KWS EXTASE

Grower's Guide

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KWS

Content

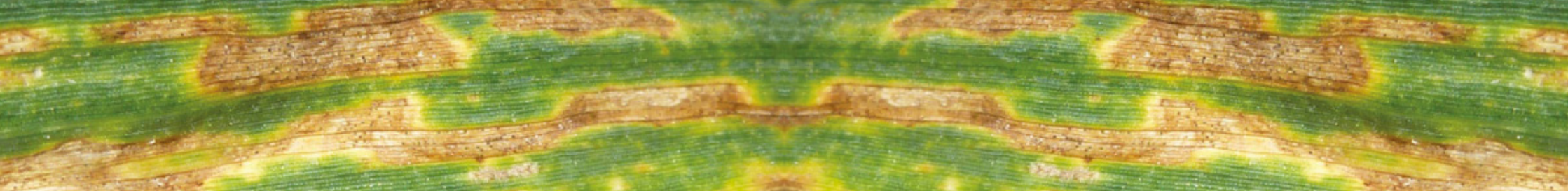
Introduction

Growers Guide

This guide is intended to give growers and professional advisers the latest information needed to get the most out of their crop of KWS Extase this growing season. Rather than being a stringent protocol, this guide aims to provide sufficient technical information, covering aspects such as varietal characteristics, regional performance and crop management strategies so that grain quality, yield potential and agronomic performance can be specifically tailored to your farming situation.

If you have any questions, or would like further information on our varieties, please do not hesitate to contact the KWS UK team (see back page for details).

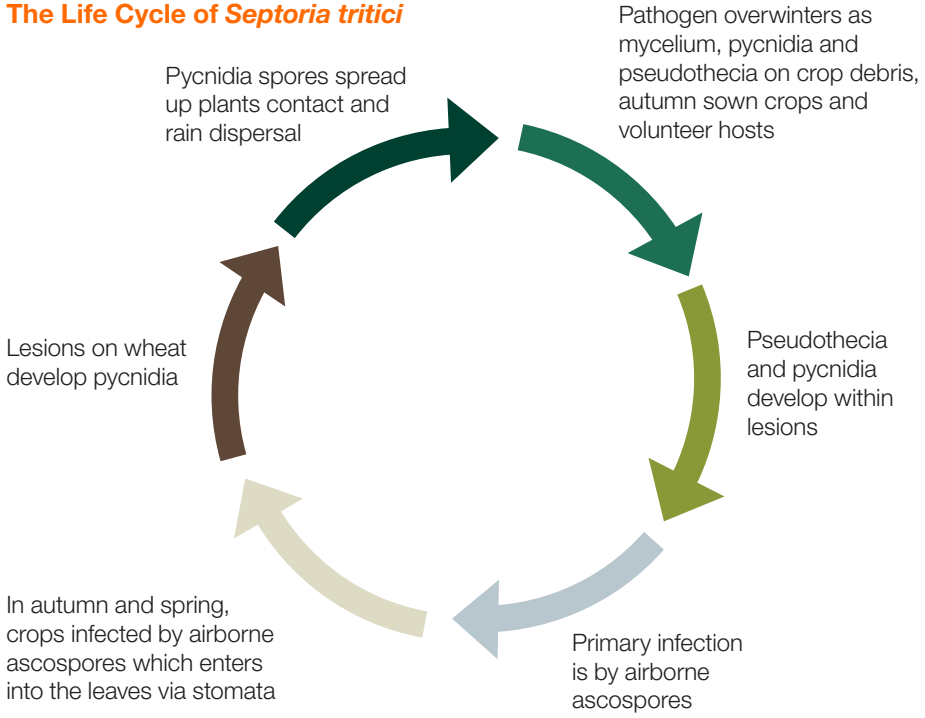
Looking ahead to harvest, wheat growers have many challenges on the horizon; future crop markets and the impact of Brexit, UK farm subsidies being to name a few. But, perhaps top of mind is the loss of chemistry from the UK amoury, the most influencial product to be withdrawn in Autumn 2019, being Chorothalonil, a non-systemic broad spectrum fungicide which has been the inexpensive backbone for the control of *Septoria sp.* in wheat since the 1960s. Whilst other, often more expensive chemical solutions are still available for use, many growers are now looking towards better varietal resistance as a key tool for the controlling *Septoria sp*. All data is sourced from ADHB Winter Wheat 24/25 Recommended List unless otherwise stated.



The Importance of *Septoria tritici*

The most destructive disease in UK wheat is *Septoria tritici* (*Zymoseptoria tritici*), which in extreme cases has been shown to reduce yields by up to 50%. Symptoms are pale brown to greenish-grey oval or 'stripe' lesions, with black pycnidia visible in the lines. A single lesion can originate from just one spore. In ideal conditions with multiple infection sites, lesions will join up to cover large areas of the leaf. Yield is lost as a result from a loss in photosynthetic capability of primarily the upper three leaf layers from infection throughout the season. There are two types of resistance mechanisms a plant can use either inherent (genetic) or adaptive (avoidance); plant breeders have been focusing on both aspects for many years.

The Life Cycle of *Septoria tritici*



Source: Ponomarenko et al., 2011 "Life cycle of the fungal wheat pathogen *Zymoseptoria tritici*"

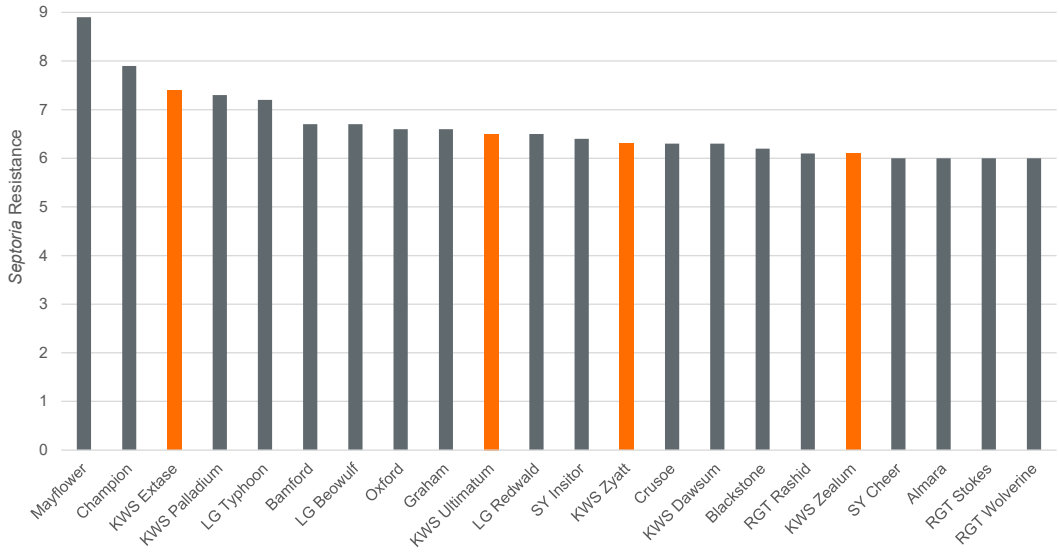
Genetics

More than 50 genes, including 20 major genes, have been identified and mapped in wheat which confer *Septoria tritici* resistance or susceptibility. Current resistances are based mostly around stacking partial resistances, which have small effects but are more durable than relying on major genes.

With a reduction in chemical control available, growers are now focusing more than ever on choosing resistant varieties, those with a resistance of 6 and above offer opportunities to save on fungicide costs, especially in lower risk seasons and later drillings. More importantly, such types can help deliver effective disease control in high pressure seasons when critical fungicide timings may slip.

If we were to re-order the Recommended List in terms of *Septoria* resistance rather than UK yield potential, then KWS Extase would rank very highly.

Ranking of winter wheat varieties with a score of 6 and above on UK 2024/25 RL



KWS Extase was also the first variety to have a *Septoria* score over an 8 on the market. The variety offers an exciting new level of resistance to *Septoria* – it will therefore be a key variety on your farm this year and beyond.

Varietal Characteristics

	KWS Extase
Breeder:	KWS Momont, Northern France
Pedigree:	Boisseau x Solheio (cross made 2008)
Parental Info:	Boisseau - a line from Azur plant breeding that brings good resistance to lodging, yellow rust, mildew and *Septoria*.
	Soleheio - a KWS Momont line with big grain and high spec weight suited to main stream breadmaking. Good resistance to yellow rust and *Septoria*.

KWS Extase in a Nutshell

Top 10 facts for KWS Extase:

1. A new era in disease resistance, the first variety to reach over an 8.0 for *Septoria tritici*
2. Unrivalled untreated yield of 93%
3. High quality Group 2 breadmaking
4. Supported by a UK National miller
5. Suited for domestic and export markets
6. Early maturity
7. Suited for sowing late September onwards
8. Extremely vigorous growth habit
9. Reliable over a range of soil types
10. Medium height variety with stiff straw

ukp

Grower's View

"On paper, KWS Extase looked like an exciting new addition to the 2019/20 RL, and having drilled it in Autumn 2018, its performance did not disappoint. This harvest is yielded well, ranging from 11.9 - 12.6 t/ha with an excellent sample of great looking wheat. What's more we sold loads into our local miller at full Group 2 specification. With the disease pressures ahead, KWS Extase is certainly a key variety we will be drilling this season and beyond.

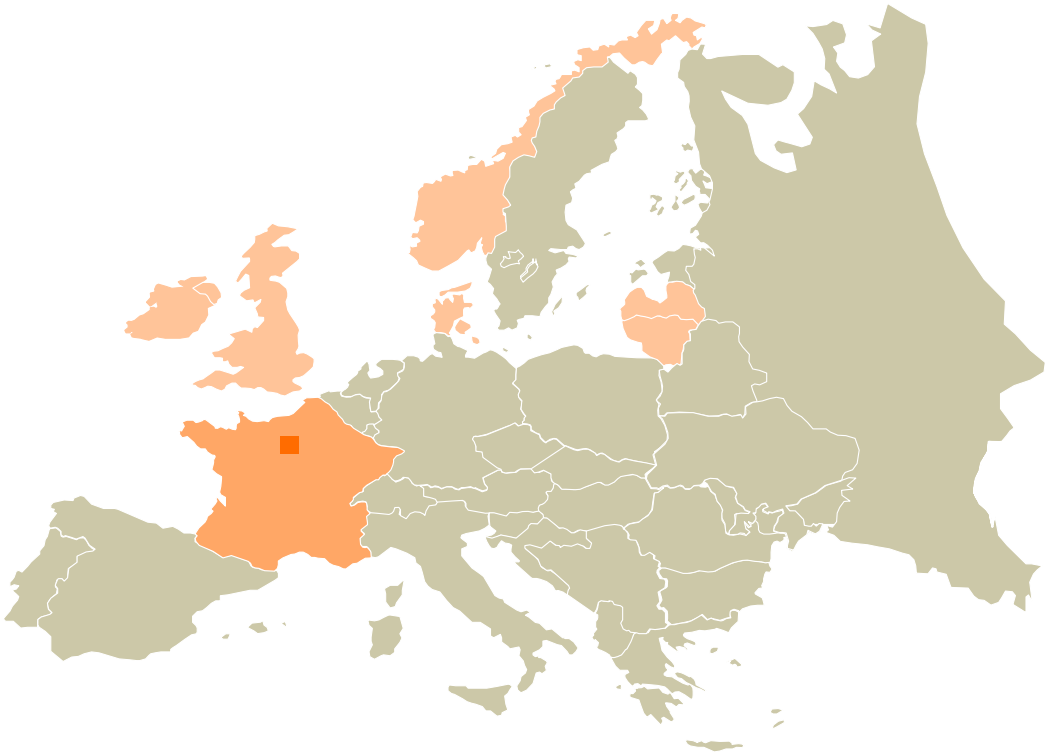
Andrew Robinson, Toddington Farms, Bedfordshire

This autumn, why grow KWS Extase?

Quite simply, KWS Extase is the most exciting variety to be recommended in recent years. Its amazing combination of disease resistance, end market appeal and field performance make it the key variety to try.

KWS Extase is a UK-adapted, nabim Group 2 milling wheat which has been developed from KWS's French breeding programme. Unusually for a winter wheat, the variety travels well and is adapted to deliver the best package of excellent disease resistance with yield and quality across the UK, France and Scandinavia.

UK:	Recommended as Group 2, November 2018
France:	Zone Nord 2017, Millers evaluation for VRM
Scandinavia:	Listed as a breadmaking type



Disease Resistance

A new era in untreated yield performance. It's headline resistance to *Septoria tritici* and unrivalled untreated yield are the showstoppers for KWS Extase. From our work at KWS, we understand that this resistance is based on a stacking a series of major and minor genes.

	KWS Extase
Untreated yield (% treated controls)	93
Mildew	7
Yellow Rust	7
Brown Rust	7
Septoria tritici	7.4
Eyespot	4
Fusarium	6

James Chapman, Trader at GrainCo Ltd

But it is not just about *Septoria* resistance, it's the combination of disease resistance figures that delivers exceptional untreated yields for KWS Extase. What's more it's not a one season wonder – over three years of official trials KWS Extase's untreated yield has been at least 21% ahead of the performance of controls; and that's in years where diseases and rain have been anything but average: *Septoria* year (NL1 2016), a rust year (NL2 2017) and a drought year (RLT 2018):

	NL1 Untrt Yield 2016 (% Untrt Controls)	NL2 Untrt Yield 2017 (% Untrt Controls)	Harvest 2018 Yield (% Untrt Controls)	Harvest 2019 Yield (% Untrt Controls)	Harvest 2020 Yield (% Untrt Controls)
	Wet weather at harvest	Variable UK crop with lodging	Drought year	High Septoria pressure	Wet autumn, high yellow rust pressure
KWS Extase	**146**	**136**	**117**	**126**	**121**
Average of controls*	100	100	100	100	100
	+ 46%	+ 36%	+ 25%	+ 26%	+ 21%

* Average of varieties used as controls - made-up of the average of Skyfall, Crusoe, JB Diego and KWS Santiago in the trial series

	Untrt Yield (% Untrt Controls)	Mildew	Yellow Rust	Brown Rust	Septoria tritici	Eyespot	Fusarium
KWS Extase	93	7	7	6	7.4	4	6
Cheer	84	[8]	7	6	6.0	4	[7]
Skyfall	66	6	3	9	5.8	6@	7

As with any variety, correct fungicide application timing is key; this is particularly important for KWS Extase because of its rapid speed of growth in the autumn and spring, which means that important spray timings may be earlier than in other varieties. KWS Extase should be some of the first crops inspected in early spring.

The most complete package of disease resistance and grain quality on the market today.

Mildew:
At a score of 7, KWS Extase has good resistance to mildew. Generally, in all but the highest of pressure situations, this disease is a low priority in structuring the fungicide programme for the season. If mildew is present it can be worth addressing early in the season so that it does not persist. It can be more viable in the absence of other diseases.

Yellow rust:
KWS Extase has good resistance (7) to yellow rust which held in high pressure season of 2019. However, the yellow rust population is increasingly diverse with large pathogen race variations across sites, seasons and fields. As the situation can change rapidly it is imprtant to monitor all varietues closely and report any unusualy sightings to the UK Cereal pathogen Virulence Survey.

Brown rust:
Brown rust will be of limited concern and easily controlled by virtually all commonly used fungicides. At a score of 6, KWS Extase has a good resistance to brown rust and only in high risk years should an ear wash fungicide with brown rust activity be advisable to reduce the potential of late season attacks. With triazole options potentially limited in seasons to come, it will be important to decide when to utilise prothioconazole or strobilurins during the season or to keep as T3 options.

Septoria tritici:
With a score of 7.4 , KWS Extase offers opportunities to save on fungicide costs, especially in lower risk seasons and later drillings. In a 'normal' year, KWS Extase can help deliver effectives disease control in high pressure seasons when critical fungicide timings may slip. We believe there are clear benefits to farmers in keeping control of production costs and securing yields when sprays are unable to be optimised. We feel strongly that we all have a roll in protecting these genetics from erosion by *septoria* races. If we cut too many corners we will increase the selection pressure in the field and erode the strength of resistances.

Fusarium:
KWS Extase has good resistance to *Fusarium* ear blight, however, as with all premium milling varieties, maintenance of quality is paramount and therefore an ear fungicide is recommended in regions where *Fusarium* is high risk.

Eyespot:
With a score of 4 on the 2024/25 Recommended List, KWS Extase does show susceptibility eyespot. In second or continuous cereal positions, and in high pressure first wheat situations, we recommend the use of an effective eyespot fungicide at T0 or T1 timings.

KWS Extase Drilled November - WW time of drilling trials, PDF East, Fowlmere

Utilising Wheat Variety Resistances to *Septoria Tritici*

KWS believes the primary role of varieties with better *Septoria* resistance are as a risk management tool.

In some situations they may offer the potential to spend less money on fungicides compared with varieties with the lowest resistances available.

Disease resistance is the ability of an organism to withstand infection from a pathogen and remain virtually unaffected.

Two types of resistance:

- Genetic
- Adaptive resistance (avoidance) RL varieties have differing levels of disease resistance
- None are immune but some show very few symptoms.
- The best *Septoria* ratings on the RL still show significant response to fungicides that more than justify a comprehensive fungicide programme.

Many of these listed so not have significant rust problems.

Many genes have been identified over the years conferring isolate specific resistance

Table 1 AHDB Winter Wheat RL 2024/25 Untreated vs Treated yields

Variety	Untreated (T.Ha)	Treated (T/Ha)	*Septoria tritici* score	Yield difference (T/Ha)
KWS Extase	10.24	11.14	7.4	0.90
KWS Palladium	9.94	10.96	7.3	1.01
SY Cheer	9.23	10.67	6.0	1.44
Bamford	10.07	11.63	6.7	1.56
LG Beowulf	10.00	11.68	6.7	1.68
Crusoe	8.83	10.49	6.3	2.30
Gleam	8.83	11.31	5.7	2.48
KWS Zyatt	7.81	10.84	6.3	3.03
Skyfall	**7.28**	**10.58**	**5.8**	**3.30**

20 major resistance genes have been mapped

Using major genes can be risky

- They work very well providing strong resistance
- Often breakdown after 'short' period of time with potentially severe consequences.

Partial resistances have much smaller effects but are additive. Most RL varieties are relying on partial resistance.

One study identified over 50 genes involved directly in either resistance or susceptibility.

There are pressures to cut the cost of production using more resistant varieties. In recent years this has been straight forward utilising CTL and cheaper, older triazoles. In a future without these products it will be more difficult to spend small amounts on programs and not leave significant disease gaps or recover poor application timings in most situations

Ongoing KWS trials try to quantify the impacts of spend and weather risks

High pressure/ high rainfall years

- Best varieties loose half the yield of lower resistances
- Robustness of programmes clear on all varieties
- Timeliness of applications critical

Medium pressure years and sites

- Poor timing results in yield loss in most varieties
- Poor timed applications can result in other diseases effecting yields
- Yield reductions of 0.2-0.5t/ha weak programmes & late timing on poorer varieties
- Minimal yield reductions in late timings and no response from bigger programmes on the better resistance varieties

Low pressure years and sites

- Yields may be limited due to other environmental factors
- Rusts could be the most predominant disease- keep up to date on races changes
- Some cutting back of inputs likely, most resistant varieties first
- Yield preservation

Varieties with better resistance bring farmers greater yield insurance. In some situations they will allow a more tailored approach to input.

Further chemical withdrawals will likely increase the cost of crop protection whilst raising the value of inherent disease resistance.

Grain Quality, Milling and Baking Performance

An approved milling wheat (VRM – varieties approved by the millers) in France, KWS Extase was approved as a nabim Group 2 wheat following 3 years of milling and baking trials.

As a nabim Group 2, KWS Extase is fully approved for UK breadmaking but may also have some specialist bakery applications; these differing end uses may attract varying market prices e.g. lower protein KWS Extase would suit UK millers' lower protein contracts. It's always best to check with your local markets on their precise requirements.

In breadmaking trials, KWS Extase produced flours and doughs similar to Group 2 controls with the resultant bread having very good oven jump and loaf height and a good light crust colour. It is no surprise that these milling properties are desired by a UK millers and buy-back contracts in are place for harvest 2024 and beyond.

KWS Extase in a commercial bake test (harvest 2018)

In addition, KWS Extase a very high HFN, excellent specific weight, and one of the best combinations of grain quality characteristics available today.

Table : Quality Characteristics of KWS Extase

	KWS Extase	SY Cheer	Skyfall
NABIM Group	2	1	1
Protein (%) milling specification	12.3	13.0	12.9
HFN	283	299	265
Specific weight (kg/hl)	79.1	79.5	89.1

Data source: 2024/25 AHDB Recommended List - Winter Wheat.

What's more, it is not just UK millers who are seeing the benefits of including KWS Extase in their breadmaking grists; the variety effortlessly meets the high W and low P/L requirements of overseas buyers purchasing UKP bread wheats to add to their recipes.

Table : Chopin Alveograph Characteristics of KWS Extase

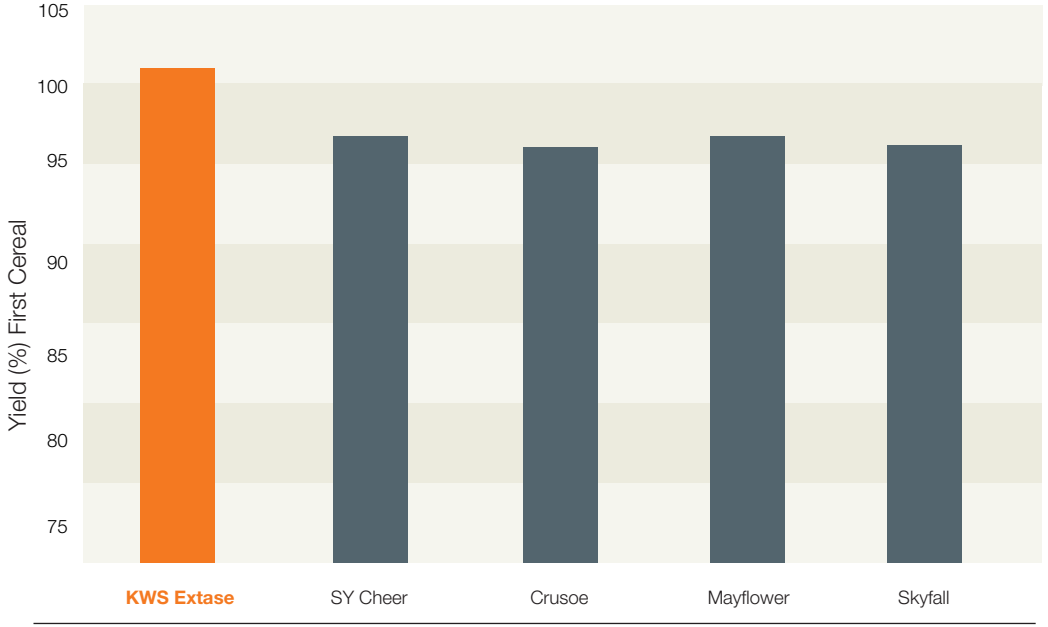
ukp

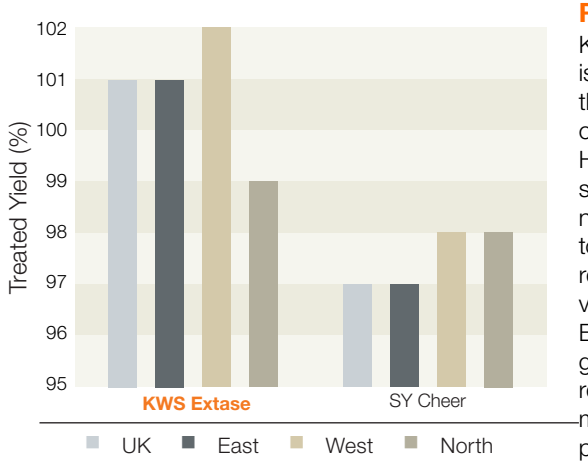
A blend of semi-hard varieties to suit both EU and non-EU bread making. W≥170 P/L ≤ 0.9 Protein 11-13%.

	KWS Extase ukp	Crusoe ukp	KWS Zyatt ukp	Crusoe ukp	Skyfall
W	203	207	-	243	-
P/L	0.7	0.8	-	0.6	-

First wheat yield potential

With an unrivalled all-round disease package, KWS Extase achieves what many other breadmaking types strive to do – the biggest heap of marketable grain with low risk. The variety has excellent yield potential which it has demonstrated continuously throughout its development; even in the challenging drought season of 2018, which compromised performance of some of the biggest yielding wheats, KWS Extase still delivered across the country.



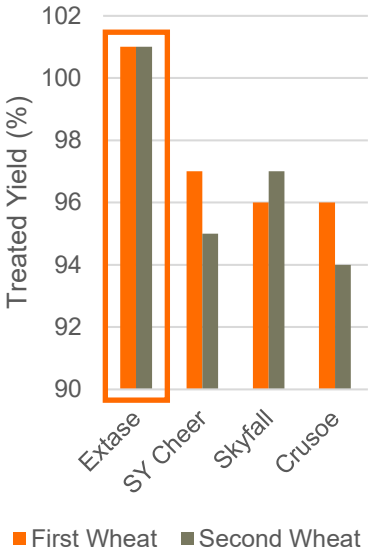


Regional performance

KWS Extase is strongest in the west, this is not unsurprising as regionally *Septoria* is the most significant disease. The challenges of this region already define variety choice. High hagberg and good fusarium and stiff straw underpin the regional performance. The north is also strong, again this may be due to prevalence of *Septoria* but yellow rust can regularly figure. An early harvest date is very valuable for getting wheat harvest started. Eastern country performance is based around good rust scores with the addition of *Septoria* resistance as a useful back up. The early movement and maturity can protect yield potential in dry spring. Early maturity wheat are an important tool in spreading workload at harvest and throughout the season.

KWS Extase as a second or subsequent wheat

Many growers grow milling quality wheat in the second or continuous wheat slot. KWS Extase performance in second wheat is good but to realise its potential it is best sown as a first wheat. It should be recognised that there are a number of trials behind the RL second wheat data especially for new varieties and no trials exploring a



Agronomic characteristics

KWS Extase has a solid agronomic package. It is a medium-tall variety with stiff straw and good resistance to lodging in the absence of plant growth regulator (PGR) applications. The variety responds well to PGRs, and a good programme is suggested to ensure that yields maybe maximised. PGRs work best when well timed so growth early season should be carefully monitored and expectations of calendar growth stages avoided.

RL data shows that KWS Extase matures at a similar rate to Skyfall, KWS information (when sown at the time time), would suggest earlier maturity (see page 24). Care must be taken in planning sowing to make the biggest advantage of earliness. Sowing later maturity crops before earlier ones can nullify an advantage. We would suggest sowing KWS Exstase before KWS Siskin. Early maturity is a key characteristic for any milling type, ensuring that grain quality is preserved, especially in a catchy harvest.

	Lodging (- PGR)	Lodging (+ PGR)	Height (cm) -PGR	Ripening
KWS Extase	7	8	92	-1
SY Cheer	8	7	91	-1
Skyfall	8	7	87	0
Crusoe	7	8	84	+1

KWS Extase

KWS Cordiale

Crop Management Strategies

Sowing Information

KWS Extase can be grown on a range of soil types, although preliminary data from AHDB trials suggests that the best yield performances may come from crops on medium to lighter land.

Time Of Sowing And Seed Rates

KWS Extase is not suited to early drilling due to its vigorous growth habit. Can be sown from the 4th week of September through to early December, depending on region. Optimum seed rates will be no different to standard UK wheats, where a spring plant population of 260 plants per square metre remains the target. As a vigorous developer, KWS Extase will compete strongly with blackgrass.

1ST- 3RD WEEK SEPTEMBER

Not recommended to be sown at this time

KWS Extase has a vigorous growth habit compared to many UK types.

4TH WEEK SEPTEMBER - EARLY OCTOBER

CONDITIONS	SOIL TYPE
Good Seed Bed 300-350	Light 300-325
Poor Seed Bed 350-375	Heavy 325-350

Main drilling window for UK milling wheats.

MID-LATE OCTOBER

CONDITIONS	SOIL TYPE
Good Seed Bed 350-375	Light 350-375
Poor Seed Bed 375-400	Heavy 350-400

KWS Extase's early maturity and speed of growth habit makes this an ideal sowing slot for the variety.

LATE OCTOBER - EARLY NOVEMBER

CONDITIONS	SOIL TYPE
Good Seed Bed 350-400	Light 350-375
Poor Seed Bed 400-425	Heavy 400-450

Getting into the late drilled variety slots. By drilling at this time tillering numbers can decrease and so early nitrogen applications are recommended to maximise tiller numbers.

EARLY NOVEMBER - EARLY DECEMBER

CONDITIONS	SOIL TYPE
Good Seed Bed 425-500	Light 425-475
Poor Seed Bed 500 +	Heavy 500 +

Potentially tough position for winter crops. Early nitrogen is key to push for a successful crop.

Crop Nutrition

KWS Extase has a vigorous erect growth habit offering a competitive plant canopy and because of the architecture, there are three factors to be considered when planning the nutritional strategy for this variety:

1. Know your end market – nitrogen strategies should be targeted at delivering 11.5 through to 13% protein as per your contract, whilst avoiding large uptakes resulting in excessive growth at stem extension.
2. Growth can start earlier in the spring compared with other mainstream UK variety types – milder UK winter months do not hold crops as would be experienced continental winters. Calendar timings of the first top dressing and T0 fungicides may be earlier than most UK variety types.
3. KWS Extase has the potential to be medium-tall strawed and so care should be taken to avoid large uptakes of nitrogen which can produce excessive growth and stem extension. Straw strength should not be overlooked so a nutritional strategy in combination with PGR applications required advanced planning.

Fertiliser Requirements and Application Timing

Fertiliser recommendations should always be based around RB209 and not exceed nitrate vuntrable zones (NVZ) crop N maxs. Recommendations should be received from a FACTS qualified advisor.
The aims of the fertiliser strategy should be to a balance for the crops needs with regard to crop structure, soil nitrogen availability and total crop requirements to achieve the aims. Total amounts applied would vary between site, season and soil reserves.

When meeting the crop's nutrient requirements the intention should always be to ensure a steady but consistent supply through the growing period. Whatever product you choose to apply, KWS suggest a three-way split of nitrogen to meet crop needs.

Early spring management should target a plant population of 260 plants/ m2. Each plant may be carrying between 3 and 4 tillers, giving a total of just under 1000 tillers in early spring. More than this number creates a structure which is hard to support and this level is adequate to achieve the targets set.

From GS31 back tillers start to die off. The AHDB wheat growth guide indicates 30% of final nitrogen will be taken up at this point. This is the time when temptation is greatest to apply a large dose. While there are good arguments for this in some years and areas due to the weather patterns, it will increase the retention of unnecessary tillers and lead to increased lodging risk. There is no substitute for spring tiller counting to justify decisions.

50% of total nitrogen is taken up in the period between first node and flag leaf. A further 20% is taken up between flag leaf and flowering GS61. Roughly 70% of the final nitrogen demand of the crop should be in the plant inside this construction phase. Only a small amount of nitrogen is taken up by plants after flowering (30kg/ha).
Most grain protein will come from redistribution from stems, leaves and roots.

Crops that are too thick may not have enough reserves in each tiller to achieve 13% proteins. Crops than are too thin, sub 400 ears/m2 may reach high proteins but yield has been missed. Final ear numbers should aim to reach around 500 ears/m^2. Ear counts completed around flowering time are easily carried out before ears start to neck over making counting more difficult.

Additional Nutrients

Nitrogen is the key driver in crop yields. Its utilisation is only as good as the crops next limiting nutrient. Phosphate and potash are rarely considered limiting factors on most soils but at certain times of year or under conditions of stress their availability is critical to build the crop architecture, resist stress and help nutrient efficiency and water transportation. Applications containing sulphur should be routine in milling crops to ensure efficient protein assimilation. Trace elements are an important addition on many soils. Much of the requirement will be based on field history. Additional applications are justifiable on higher value crops such as milling crops. Crops should be monitored closely throughout the season so any elemental deficiencies can be addressed quickly.

PGR Strategy

We recommend a comprehensive programme to limit stem height this variety, promote tiller retention and provide good anchorage. A robust T0 & / or T1 are advised. Chemicals available will include Chlormequat and Trinexapac-ethyl would be advised. Depending on drilling date and crop thickness, we would recommend a robust dose of a late season PGR such as Terpal* or Cerone*.

*Terpal and Cerone are registered trademarks of BASF and contain 2-chloroethylphosphonic acid and Mepiquat chloride.

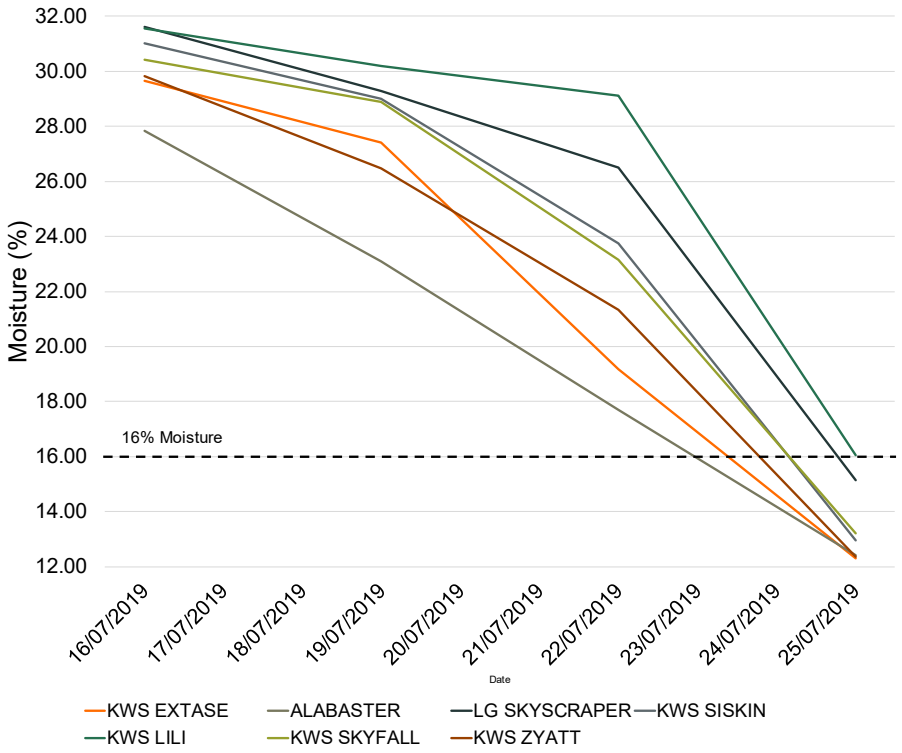
Wheat Orange Blossom Midge (WOBM)

WOBM continues to be a key consideration in the summer months, particularly in the East and South of England. KWS Extase does not have resistance to this pest and so the correct use and timing of approved insecticides is recommended, where thresholds are reached, to ensure milling quality is achieved. Early maturing KWS Extase will be one of the first varieties on farm to reach ear emergence and consequently should be monitored and treated first where necessary.

Harvesting and Storage

As with any variety grown to achieve a premium market specification, attention to detail at harvest is vital. Thanks to KWS Extase's early maturity, it will be one of the first varieties to be ready and the good grain quality package will benefit growers at harvest. As the graph below shows, in KWS trials at Thriplow in 2019, KWS Extase was earlier to mature than current Group 1 wheats Skyfall and KWS Zyatt and just behind our specialist white wheat, KWS Alabaster.

Drydown - Milling (Group 1 & 2) in KWS trials, Harvest 2019



Further Information

If you need any further information or advice on growing KWS Extase, then please email us at: **info@kws-uk.com** or telephone **01763 207300**.

For more about KWS UK Ltd and our other varieties, please visit our website at: **www.kws-uk.com**

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