases

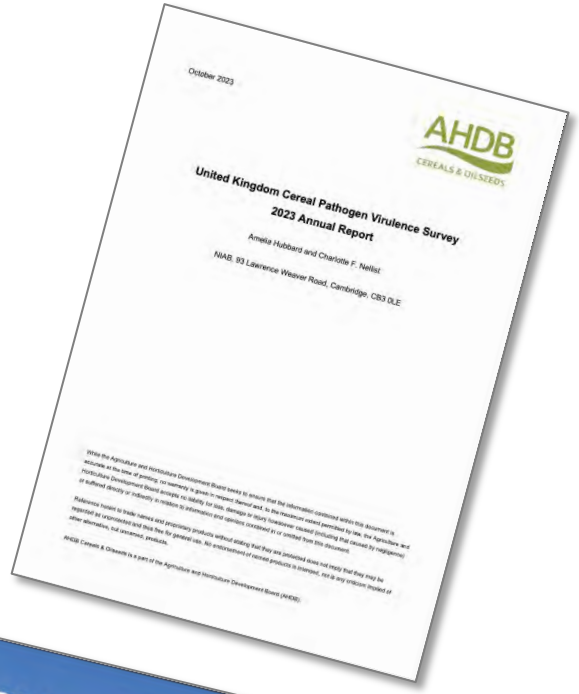
  https://ahdb.org.uk

- Sampling and P&P

  https://niab.com/research/agricultural-crop-research/research-projects/uk-cereal-pathogen-virulence-survey

- Global Rust Reference Centre

  http://wheatrust.org/yellow-rust-tools-maps-and-charts/



Acknowledgements

- AHDB
- APHA
- Samplers
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- Anne Webb
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- Megan Burt
- Kostya Kanyuka
- Diane Saunders and team (JIC)

UKCPVS

NIAB

AHDB

Animal & Plant Health Agency

John Innes Centre

RUSTWATCH
WHEAT RUST EARLY WARNING

Any Questions?

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