

WGIN Stakeholder Meeting

The Role of Genetics in Integrated Pest Management

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Review of IPM evidence

Enabling the uptake of integrated pest management (IPM) in UK arable rotations (a review of the evidence)

- Project leader: ADAS
- AHDB Research Review 98
- Report available:
ahdb.org.uk/enabling-the-uptake-of-integrated-pest-management-ipm-in-uk-arable-rotations-a-review-of-the-evidence

- Varietal choice identified as an IPM option for 16 wheat & barley key pests:
 - Resistance
 - Tolerance
 - Competitiveness (suppression, tolerance, allelopathy)
- Variation in strength of evidence

Information available to farmers - AHDB Recommended Lists



RL Septoria tritici disease ratings

Winter wheat 2023/24

Yield, agronomy and disease resistance

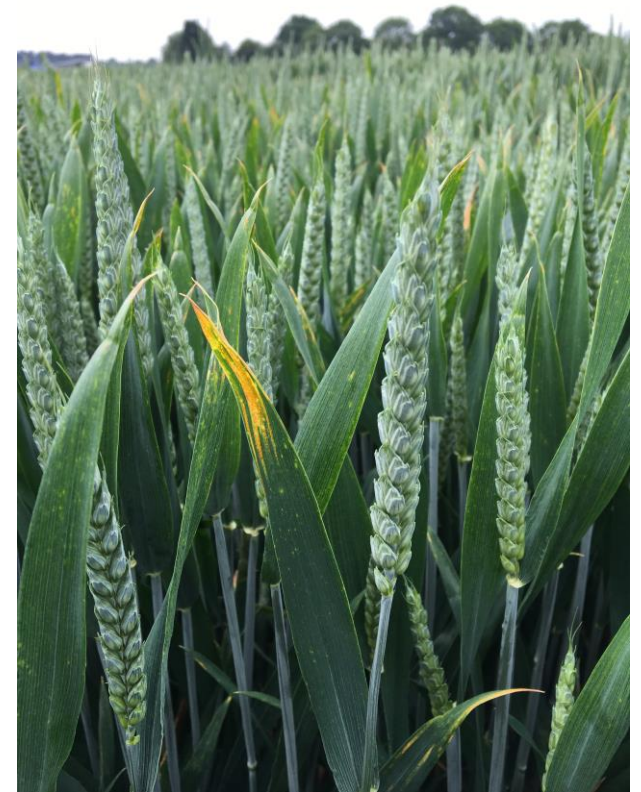
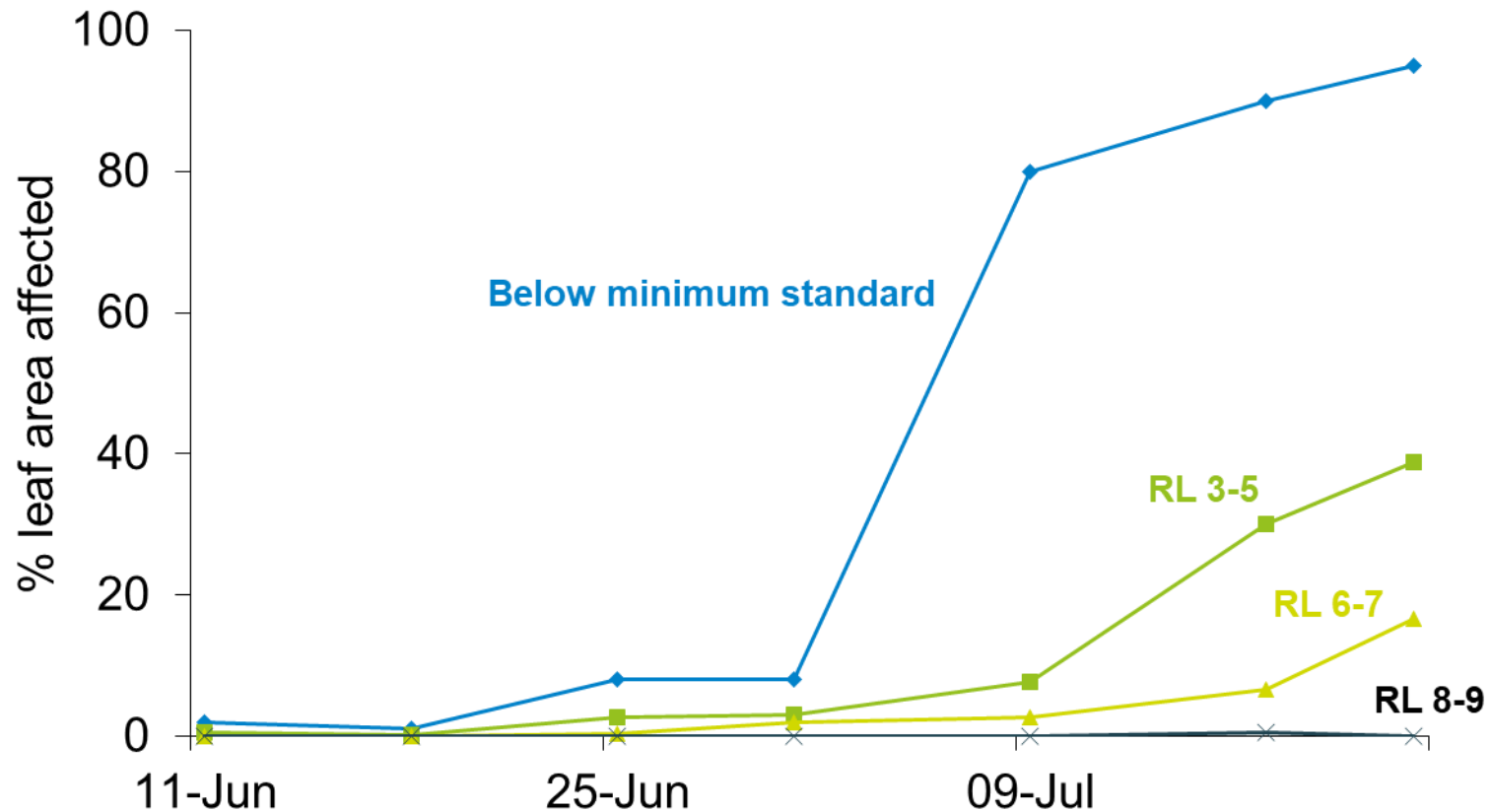


	KWS Zyatt	Skyfall	Crusoe	RGT Illustrious	KWS Extase	KWS Ultimatum	KWS Palladium	KWS Siskin	Mayflower	KWS Guitium	RGT Wilkinson	LG Prince	KWS Brium	Merit	KWS Firefly	RGT Rashid	LG Illuminate	LG Astronomer	Elicot	
End-use group	UKFM Group 1				UKFM Group 2					UKFM Group 3										
Scope of recommendation	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	E	UK	E	UK	UK	UK	
Variety status	c					NEW		*C			NEW				*					*
Fungicide-treated grain yield (% treated control)																				
United Kingdom (10.9 t/ha)	99	97	96	96	102	101	100	99	97	101	101	101	100	100	100	100	100	99	98	
East region (10.7 t/ha)	98	97	96	95	102	101	100	99	97	102	102	101	101	101	100	101	100	99	98	
West region (11.1 t/ha)	99	97	97	97	102	102	101	99	98	100	101	100	100	98	99	97	100	99	97	
North region (11.3 t/ha)	98	96	94	95	100	[103]	99	99	96	101	[100]	98	100	100	99	98	100	97	99	
Untreated grain yield (% treated control)																				
United Kingdom (10.9 t/ha)	75	70	76	85	97	93	94	87	93	80	87	85	83	84	80	81	87	88	82	
Agronomic features																				
Resistance to lodging without PGR (1-9)	8	8	8	7	7	[7]	7	6	6	7	[8]	7	7	6	8	8	7	7	6	
Resistance to lodging with PGR (1-9)	8	7	7	8	8	7	8	6	7	7	8	8	7	6	8	8	7	9	7	
Straw length without PGR (cm)	85	85	82	89	91	85	83	84	89	90	83	83	92	88	83	86	83	88	86	
Straw length with PGR (cm)	75	77	75	80	85	75	78	74	82	82	77	75	85	81	75	79	76	79	77	
Ripening (days +/- Skyfall)	-1	0	+1	+1	-1	+1	-1	0	-1	+3	+2	+2	+2	+1	0	+3	+1	+1	+1	
Resistance to sprouting (1-9)	6	6	6	6	6	[7]	[6]	4	[6]	[6]	[5]	[5]	[6]	[6]	5	[6]	[6]	[6]	5	
Disease resistance																				
Mildew (1-9)	7	6	7	7	7	7	8	8	7	5	8	4	7	4	5	4	5	4	6	
Yellow rust (1-9)	3	3	9	8	8	9	9	9	9	9	7	8	9	8	6	8	7	9	9	
Yellow rust (young plant) – see note below	s	s	r	s	r	r	r	r	r	r	s	r	r	r	s	r	r	r	s	
Brown rust (1-9)	7	9	3	6	6	6	5	5	6	3	5	7	5	7	5	6	6	8	6	
Septoria tritici (1-9) – see note below	6.1	5.4	6.2	5.7	7.8	6.4	7.4	6.8	8.9	5.1	5.5	5.9	5.6	5.4	5.1	6.4	5.8	6.2	5.0	
Eyespot (1-9) – see note below	[6]@	[5]@	[5]	[7]@	[4]	[5]	[6]	[4]	[6]@	[5]	[7]@	[4]	[6]	[3]	[4]	[6]	[6]	[5]	[6]	
Fusarium ear blight (1-9)	6	7	7	6	6	7	6	6	6	7	6	6	6	6	5	7	6	6	6	
Orange wheat blossom midge	-	R	-	-	-	-	-	-	-	R	-	R	-	R	R	R	R	R	R	

On the 1-9 scales, high figures indicate that a variety shows the character to a high degree (e.g. high resistance). Comparisons of varieties across regions are not valid.

Value of varietal resistance & minimum standards

- Yellow rust development



Value of disease resistance

- Agronomic merit

Filter panel (1) ¹ Filter panel (2) Calculate Agronomic Merit ²

Click importance level for one or more factors to re-calculate Agronomic merit on X-axis or click one of the 'RL rating' buttons to display the RL rating on X-axis.

To get Agronomic Merit back on X-axis, click one of the regional yield measure buttons on the top right hand side.

Septoria importance ³

Very high High Medium Low None RL rating

Yellow rust importance ³

Very high High Medium Low None RL rating

Brown rust importance ³

Very high High Medium Low None RL rating

Mildew importance ³

Very high High Medium Low None RL rating

Fusarium importance

Very high High Medium Low None RL rating

Eyespot importance

Very high High Medium Low None RL rating

Lodging (+PGR) importance

Very high High Medium Low None RL rating

Lodging (-PGR) importance

Very high High Medium Low None RL rating

Select regional yield measure on Y-axis ⁴

5 year data (2017-2021) 1 year data (2021)

UK (+F) East (+F) North (+F) West (+F) UK (-F) UK (TB) UK (-F) UK (TB)

Distinguish variety points in graph by ⁵

Scope of recomm. Years on RL End-use group Control varieties

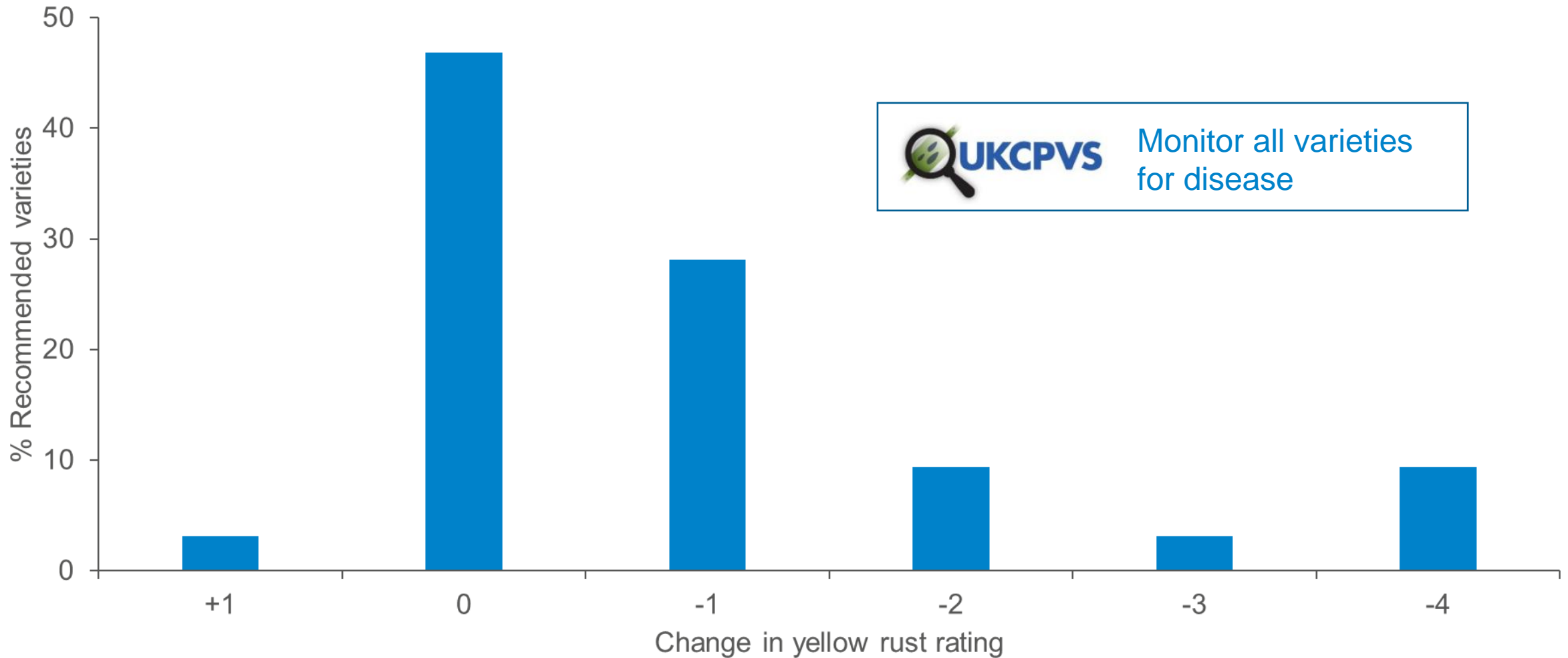
Fungicide-untreated yield (t/ha), UK, 2017-2021

Agronomic Merit

- UKFM Group 1
- UKFM Group 2
- UKFM Group 3
- Hard Group 4
- Soft Group 4

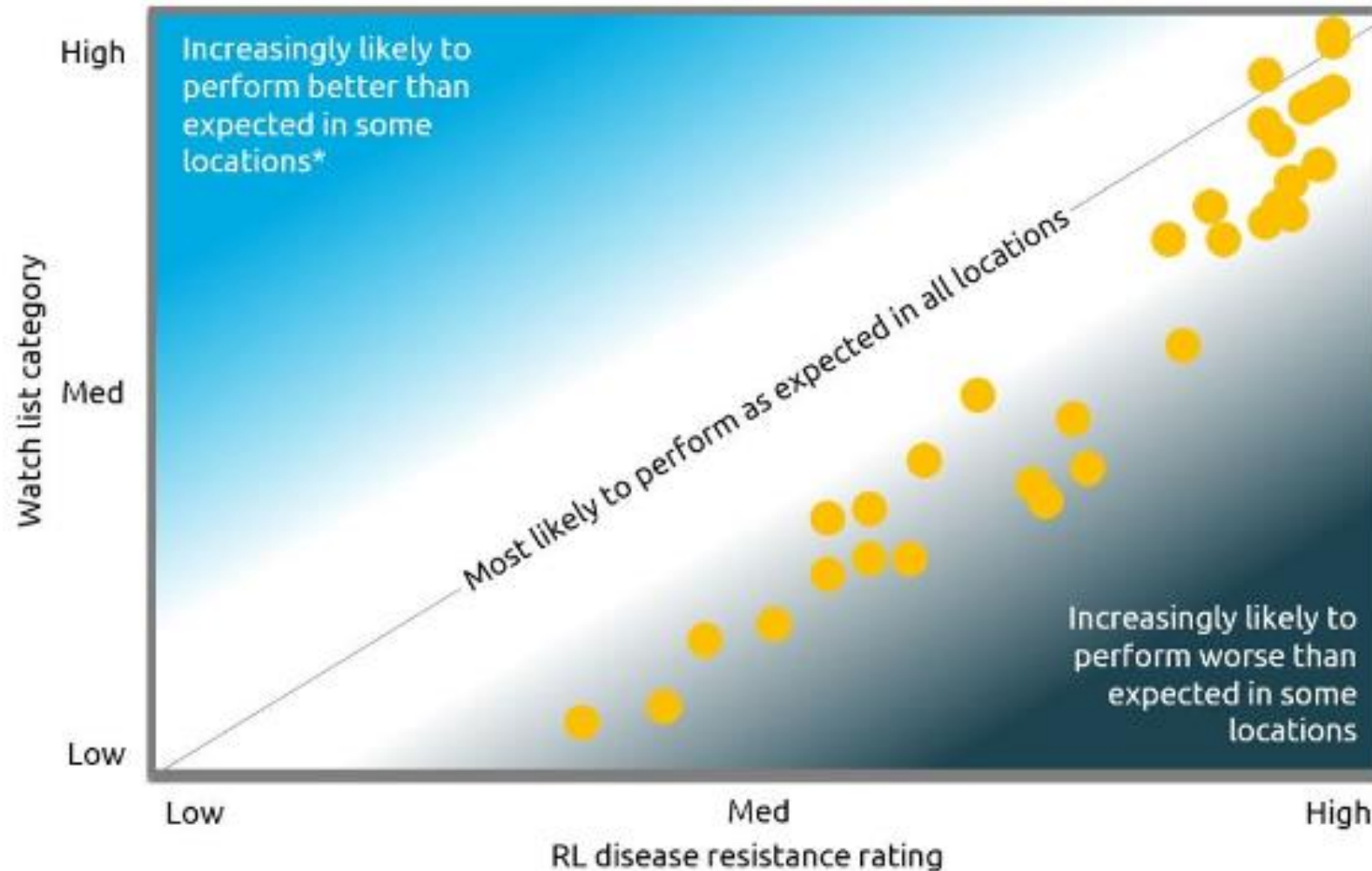
Durability of resistance

- Yellow rust changes in RL ratings between 2015 and 2016



Yellow rust watch list

Disease rating v watch list category



Yellow rust watch list

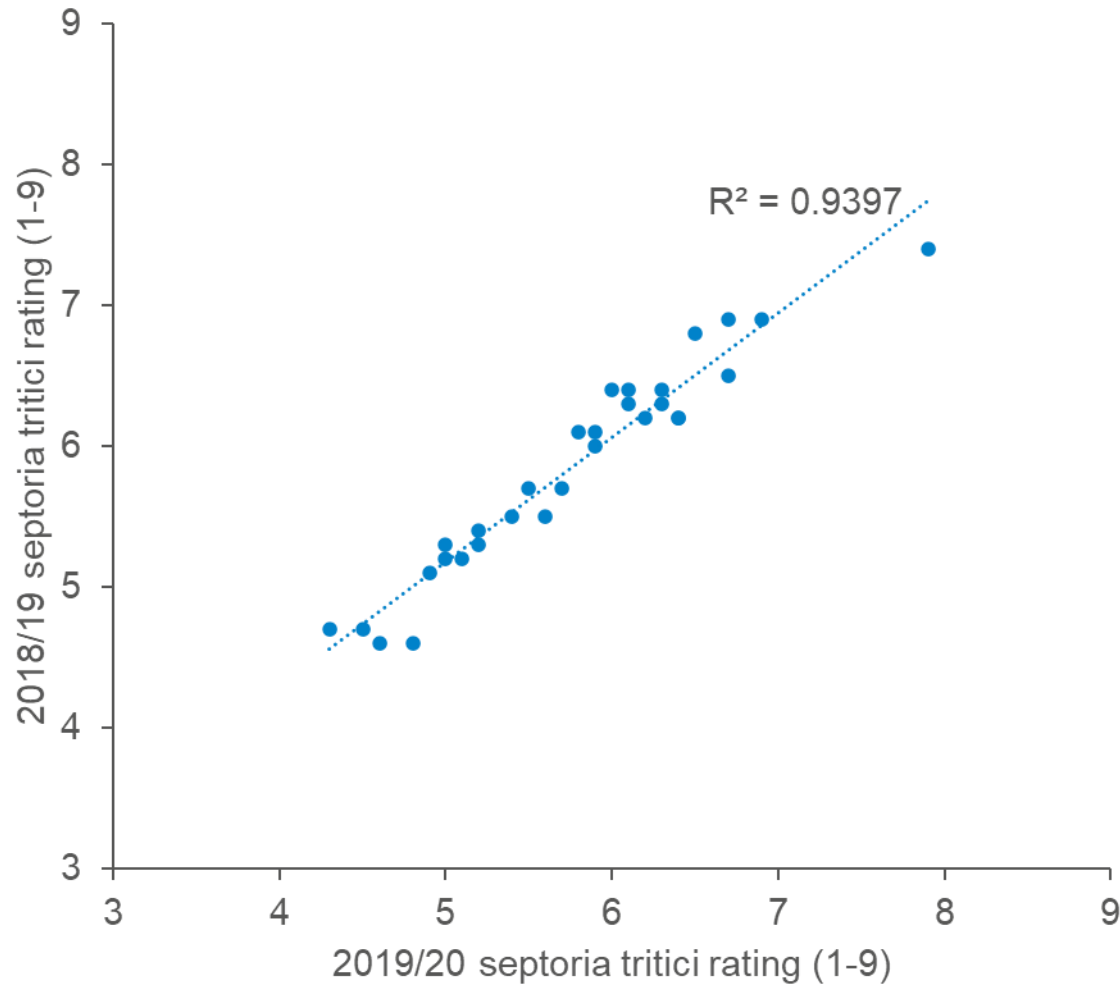
- Has it worked?



- Most varieties classified as *most resistant* had stable ratings or small falls
- The largest falls in ratings were seen in those classified as least resistant
- Not all of those classified as least resistant saw falls
- Only one years data, but promising results
- New yellow rust variety watch list will be published in January

Durability of resistance

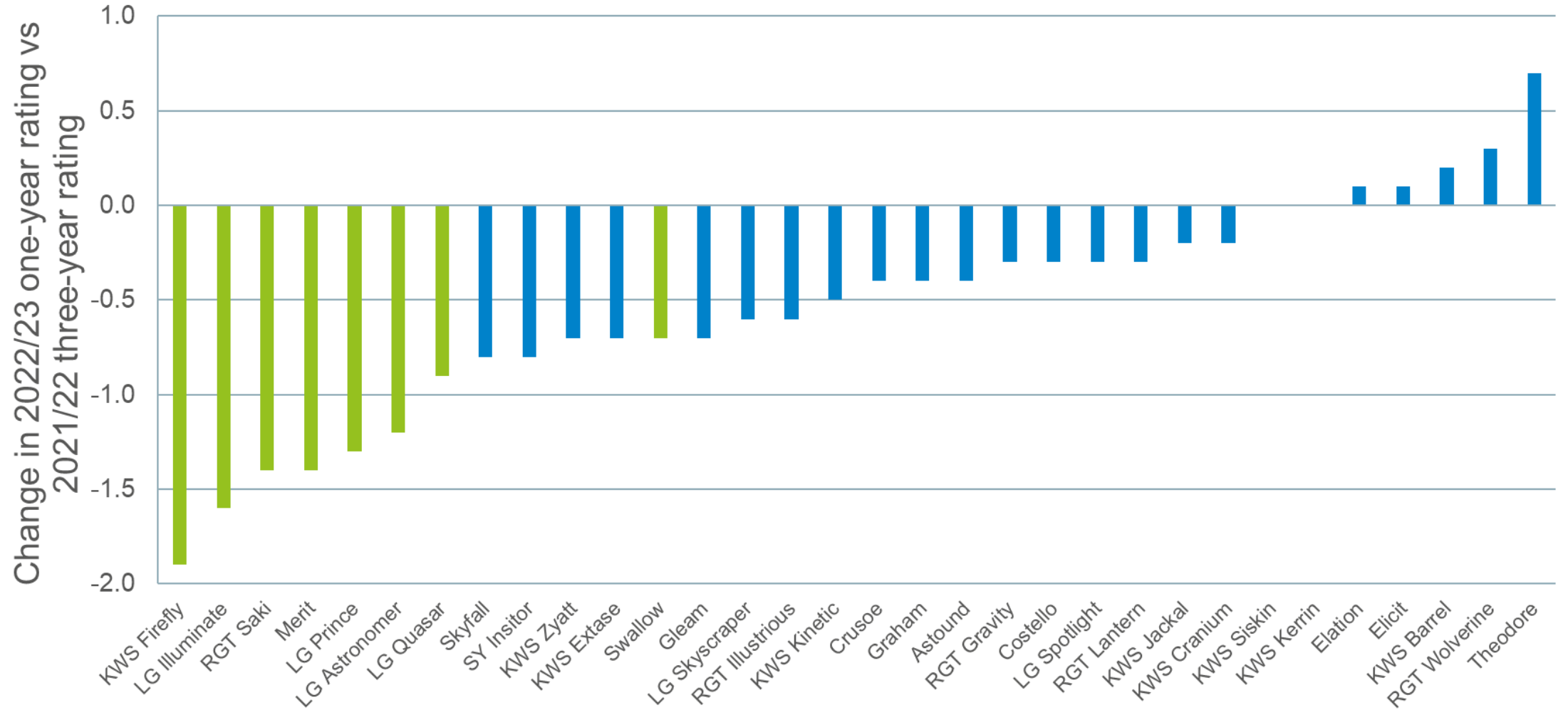
- *Septoria tritici*



- RL disease ratings were historically 'stable'
- Average change between 2018/19 and 2019/20 RL was -0.01 rating

However ...

Change in septoria disease ratings 2022/23 versus 2021/22



Variety blends

- Increase genetic diversity within a field
- Slow/reduce the spread of some diseases
- Reduce risk of varietal resistance breakdown

Need to know requirements of end market

AHDB variety blends tool

Use the filters to narrow down varieties listed in table

End-use group(s)

 1
 2
 3
 4H
 4S

Ripening days (+/- Skyfall)

 -1
 0
 +1
 +2
 +3

Varieties occurring five times or more as parents / grandparents

 Select all
 Cassius
 Cougar
 Hereford
 KWS Santiago
 Oaklev

OWBM resistance

 Select all
 0
 1

Select varieties to include / exclude in blend, then click a button below

Blends must contain (select up to 3/4 varieties)

All

Blends must NOT contain

All

Tips: click column header to sort, use scroll bar at bottom, change column width to see hidden columns on right, hover over cells for more info

Green circles, yellow triangles and red diamonds indicate top, middle or bottom 33.3% of each category respectively; data in grey shaded columns represents data for last season only. -F = no fungicides

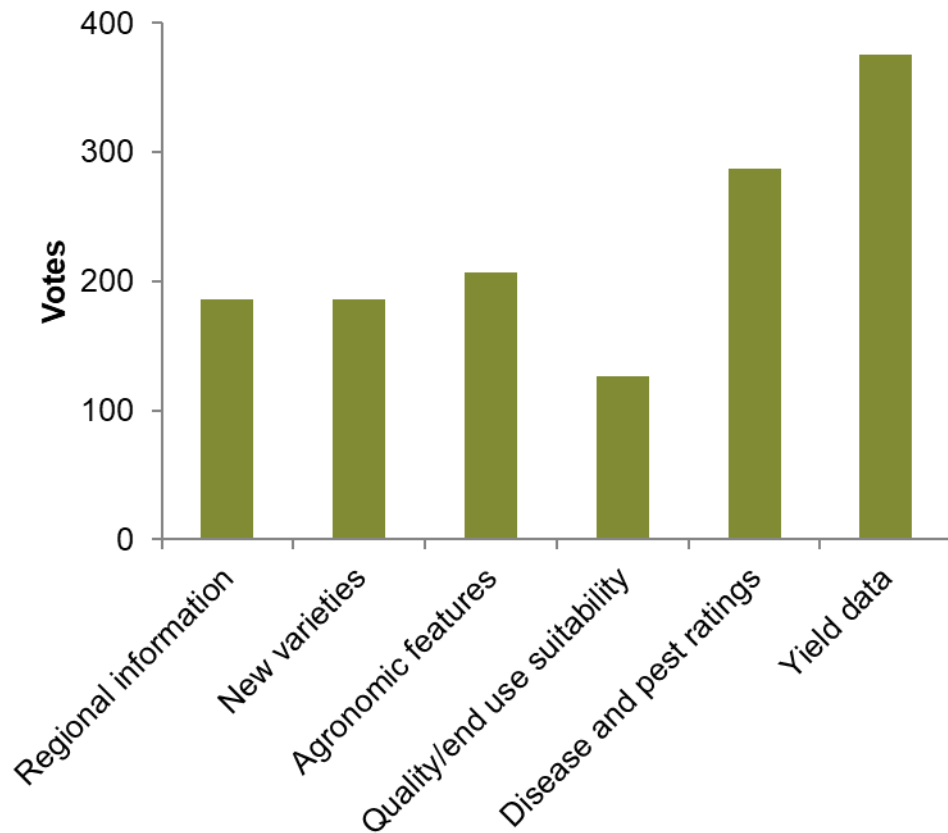
Group	Variety	Parentage	Septoria (3y)	Septoria (1y)	Yellow rust	Brown rust	Lodging (without PGR)	Ripening days (+/- Skyfall)	Protein content (%)	Hagberg Falling Number	Specific weight	Yield (-F, 5y)	Yield (-F)
3	KWS Guium	KWS Rowan x KWS Tempo	4.7	5.0	8.8	3.4	7.3	+3	11.3	255	78.1	101	
4H	KWS Dawsum	KWS Kerrin x Costello	6.3	6.1	8.7	7.2	6.9	+1	11.2	304	79.4	119	
2	KWS Palladium	KWS Zyatt x KWS Trinity	7.4	7.2	8.7	5.4	7.2	-1	11.8	315	76.9	116	
2	KWS Siskin	KWS Sterling x Timaru	6.5	6.5	8.7	4.8	5.8	0	11.9	282	76.7	107	
4H	LG Typhoon	LG Garrus x LGW88	7.2	6.9	8.7	6.1	7.0	+2	11.1	169	76.3	115	
2	Mayflower	Ascott x Armada	8.4	8.2	8.7	5.7	6.3	0	11.9	294	78.5	116	
4H	Theodore	Stigg x Tuxedo	8.5	9.0	8.7	7.7	6.2	0	12.0	306	73.8	114	
4H	Costello	(Cordiale x Biscay) x Timaru	5.8	5.6	8.6	4.6	7.5	+2	11.8	322	80.6	105	
1	Crusoe	Cordiale x Gulliver	6.2	5.9	8.6	2.7	7.6	+1	12.7	274	77.8	93	
3	KWS Brium	KWS Solo x KWS Basset	5.4	5.6	8.6	4.8	7.3	+2	11.5	268	77.3	104	
3	Elicit	Cassius x Viscount	4.9	5.2	8.3	5.8	6.2	+1	11.5	208	76.4	101	
4H	KWS Cranium	KWS Crispin x KWS Kielder	5.9	5.7	8.3	4.4	7.7	+3	11.2	279	75.1	102	
4S	KWS Jackal	KWS Santiago x KWS W177	4.6	4.6	8.3	5.4	6.6	+1	11.1	179	74.8	95	
3	LG Astronomer	(Cougar x Leeds) x Britannia	6.8	6.2	8.3	7.8	7.3	+1	11.7	232	77.4	111	
4S	Elation	Cassius x Viscount	4.0	3.9	8.1	4.9	7.2	+1	11.5	212	76.9	100	
2	KWS Extase	Boisseau x Solheio	7.8	7.3	8.1	6.6	7.0	-1	11.9	289	78.5	120	
4S	RGT Saki	Cougar x KWS Santiago	5.9	5.1	8.1	6.6	6.2	+3	11.4	220	75.6	109	
3	LG Prince	(Cougar x KWS Kielder) x Revelation	6.4	5.8	7.8	7.4	6.9	+2	11.1	253	74.0	107	
3	RGT Rashid	(Icebreaker x KWS Solo) x Cougar	6.9	6.4	7.7	5.6	7.6	+3	11.1	226	76.4	102	
4H	Champion	(Celebration (DFLI) x Verlain) x	7.7	8.0	7.6	5.3	6.1	0	11.4	239	74.8	116	

- RL data
- Parental diversity information

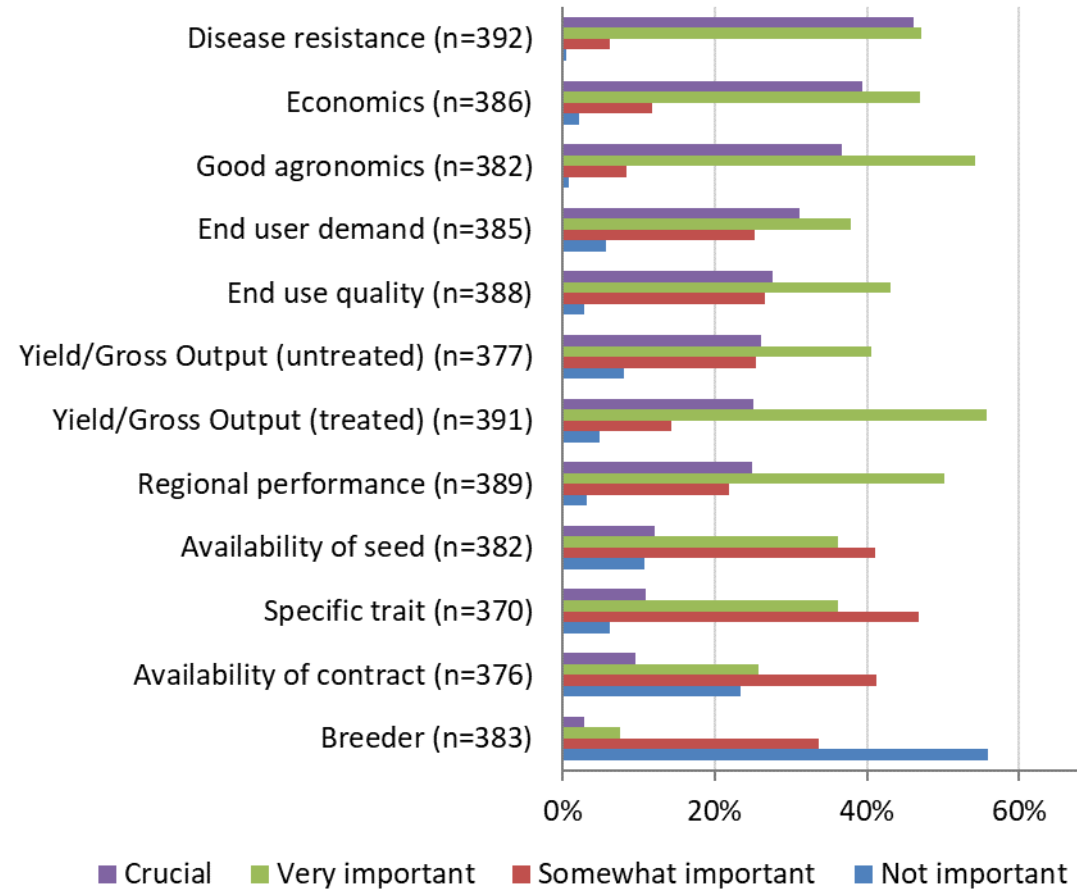
ahdb.org.uk/variety-blend-tool-for-winter-wheat

How important is pest resistance/tolerance when selecting a variety? AHDB

2011



2018



2023



RECOMMENDED LISTS

RL review What do *you* recommend?

You rated
the RL*
4.2/5.0



Complete the questionnaire**
to direct the future of the RL

For further information, visit:

ahdb.org.uk/rl-review

**Based on levy payer
Shape the future ratings (2022)*

***Questionnaire open until
17 February 2023*

Summary

- Genetics are a valuable tool in an IPM strategy, however in most cases it is not appropriate to consider a specific resistance in isolation
- There are trade-offs between pest resistance and other characteristics, such as yield and quality, when making variety selections
- Regular monitoring of varieties is essential
- There has been an increase in the importance of pest resistance, relative to treated yield, in RL surveys since 2011. New questionnaire to survey 2023 opinions
- There is potential for genetics to play a role in IPM strategies towards a broader range of pests in the future

A vibrant landscape of a green field at sunset. The sun is low on the horizon, casting a warm glow over the scene. The sky is filled with colorful clouds, and the field is lush and green. A path leads from the foreground towards the horizon. In the foreground, there are several thin, white, wavy lines that appear to be part of a decorative graphic.

**‘Inspiring our farmers, growers
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rapidly changing world’**

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