Husbandry Guidelines

NICKERSON

Rothwell, Market Rasen, Lincolnshire, LN7 6DT

Tel: 01472 371471 Fax: 01472 371386

Web Site: www.nickerson.co.uk/xi19.html

E-mail: enquiries@nickerson.co.uk

Xi19

WINTER WHEAT

Introduction

Breeders are always seeking out the rare variety that seems to break all the rules and set new standards. Xi19 is such a variety. Developed from the cross between two moderate quality bread-making varieties (Rialto and Cadenza) the selection, Xi19, combines a unique combination of very high bread-making quality and very high yield potential.

This in itself sets new challenges for growers as they seek to capture the real value of this exciting variety. In many respects some of the perceived agronomy strategies of the past need to be re-visited and updated. These husbandry guidelines seek to fulfil this remit as we have been able to take advantage of a large amount of trials data and grower feedback. In addition we have been able to draw on the experience of utilising new chemistry to maximise output and consequential profitability.

Xi19 sets new standards and set growers new challenges. We hope that utilising information provided here will allow growers to meet those challenges and enjoy the benefits of a variety that has set new quality and yield standards.

Key Points

- **Excellent bread-making quality**
- **HGCA Recommended**
- **Nabim Group 1**
- **Highest Group 1 yield**
- **Good agronomic characteristics**
- **For sowing beginning of October onwards**
- **First & second wheat**

Market

- **Bread-making**

Xi19
WINTER WHEAT

Xi19 - Position in the Market

Xi19 produces grain highly suitable for domestic use in the production of flour for bread-making. Prior to its addition to the HGCA Recommended List in 2002, Xi19 was thoroughly tested by end users in the milling industry. Xi19 performed consistently in this evaluation and, following HGCA recommendation, was placed in nabim Group 1 as a variety suitable for inclusion in all grists.

Used by kind permission of Rank Hovis.

The principle requirement of a bread-making variety is that when made into flour it produces a loaf with a good volume and fine crumb structure. The baker looks for varieties that have a good balance of extensibility and elasticity, in technical parlance, the rheological characteristics. Good extensibility allows the dough to rise in response to yeast activity, whilst elasticity permits the gas produced in fermentation to be retained. Together these properties ensure the loaf has a good volume and crumb structure.

In addition, the variety should also have a high rate of flour extraction, an acceptable capacity for the absorption of water and produce flour with a pleasing white colour that appeals to the consumer.

Xi19 has demonstrated excellent milling characteristics, producing white flour at a high rate of extraction. Its rheological properties have also been very acceptable and Xi19 has remained in nabim Group 1 since being placed there in 2002.

The traits outlined above are largely determined genetically and are inherent in a specific variety's genetic composition. In common with other markets for wheat, grain destined for bread-making has to meet quality specifications for specific weight, Hagberg Falling Number and protein content. These are influenced by crop agronomy and environment, and are addressed in these Husbandry Guidelines.

Xi19 - Pedigree and Selection Mechanism

Pedigree: Xi19 = (Rialto x Cadenza) x Cadenza

Xi19 was selected from a cross between the winter wheat variety, Rialto, and the alternative wheat, Cadenza. Both parents were successful commercially and combined high yield potential with good bread-making quality. The resulting selection (Xi19) was an improvement over both parents (table 1) - a variety with very high yield potential, excellent bread-making quality and good agronomic characteristics.

Table 1. Yield, Agronomic and Quality Characteristics

	Xi19	Rialto	Cadenza
Treated Yield (% controls)	103	97	95
Lodging PGR Treated (%)	11	5	8
Straw Length (cm)	96	96	102
Days to Ripening	304	305	301
Resistance to:			
Mildew	8*	6	7
Yellow Rust	9	6	9
Brown Rust	8*	4	9
Septoria tritici	5	5	5
Septoria nodorum	6	6	4
Fusarium Ear Blight	5	5	6
Eyespot	4	6	5
Endosperm Texture	Hard	Hard	Hard
nabim Group	1	2	2
Protein Content (%)	11.7	12.7	12.7
Hagberg Falling Number	282	197	246
Specific Weight (kg/hl)	75.8	77.3	77.3

Source: NIAB Classified List 2006

* Note: data differs from HGCA Recomended List 2007/08 as sourced from different datasets

The use of double haploid technology in the selection process enabled a true breeding line to be developed rapidly, with grain quality and agronomic characters fixed early on in the process.

Electrophoresis and baking tests were used to confirm the bread-making quality and identify the presence of desirable high molecular weight protein sub-units and good rheological properties.

Xi19 - Yield Potential

Xi19 is an impressive variety with relatively long straw and large ears. Physiological studies looking at components of yield suggest the variety tends to produce fewer tillers than average with an optimum ear number and a high number of grains/ear (table 2).

Table 2. Components of Yield

	Max No. of Tillers/Plant (GS 31)	Ears/m² (at harvest)	Grains/Ear	TGW (gm)
Xi19	**4.8**	**627**	**44.5**	**44.5**
Consort	5.8	691	39.8	34.2
Claire	4.0	608	39.6	35.1
Solstice	4.6	570	41.5	41.6
Trial Average	5.2	660	39.1	40.1

Source: Scientific and Technical Services 2002

This combination of large ears, numerous grain sites and good grain size all contribute to Xi19's high yield potential which is supported by data from independent trials managed by HGCA and The Arable Group (TAG).

The HGCA trials are managed with high levels of fungicide input to evaluate a variety's genetic potential. Xi19 is by far the highest yielding nabim Group 1 variety, 10 % higher yielding than Malacca, 11% higher than Hereward and comparable with the feed varieties Alchemy and Gladiator. When grown without fungicide treatment Xi19's yield advantage is 7% over Malacca and 4% above Hereward (table 3).

Xi19 has maintained its position at the top of Group 1 for yield consistently over the past five years in trials.

Table 3. Treated and Untreated Yields

	Treated Yield (% controls)	Untreated Yield (% treated controls)
Xi19	**104**	**81**
Malacca	94	74
Hereward	93	77
Alchemy	105	90
Gladiator	105	83

Source: Data from the HGCA Recommended Lists database, full data at www.hgca.com

The HGCA trials test varieties throughout the UK under a wide range of climatic conditions. Xi19 has shown a very high level of performance in all three HGCA regions and yielded particularly well in the Eastern region, the main growing area for bread-making varieties.

The HGCA system tests varieties over a range of rotational positions: as a first or second cereal, when early or late sown and on light and heavy soil types. Xi19 is unusual in the nabim high quality Group 1 sector in that it has performed well when sown as a first or second cereal (table 4).

Table 4. Performance as Second Wheat

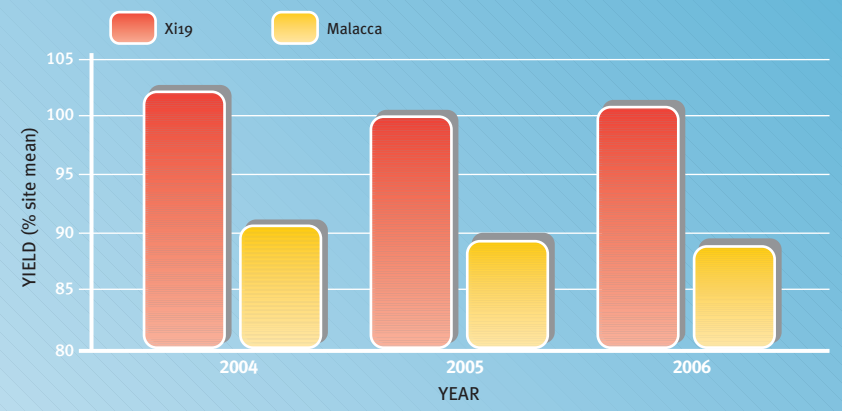
	Rotational Position	
	First Cereal	Second or More Cereal
Xi19	**103**	**104**
Malacca	94	96
Hereward	93	93

Source: Data from the HGCA Recommended Lists database, full data at www.hgca.com

Xi19 is very well suited to a range of soil types and has been proven to be an excellent choice for higher yielding situations. If tempted to drill in September, growers should consider Solstice winter wheat as a preferred option.

Trials conducted by TAG (chart 1) are managed according to 'best local practice' and reflect the level of input that would be used on many commercial farms. At this more realistic level of input, Xi19 has continued to outyield Malacca by 11% averaged over the last three seasons.

Chart 1: Yields of Xi19 and Malacca 2004 - 2006



Source: TAG Descriptive List Trials 2004 - 2006.

Xi19's agronomic type and speed of apical development make it ideally suited for sowing later in the season after root crops, such as potatoes and sugar beet. HGCA conduct trials comparing the performance of varieties when sown in the late autumn. Xi19 has continued to produce excellent yields when sown at this time with the additional benefits of less straw and an improvement in resistance to lodging when PGR treated, as table 5 below shows:

Table 5. Xi19 Performance when Late Sown

	Late Autumn Sown Trials	RL Trials
UK Yield % Treated Controls (t/ha)	108 (9.7)	104 (10.2)
Crop Height (cm)	83	94
Resistance to Lodging, with PGR (1-9 scale)	8	7

Source: Data from the HGCA Recommended Lists database, full data at www.hgca.com

Sowing Xi19 in the late autumn reduced crop height by 11 cm and improved the lodging resistance rating by 1 in comparison with the RL trials sown earlier.

Late autumn drilling does reduce yield potential and growers should seek to exploit this later drilling slot by capturing the higher protein content resulting from lower yield potential. Xi19 growers now have the optimum selection – high yield potential with high bread-making quality.

Xi19 - Place in Rotation

Xi19 is a consistent performer from a range of sowing dates. Growers should, however, be selective in their use of varieties. Xi19 is not suited to early drilling, with its optimum drilling date in first wheat situations being targeted at the beginning of October onwards. The variety is ideally suited to later sowings, producing high quality grain from sowings following sugar beet and potatoes.

Unusually for a high quality variety, Xi19 has performed consistently well as a second wheat, although careful attention to managing eyespot in this situation is important (see table 4).

Xi19 - Sowing Date, Seed Rate and Seed Treatments

In response to increasing workloads on farm, the sowing date for winter wheat has moved earlier into September in recent years. One of the key factors in determining whether a variety is suitable for early September sowing is its speed of apical development. Those with relatively fast development will switch from vegetative (leaf) to reproductive (ear production) growth early in the spring at a time when weather conditions can adversely affect the embryonic ear and hence final grain yield.

Xi19 has an unusual pattern of apical development. It is not suitable for sowing in early September as it develops very rapidly in response to both temperature and day length. From late September onwards, Xi19's speed of apical development is slower - making it suitable for sowing from October onwards.

Xi19 has a low vernalisation requirement – the period of cold required to ensure the plant switches from vegetative growth to reproductive growth – and may be safely sown later than many other winter wheat varieties. In trials Xi19 has been sown up until the end of February (HGCA Recommended List) without detriment. The latest safe sowing date will depend on geographical location and the likelihood of the crop receiving sufficient vernalisation after sowing to produce ears. Xi19 is not a true spring wheat and, if considering spring sowing, wheat growers should consider the variety Tybalt as a preferred option.

With greater flexibility in sowing date particular attention should be paid to selecting the appropriate seed rate for Xi19. For guidance the following seed rates are suggested but must be adjusted for conditions at drilling (table 6):

Table 6. Seed Rates (seeds/m²) for Xi19

	Time of Sowing					
	October	November	December	January	February	March
Seeds/m²	250 - 300	300 - 350	350 - 400	400 - 425	400 - 425	350 - 400

These seed rates are based on sowing into seedbeds where establishment is likely to be good. Under less favourable conditions they should be increased by 40–50 seeds/m² to allow for losses during establishment. Lower seed rates will be necessary where lodging is likely to be a risk, for example where fertility is high.

All Xi19 seed should receive a single purpose seed treatment as standard in order to control the commonly occurring seed borne diseases. Where take-all risk is high (second or third cereal crops) a specific dressing – such as Latitude (silthiofam) or Jockey (fluquinconazole) - should be considered. Insecticide seed dressings can be useful in providing protection against aphids carrying barley yellow dwarf virus (e.g. Deter, clothianidin) or wheat bulb fly (Evict, tefluthrin).

Xi19 - Herbicides

Xi19 is sensitive to products containing chlortoluron. Growers should seek advice as to which herbicides not containing this chemical should be used for weed control.

Xi19 - Plant Growth Regulator (PGR) use

Xi19 has relatively long straw and is very responsive to plant growth regulator (PGR) applications which reduce crop height and improve resistance to lodging. A trial conducted by Arable Research Centres (TAG) clearly illustrated the benefit of using a sequence of PGRs on Xi19 to reduce crop height and subsequent lodging (chart 2/3).

Chart 2: Crop Height

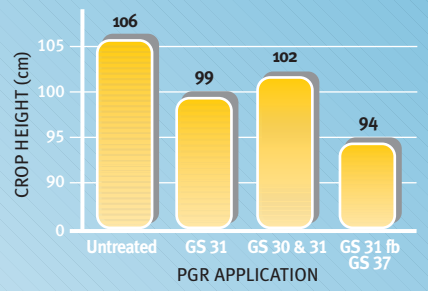
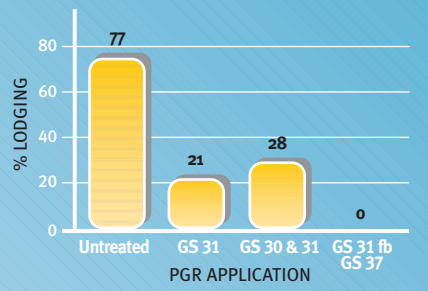


Chart 3: Lodging

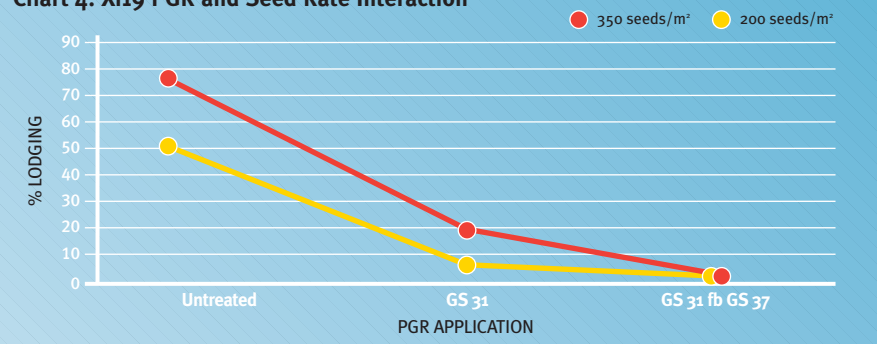


Source: ARC 2002

The trial was located on a fertile site which produced a tall crop with significant lodging in the untreated plots. PGR treatments reduced crop height by between 7cm and 12cm with the sequences having the greatest effect. Lodging was reduced from 77%, where no PGR was used, to zero, where a chlormequat/Terpal sequence was applied, with a statistically significant increase in yield. Chlormequat applied either as a single or split application was also useful at reducing lodging.

The effect of reducing seed rate was also investigated in the same trial (chart 4) by comparing rates of 350 and 200 seed/m² sown (equating to approximately 260 and 150 plants/m² established) in conjunction with (fewer) PGR treatments.

Chart 4: Xi19 PGR and Seed Rate Interaction



Source: ARC 2002

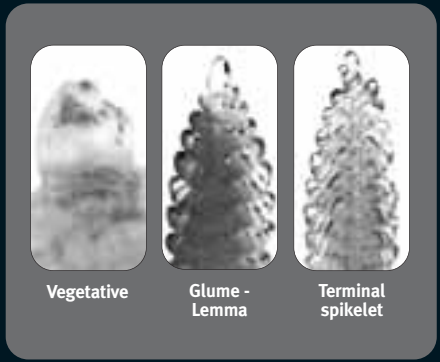
Using the lower seed rate reduced lodging from 77% to 52% without any PGR application. A single dose of chlormequat was very effective at the lower seed rate, reducing lodging to 6%, with a Terpal sequence again eliminating lodging. The reduced seed rate had no effect on crop height or yield and the single chlormequat treatment produced a significant yield increase.

This trial illustrated the role that lower seed rates (and plant populations) can play in managing lodging with Xi19 and the importance of matching a PGR programme to the lodging risk: more plants equating to greater risk and requiring a higher PGR input; lower populations requiring less intensive PGR use.

Crops of Xi19 sown later in the season will be less likely to lodge than those sown earlier. Later sowing reduces crop height and improves Xi19's standing power when PGR treated.

In summary, the Nickerson guidelines for reducing lodging on Xi19 are to use a combination of PGRs and good agronomic practices:

- An early season PGR to work predominately on the lower part of the stem. Applications according to apical development give the most effective results, shortening the first internode and increasing straw stiffness. Xi19 should be treated with an application of chlormequat split between glume primordia stage (2/3 dose) and terminal spikelet (1/3 dose) with Moddus (trinexapac-ethyl) or Meteor (imazaquin and chlormequat) added in high-risk situations or where a split chlormequat application is not possible. Alternatively Canopy (prohexadione-calcium + mepiquat chloride) could be used.



Primordia development stages in wheat

- A late season ethephon-based PGR (such as Terpal) applied between GS 33 and GS 39 should only be considered if the risk of lodging remains high late in the season. Such products should be utilised with care as their application at the later growth stages (particularly at high rates) can cause physiological problems which could affect yield potential.
- The use of lower seed rates, later sowing and avoiding early applications of nitrogen, especially where crops are forward or have high tiller numbers, are all good agronomic strategies which may be used to good effect on Xi19.
- Growers should seek up-to-date advice on the permissible rates and timings of chlormequat based products.

Xi19 - Disease Resistance

A high level of durable genetic disease resistance is a key target in Nickerson's breeding programmes.

Table 7 (below) gives the disease resistance ratings for Xi19 and other nabim Group 1 varieties.

Table 7. Xi19 Disease Ratings

	Resistance to: (1-9 scale)						
	Mildew	Yellow Rust	Brown Rust	*Septoria nodorum*	*Septoria tritici*	Eyespot	*Fusarium* Ear Blight
Xi19	**7**	**9**	**7**	**6**	**5**	**4**	**5**
Malacca	6	9	6	7	5	4	6
Hereward	6	5	5	6	6	4	5
Solstice	4	9	4	6	5	4	6
Mascot	6	5	5	(6)	5	6	-

( ) = limited data

Source: Data from the HGCA Recommended Lists database, full data at www.hgca.com

Septoria tritici is the most widespread and damaging disease of winter wheat and resistance to this disease is the benchmark by which most varieties are judged. Xi19 has an acceptable level of resistance to *Septoria* and is comparable with the other Group 1 varieties in this respect. This resistance used in conjunction with a well targeted fungicide programme and later sowing means Xi19 can be managed to give the highest level of *Septoria* control and deliver its full genetic potential.

Septoria tritici is the most damaging disease of winter wheat - Xi19 has an acceptable level of resistance to this disease

Yellow rust - Xi19 has excellent resistance

Xi19 has excellent resistance to yellow rust (*Puccinia striiformis*). The use of genetic marker technology has shown this is polygenic and is believed to be durable. It also has very good resistance to brown rust (*Puccinia recondita*). With an inherently high level of resistance to both yellow and brown rusts, triazole fungicides used for *Septoria* control on Xi19 should be more than adequate to control these diseases as well.

Eyespot will need to be monitored in Xi19. This photo demonstrates the difference between resistant (R) and susceptible (S) varieties

Powdery mildew (*Blumeria graminis*) resistance for Xi19 is also good and this disease should not require routine treatment other than in high risk situations. Crops sown in the late autumn or winter with plentiful 'soft' growth in the spring, particularly on lighter soils, may require a specific mildewicide (see below).

Powdery mildew - Xi19 has good resistance

The development of eyespot (*Oculimacula yallundae* and *Oculimacula acuformis*) will need to be monitored on Xi19, with thicker crops on the heavier soil types being most at risk. A number of risk factors need to be considered when deciding to treat for this disease. These include: the preceding cereal crop, soil type, sowing date, cultivation technique, spring weather conditions and the correct identification of disease at the stem base. HGCA Topic Sheet 80 (Determining eyespot risk in winter wheat) provides a useful risk assessment table to aid decision making.

Xi19 has average resistance to *Fusarium*

Xi19 has average resistance to *Fusarium* ear blight and, as with most bread-making varieties, a well-timed, post flowering (T3) fungicide provides the best approach to obtain reasonable control of this disease and maintain grain quality, particularly specific weight.

Xi19 - Fungicide Programmes

Fungicide programmes for Xi19 should take into account its resistance to the individual diseases outlined earlier. The aim should be to keep the crop clean to the ground but the flag leaf and top two leaves are particularly important with respect to grain filling. It is particularly important that *Septoria tritici* is controlled very effectively and the development of eyespot monitored during the spring.

To (Pre GS 30)

Xi19 is unlikely to require a routine To fungicide in the majority of cases unless early season mildew is present.
In this case products such as Talius (proquinazid) and Flexity (metrafenone) with good protectant activity should be chosen, the latter also giving some early eyespot control.

T1 (GS 31-32)

A reduced rate triazole (e.g. Opus, epoxiconazole) with chlorothalonil will be effective against any *Septoria* present at this time, ideally applied to coincide with the emergence of leaf three.
If eyespot is also a threat then Proline (prothioconazole) or Tracker (boscalid + epoxiconazole) should be considered.

T2 (GS 37 – 39)

Aimed at keeping the flag leaf clean, a robust rate of Opus with chlorothalonil has proved to be very reliable at this timing.

T3 (GS 60 +)

An ear emergence fungicide is **essential** for a quality wheat such as Xi19 to maintain earlier disease control, protect the ear against late disease infection, and help to improve specific weight. Swing Gold (dimoxystrobin + epoxiconazole) or Amistar (azoxystrobin) + a triazole perform well on the ear - if targeting *Fusarium* specifically the timing needs to be closer to flowering.

Xi19 - Nutrition

NITROGEN

Xi19 has tended to produce lower than average protein contents in official trials – a reflection of its very high yield potential. Protein **content** can be improved by husbandry, particularly nitrogen application, whilst protein **quality** is primarily a genetic trait which is selected in the breeding process.

Independent trials over many seasons have established that it is possible to achieve both high yield and 13% protein with Xi19 at nitrogen levels in line with current practice for managing milling varieties. The important aspects of nitrogen management for Xi19 are the **total amount of nitrogen required** and **its time of application.**

- **The Total Amount**
  The yield potential of Xi19 is similar to that of feed varieties and additional nitrogen will be required to enhance protein content to meet specifications. With increasing scrutiny on nitrogen use it is imperative that growers can justify the amount of fertiliser applied. The use of DEFRA 'Fertiliser Recommendations for Arable Crops' RB 209 provides a useful reference point although it is widely accepted that this tends to underestimate the amount of nitrogen required for modern, high yielding bread-making varieties. RB 209 suggests using grain nitrogen concentration as a guide to determine whether nitrogen use is correct: *'The grain nitrogen concentration at the economic optimum rate of nitrogen is about 2.2% N for bread-making wheats. Where concentrations are above or below these values, fertiliser rates should be adjusted by 30kg/ha per 0.1% difference in grain nitrogen'*.
  When calculating the total amount required site specific factors such as soil fertility, previous cropping, soil type, use of organic manures and over winter rainfall should be considered all of which contribute to the soil nitrogen supply.

Take advice from a FACTS qualifed adviser when determining fertiliser rates.

- **Time of Application**
  Given that many Xi19 crops are likely to be later sown, a three dose approach should only be considered for late sown, poorly established crops or second/continuous wheats. Where crops have plenty of tillers or the soil nitrogen supply is high, a two-way split is preferred and applying nitrogen before terminal spikelet should be avoided because it is only likely to increase disease pressure and lodging risk.

The amount of nitrogen at each timing for a three-way split should be:

- **First application** (thin or badly established crops or second wheats): Up to 40 kg/ha in mid-March (at the start of spring growth). Where take-all risk is high, the rate could be increased slightly.
- **Second application:** The main dose for yield of about 100kg/ha.
- **Third application:** The balance of the nitrogen required for yield and also to increase grain protein.

Where a two-way split is chosen this should be divided between mid-April (50 - 60%) and mid-May.

RB 209 suggests that an additional 40kg/ha may be applied to boost grain protein in some circumstances. Past experience and measurement of grain protein levels achieved will provide guidance on whether this is necessary.

Sulphur applications will improve loaf volume

The extra fertiliser may be applied as a solid with the final application in May or as liquid urea after flowering (GS 69 – 79). The latter approach is often more effective at enhancing grain nitrogen (and hence protein content) but can cause scorching of the upper leaves and is not accepted by all end users; check with your merchant or buyer before using this method.

SULPHUR

It is now widely accepted that many soils throughout the UK are deficient in sulphur following a decline in atmospheric levels since the 1970s. Sulphur is essential for both the crop's utilisation of nitrogen and protein quality of grain. A deficiency will affect bread-making quality, specifically loaf volume, so it is important that crops destined for bread-making are not lacking in sulphur. Crops of Xi19 being grown on the lighter sandy or chalky soil types are most at risk but the deficiency is becoming more widespread on other soil types.

Given that the consequences of sulphur deficiency can be quite significant, an application of 15 – 20kg S/ha (38 – 50 kg SO_3/ha should be included with the first nitrogen application. Later applications may not be as effective at eliminating sulphur deficiency in crops or enhance grain protein quality.

Xi19 - Grain Quality

Xi19 is a hard endosperm nabim Group 1 variety likely to gain a full bread-making premium provided that the miller's specifications for protein content, Hagberg Falling Number and specific weight are met. Xi19 has been a consistent performer in nabim tests over a number of seasons, producing a good combination of high flour yield and excellent flour colour. Both loaf volume and crumb structure in baking tests have been consistently good, similar to Hereward. Xi19's grain quality characteristics are summarised in table 8 below:

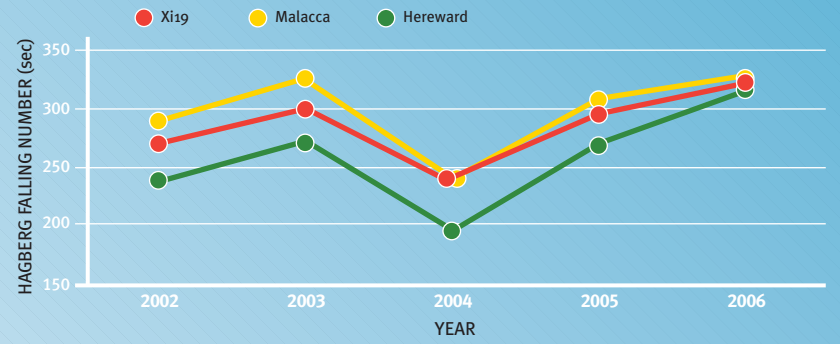
Table 8. Xi19 Grain Quality Characteristics

	nabim Group	Endosperm Texture	Protein Content (%)	Hagberg Falling No. (secs)	Specific Weight (kg/hl)	Thousand Grain Weight (gm)	Resistance to Sprouting
Xi19	**1**	**Hard**	**11.7**	**280**	**75.7**	**52.0**	**6**
Malacca	1	Hard	12.4	298	75.2	45.7	6
Hereward	1	Hard	13.2	241	79.1	48.7	6

Source: Data from the HGCA Recommended Lists database, full data at www.hgca.com

Xi19 has a high Hagberg Falling Number and is more akin to Malacca than Hereward for this trait. HGCA survey data taken from commercial crops over numerous seasons show the reliability of Xi19 for this important character (chart 5):

Chart 5: Hagberg Falling Number 2002 - 2006



Source: HGCA Cereal Quality Surveys 2002 - 2006

Testing for bread-making quality at Nickerson's Breeding Station

In four of the five survey years, Xi19's Hagberg Falling Number has been comfortably above the minimum of 250 required to meet the nabim Group 1 specification and in the wet year of 2004 it was significantly superior to Hereward.

Although Xi19 has a reliable Hagberg and good sprouting resistance growers should give it a high priority at harvest, aiming to start combining as soon as the moisture content is suitable.

A specific weight of 76 kg/hl is normally required to meet the nabim Group 1 specification and, if managed correctly, Xi19 samples should meet this.

Specific weight can be influenced by:

- Using a T3 fungicide to keep the ears disease free and prolong grain fill
- Avoiding lodging through PGR use, nitrogen timing and correct seed rates
- Prompt harvest to avoid weathering of the grain

Grain quality (particularly specific weight and Hagberg), and therefore marketability, can also be severely reduced by attack from Wheat Orange Blossom Midge (WOBM). In common with the other Group 1 varieties, Xi19 does not possess any genetic resistance to this pest. WOBM is an opportunistic pest that occurs in a proportion of wheat crops every season, particularly in East Anglia and Southern England. Growers of bread-making varieties should use control measures once the threshold of one midge per six ears is reached at early ear emergence (GS 55 – 59). Please refer to the HGCA leaflet 'WOBM Assessment and Control' for further information.

Some crops of Xi19 have been infected with ergot (*Claviceps purpurea*) in difficult years. Growers should be alert to the problem and controlling insect pests prior to and during the flowering phase will reduce the risk. Growers should consult the Einstein husbandry guidelines for an in-depth analysis of the problem.

Xi19 - Financial Return

Xi19 has a very high yield potential and the capability to produce nabim Group 1 quality if managed in the appropriate manner. An investment in extra nitrogen fertiliser – with an associated additional cost - is clearly necessary if grain protein levels approaching 13% are to be achieved.

Growers will naturally be concerned as to whether this is likely to be cost effective, especially at current nitrogen prices. Nickerson calculations suggest that Xi19 will produce an excellent return over nitrogen expenditure and is superior to the other nabim Group 1 varieties in this respect.

In the example below (table 9) a gross output has been calculated for Xi19, Malacca, Hereward and a feed wheat using HGCA RL yields and grain prices of £75/t plus £15/t premium.
The optimum nitrogen rate is based on data from independent trials that found Xi19 is likely to require about 90 kg N/ha more than Hereward and 30 kg N/ha more than Malacca to achieve 13% protein in comparable situations. Deducting the nitrogen cost from the gross output gives a margin over nitrogen/ha.

Table 9. Margin over Nitrogen Cost

	Yield (% treated controls)*	Yield t/ha (100=10.2)*	Gross Output (£/ha)	Optimum Nitrogen (kg/ha)	Cost of Nitrogen (£/ha)	Margin over N (£/ha)
Xi19	**104**	**10.6**	**954**	**290**	**131**	**824**
Malacca	94	9.59	863	260	117	**746**
Hereward	93	9.49	854	200	90	**764**
Feed Wheat	108	11.02	827	220	99	**728**

Source: *HGCA RL 2007 - 8; Grain £75/t + £15/t premium; nitrogen 45p/kg

This analysis clearly shows that although Xi19 is likely to require a greater nitrogen input than Malacca, Hereward or a high yielding feed wheat, this is more than compensated for in the final margin over fertiliser expenditure and showing Xi19's superior potential over these varieties.

Historically, growers have not had the opportunity to grow a very high quality wheat with a similar level of performance to the feed or biscuit varieties. Quality has always been associated with lower yield potential. Xi19 is a significant step forward in wheat breeding, challenging the negative yield/quality relationship and offering growers the opportunity of excellent margins.

Xi19 - Husbandry Summary

- Sow from early October through to March; do not sow very early
- Match seed rate to sowing date and lodging risk
- Go later rather than earlier with spring nitrogen with the majority after first node; use sulphur routinely
- Do not compromise either yield potential or grain protein content with low rates of nitrogen
- Use a three-spray fungicide strategy to control *Septoria* and give a long grain fill
- Use a robust sequence of PGRs to reduce lodging risk, in conjunction with good husbandry
- Harvest promptly to preserve grain quality

Disclaimer:
The information in this document is for guidance only and does not constitute a recommendation. Nickerson cannot accept any liability in connection with the use of this information.

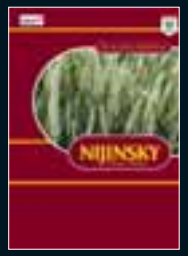
Notes:

1. 'HGCA Recommended Lists' is a registered trademark of the Home-Grown Cereals Authority
2. Canopy, , Flexity, Jockey, Meteor, Opus, Terpal, Tracker, and Swing Gold are registered trademarks of BASF (www.agricentre.co.uk)
3. Deter, Evict and Proline are registered trademarks of BayerCropScience (www.bayercropscience.co.uk)
4. Amistar and Moddus are registered trademarks of Syngenta (www.syngenta-crop.co.uk)
5. Latitude is a registered trademark of Monsanto (www.monsanto.co.uk)
6. Talius is a registered trademark of DuPont (www.gbr.ag.dupont.com

Always read the label. Use pesticides safely.

Wheat Portfolio

Comprehensive grower's husbandry guides are also available for other wheat varieties in the Nickerson Wheat Portfolio



NICKERSON

For your copy, email us at enquiries@nickerson.co.uk