

Trial Title: Fungicide timing response monitoring in winter wheat at Morley.
Centre: Morley **Trial Code:** WW21-05501 **Varieties:** KWS Extase and RGT Gravity

Objective: To record and monitor the yield responses to each of the component spray timings within a fungicide spray programme on wheat.

Background: This trial is supported through The Morley Agricultural Foundation (TMAF) as part of the NIAB Morley Long Term Studies (LoTS) programme.

Varieties with similar fungicide treated yields can have very different fungicide requirements. The 2021 trial at Morley considered this, by including two contrasting varieties KWS Extase and RGT Gravity. KWS Extase has a high resistance score for *Septoria tritici* at 7.8, good resistance to both mildew and brown rust and strong untreated yields. KWS Extase does respond to fungicide use, but the fungicide spend on this variety can be half that of disease-susceptible varieties. RGT Gravity is one of the highest yielding winter wheats in the UK, and despite its moderate scores for resistance to *S. tritici*, mildew and brown rust, it responds very well to fungicide use.

Disease levels were low throughout the trial period, with yellow rust and powdery mildew only evident in untreated plots from late June. *S. tritici* and brown rust were not observed.

In untreated conditions KWS Extase performed better than RGT Gravity, with a 2.32 t/ha yield difference between the two varieties. However, in the fungicide treated programmes, the difference in treated yields between the two varieties narrowed with KWS Extase showing ca. a 1.1 t/ha yield increase over RGT Gravity in a 1 or 2-spray programme and ca. a 0.7 t/ha yield increase in a 3 or 4-spray programme. For both varieties, the bulk of the yield response came from the T2 application.

The yield response to fungicide for RGT Gravity in 2021 was higher than the mean fungicide response over the 36-year period of this trial. The mean yield response of T0 was -0.15 t/ha, the mean yield response to a T1 + T2 spray was 2.51 t/ha and the mean yield response to a T3 spray was 0.36 t/ha which amounted to a total fungicide response of 2.72 t/ha. This result is interesting as the disease levels were low throughout the trial period. The result is also less than the 37-year average response which now stands at 2.23 t/ha.

Table 1. Products

Product	Active ingredient and concentration
Revystar XE	47.5 g/l fluxapyroxad and 100 g/l mefentrifluconazole
Tebucur 250	250 g/l tebuconazole
Toledo	430 g/l tebuconazole
Phoenix	500 g/l folpet
Ascra Xpro	65 g/l bixafen, 65 g/l fluopyram and 130 g/l prothioconazole

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Table 2. Treatments and timings

Variety	Treatment	Growth stage timing and date of application				Comment
		GS30 27/04/2021	GS32 11/05/2021	GS39 01/06/2021	GS65 23/06/2021	
KWS Extase and RGT Gravity	1	Untreated	-	-	-	Untreated
	2	-	-	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	-	T2 Alone
	3	-	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	-	T1 + T2
	4	-	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	Toledo 0.45 l/ha	T1 + T2+ T3
	5	Tebucur 250 0.5 l/ha	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	Tebucur 250 0.75 l/ha	Complete

The site is part of a long-term experiment that has run at Morley for 37 years (supported by The Morley Agricultural Foundation). The experiment records a snapshot of the yield response to fungicide input and spray programme components in winter wheat each year.

With regards data interpretation, the "T1+T2" response is based on a comparison of treatments 3 and 1; the "T3" response is based on treatments 4 and 3 and the "T0" is a comparison of treatments 5 and 4.

Results

Disease levels of yellow rust and septoria were low throughout the season. Some brown rust was observed on the flag leaves of both varieties at the final assessment (Table 3).

Table 3. Mean disease scores on untreated plots (n= 3 plots per treatment x variety combination).

Growth stage	GS73-77															
Date	15.07.21															
Disease	Yellow rust %				Brown rust %				Septoria %				GLA %			
Leaf	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Variety																
KWS Extase	4	2	0	0	7.3	5.3	0	0	1.0	6.7	0	0	84.7	82.0	0	0
RGT Gravity	28.3	0	0	0	6.3	0	0	0	0	1.7	0	0	64.7	90.0	0	0

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Figure 1: Yield (t/ha) ± SE of KWS Extase and RGT Gravity at Morley in 2021.

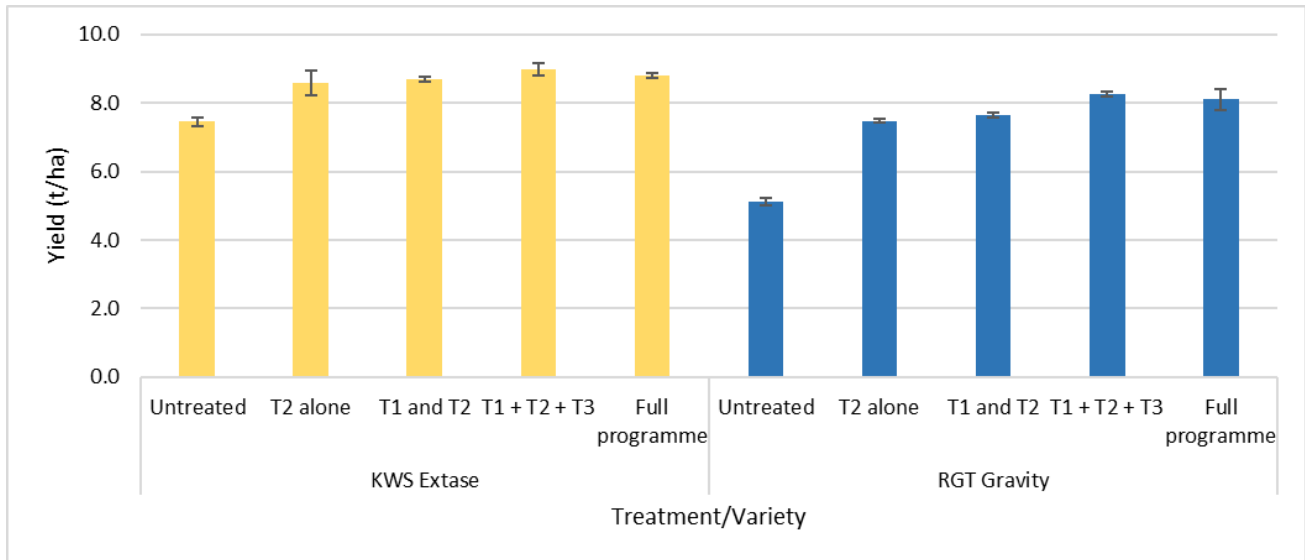


Table 4. Yield (t/ha) of KWS Extase and RGT Gravity at Morley in 2021 with details of each treatment programme and growth stage timing of application.

Treatment	Growth stage timing and date of application				Yield (t/ha) ± SE	
	GS30 27/04/2021	GS32 11/05/2021	GS39 01/06/2021	GS65 23/06/2021	KWS Extase	RGT Gravity
1	Untreated	-	-	-	7.46 ± 0.14	5.14 ± 0.11
2	-	-	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	-	8.58 ± 0.36	7.47 ± 0.06
3	-	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	-	8.70 ± 0.08	7.65 ± 0.06
4	-	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	Toledo 0.45 l/ha	8.98 ± 0.17	8.25 ± 0.07
5	Tebucur 250 0.5 l/ha	Phoenix 1.5 l/ha + Ascra Xpro 1.0 l/ha	Revystar XE 0.75 l/ha + Tebucur 250 0.5 l/ha	Tebucur 250 0.75 l/ha	8.81 ± 0.07	8.15 ± 0.31
LSD					0.41 t/ha	
CV%					3.0	

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Table 5: Component yield responses (t/ha) of KWS Extase and RGT Gravity.

Comparison	KWS Extase yield response (t/ha)	RGT Gravity yield response (t/ha)
Benefit of T1+T2 vs untreated	1.24	2.51
Benefit of T3 vs T1+T2	0.28	0.60
Benefit of T0 vs T1+T2+T3	-0.17	-0.15
Benefit of T1 alone vs untreated	0.12	0.18
Benefit of T2 alone vs untreated	1.12	2.33

Figure 1 and Table 4 show the yield performance of KWS Extase and RGT Gravity in untreated and fungicide treated plots. In untreated conditions (Treatment 1), KWS Extase performed better than RGT Gravity, with a 2.32 t/ha yield difference between the two varieties. However, in the fungicide treated programmes, the difference in treated yields between the two varieties narrowed with KWS Extase showing ca. a 1.1 t/ha yield increase over RGT Gravity in a 1 or 2-spray programme (Treatments 2 and 3) and ca. a 0.7 t/ha yield increase in a 3 or 4-spray programme (Treatments 4 and 5).

Table 5 shows the component yield responses for both KWS Extase and RGT Gravity in 2021. For both varieties, the bulk of the yield response came from the T2 application (1.12 t/ha for KWS Extase and 2.33 t/ha for RGT Gravity) and less from the T3 application (0.28 t/ha in KWS Extase and 0.6 t/ha in RGT Gravity).

Table 6 shows the multi-year yield responses at T0, T1+T2 and T3 for Morley, starting in 1986. The 2021 data shows the yield response for RGT Gravity. This variety was also used in the 2019 and 2020 trials. Some of these fungicide responses were negative and both negative and positive figures have been used to create the multi-year means for each timing, shown at the bottom of Table 6.

Considering the 2021 data, the mean 37 year fungicide response for T1 + T2 is now increased to 1.8 t/ha, and the fungicide response for T3 is now increased to 0.34 t/ha. Response to T0 has only been considered since 2005, thus the 17 year mean fungicide response to T0 has reduced to 0.06 t/ha. The mean total fungicide response is has increased to 2.23 t/ha.

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Table 6: Multi-year fungicide yield responses, starting from 1986 at Morley. The 2019-2021 data represents yield responses for RGT Gravity. Previous years' trials have selected varieties with moderate to high fungicide responses. Response to T0 was first recorded in 2005 and so 17 years of data is available.

Harvest	Timing		
	T0	T1+T2	T3
1986		0.69	0.05
1987		1.64	0.57
1989		2.98	0.87
1990		1.11	0.25
1991		1.12	0.60
1992		2.08	0.53
1993		1.67	0.50
1994		0.53	0.13
1995		2.06	0.13
1996		0.67	0.54
1997		2.92	1.20
1998		3.94	0.81
1999		4.69	0.41
2000		3.21	1.28
2001		0.75	0.00
2002		3.12	0.39
2003		1.88	0.40
2004		2.53	0.00
2005	0.14	2.26	0.23
2006	0.15	1.11	0.00
2007	0.19	1.05	0.64
2008	0.06	1.64	0.13
2009	0	0.91	0.22
2010	0	3.19	0.09
2011	0.06	0.64	-0.09
2012	0.2	3.76	0.59
2013	0.1	0.21	-0.03
2014	-0.09	3.97	-0.26
2015	0.14	0.33	-0.14
2016	0.1	2.39	0.12
2017	0.17	0.63	-0.19
2018	0.01	-0.30	0.75
2019	0.11	0.59	0.17
2020	-0.1	1.50	0.40
2021	-0.15	2.51	0.60
Mean response	0.06	1.83	0.34
Mean total response			2.23

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Field details

Trial Code:	WW21-05501
Trial Centre:	Morley
Trial Location:	Morley
Crop:	Winter Wheat
Previous crop:	Forage Maize
Soil Texture:	Sandy Loam
Total N/ha applied:	215 kgN/ha
Drill date:	05/11/20
Seed rate:	300 seeds/m ²
Drilled plot size:	2m x 12m
Replicates:	3
Harvest date:	18/08/21

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