



Stigg

WINTER
WHEAT



Husbandry Guidelines



Limagrains UK, Rothwell, Market
Rasen, Lincolnshire, LN7 6DT
Tel: 01472 371471 Fax: 01472 371386
Email: enquiries@limagrains.co.uk

www.limagrains.co.uk/stigg

Bred by Nickerson

Whilst every care is taken to produce reliable and accurate guidelines,
no liability can be accepted for any use made of this information.

06/2011

Introduction

Stigg has a novel pedigree including the use of *Triticum dicoccoides* (a close relative of wheat) (Biscay x LW96-2930) x Tanker. This enhances the genetic diversity available in the UK, providing an outstanding level of disease resistance - in particular to the most damaging foliar disease *Septoria tritici* - for which Stigg is rated '8' by the Home Grown Cereals Authority (HGCA).

Stigg is suitable for sowing in some of the most testing conditions; **early sowing** and **second / continuous wheat**. The characteristics for these difficult sowing slots are outlined in the rest of these husbandry guidelines.

Key Points

- High Hagberg falling number
- HGCA Recommended
- High yield potential
- Hard textured nabim Group 4 wheat
- Excellent disease resistance including *Septoria tritici* (8)
- Suitable for early sowing
- Performs well as 2nd or continuous wheat

Market

- Animal feed
- Bio-fuels



Contents

The Variety

Place in the Market	04
Pedigree and Selection Mechanism	04
Agronomic Characteristics	05
Resistance to Diseases and Pests	08
Yield Potential	09

Management

Seed Treatments	10
Response to Fungicide Inputs	11
Grain Quality	14
Place in Rotation	15
Husbandry Summary	19
Wheat Husbandry Portfolio	19

Stigg - Place in the Market

Stigg is a hard milling feed wheat with all the key attributes required to meet the needs of the feed wheat grower: high yield, very stiff straw, an outstanding disease profile and flexible sowing dates.

Stigg has grain quality which will meet the demands of the UK's largest market - animal feed - as well as the developing bio-fuel market which to date has not indicated any preference for the type of wheat required.



Stigg - Pedigree and Selection Mechanism

Pedigree: (Biscay x LW96-2930) x Tanker

The original purpose of this cross was to introduce exceptional disease resistance characteristics derived from *Triticum dicoccoides* into high yielding UK adapted germplasm. The striking green colour is a trait of this material, leading to enhanced photosynthetic capacity. The addition of Tanker to the original cross was primarily to improve straw stiffness whilst maintaining

yield and providing a relatively poor disease resistance profile against which the improved disease resistance could be easily identified. Stigg was selected using pedigree selection as this enabled a very large number of plants to be screened, thus increasing the possibility of selecting a variety that contains all the traits that the cross has been designed to produce.

Stigg - Agronomic Characteristics

In many ways Stigg is similar to its parent Tanker, but with much improved disease resistance (see below). High yields are a reflection of its inherently high spikelet fertility. As with Tanker, Stigg produces an efficient crop canopy based on limited tiller production. It is not until just before harvest that growers will see the high packing density that is achieved within the ears.

Stigg has a 'determinate type' tillering pattern, so seed rates should be adjusted accordingly. Table 1 gives the recommended seed rates but growers should be aware that in difficult (cold or poor) seedbeds, rates should be revised upwards.

Table 1: Sowing - Optimum Dates plus Seed Rates

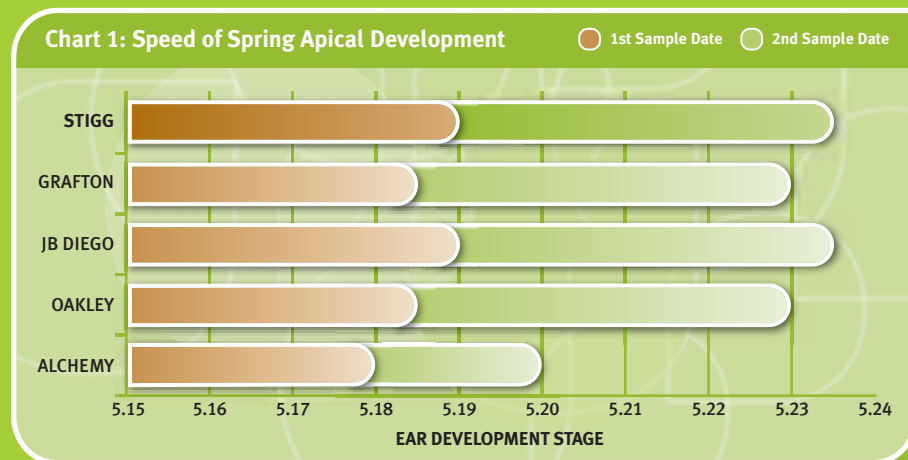
	September			October			November			December
	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	
Stigg	140-180	180-220	220-260	240-280	280-325	280-350	300-380	320-380	350-400	350-400
Claire	120-160	160-200	200-250	220-275	265-325	265-325	300-350	300-350	325-375	325-375
Alchemy	120-160	160-200	200-250	220-275	265-325	265-325	300-350	-	-	-

Rates expressed as viable seeds per sq. metre (Do not forget to adjust for germination %)
Source: Limagrain UK



The HGCA Recommended List data show that Stigg is slower than average in its speed of development to GS 31 from an early September sowing date.

Limagrain studies on the development of ear primordia in the spring suggest that Stigg has a similar speed of development to JB-Diego (See Chart 1).



Source: Limagrain Agronomy 2010

Ear development stages are as published by Kirby, E.J.M. and Appleyard, M. Cereal Development Guide (1981) National Cereal Unit

HGCA Recommended List trial data (Table 2) show that Stigg has relatively short stiff straw. Independent agronomy work on Stigg at two different seed rates suggests that a single PGR application at

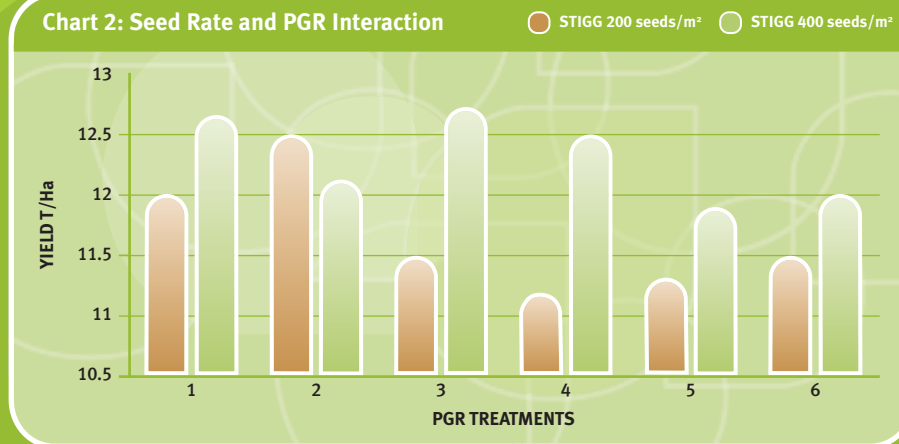
GS 31 should give the best yield results. Additional applications have the potential to reduce yield by shortening the plants too much (See Chart 2 and Table 3 for the different PGR inputs).

Table 2: Straw Height and Lodging Resistance

	Height (cm)	Lodging (%) - PGR	Lodging (%) + PGR
Stigg	84	2.6	1.8
Grafton	79	0.3	0.7
JB-Diego	91	4.4	5.5
Oakley	87	3.1	6.0

Source: HGCA Recommended List

Chart 2: Seed Rate and PGR Interaction



Source: Masstock Arable (UK) Ltd. Site: Tiptree, Essex

Table 3: Treatments for Masstock PGR Trials

PGR Treatments	Application A GS 23-29	Application B GS 31	Application C GS 37-39
1	Untreated	*****	*****
2	Adjust 1.0	*****	*****
3	*****	Adjust 0.8 + Moddus	*****
4	Adjust 1.0	Adjust 0.8 + Moddus	*****
5	*****	Adjust 0.8 + Moddus	Adjust 0.8 + Cerone 0.25
6	Meteor 1.25	Adjust 0.8 + Moddus	Adjust 0.8 + Cerone 0.25

Source: Masstock Arable (UK) Ltd

However, if drilling early or on a particularly fertile soil type it is recommended that a split PGR treatment should be used, with two-thirds rate of a CCC based product applied at the glume primordia stage, followed by a one-third rate application at first node or GS 31. This should shorten the critical first internode and thus increase straw stiffness.

HERBICIDE SENSITIVITY

Preliminary tests suggest that Stigg is susceptible to herbicides based on chlortoluron, but growers should check the manufacturers guidelines for additional information (www.mauk.co.uk) or consult their agronomist.

Stigg - Resistance to Diseases and Pests

Table 4: Disease Resistance Ratings

	Mildew	Yellow Rust	Brown Rust	<i>Septoria nodorum</i>	<i>Septoria tritici</i>	Eyespot	<i>Fusarium</i> Ear Blight	OWBM
Stigg	7	9	9	(7)	8	7	6	S
Grafton	7	8	3	6	6	7	5	S
JB-Diego	6	6	4	7	6	5	6	S
Oakley	6	2	6	7	5	4	5	R

() = limited data
Source: HGCA Recommended List

R = Resistant
S = Susceptible

The unique characteristic of Stigg is its totally unprecedented level of resistance to *Septoria tritici* (See Table 4). It is the only wheat variety on the 2011/12 Recommended List which has a resistance rating of 8 for this disease. In addition to this Stigg has excellent levels of resistance to mildew, yellow rust and brown rust. Although the agrochemical industry has responded to the increased disease threats posed by the extensive growing of disease-susceptible varieties with the new SDHI fungicide chemistry, growers can use the superior genetic disease resistance provided by Stigg to complement fungicide use and thus minimise their exposure to the risks posed by the damaging foliar diseases of wheat.

Stigg also has good resistance to Eyespot and moderate resistance to *Fusarium* ear blight.

Stigg does not carry resistance to Orange Wheat Blossom Midge (OWBM), so growers with crops at risk from this pest should make allowance for this when planning their pest control strategy.

OWBM has become less of a problem over the last few years as farmers have used insecticides prophylactically, as well as growing a higher proportion of resistant varieties. However, OWBM still represents a significant threat to crops if large hatch numbers coincide with ear emergence. Under high risk situations application of a chlorpyrifos-based product should be considered, as this active ingredient has a high level of persistence and will kill both the adults and newly-emerged larvae. More recently, approval has been given to products based on Lambda-cyhalothrin (e.g. Hallmark) and Thiacloprid (e.g. Biscaya). The former is a pyrethroid and will only kill insects present at the time of application, while the latter is a neonicotinoid and should be applied when OWBM thresholds are reached. Attempting control using pyrethroid-based products may exacerbate the threat from OWBM as these products may reduce the numbers of hymenopterous parasitoids, the natural enemies of OWBM. Growers should refer to the HGCA website (www.hgca.com) for more detailed advice.

Stigg - Yield Potential

Stigg has shown very high yield potential over several years of official trials and has demonstrated particularly impressive

untreated yields that are a direct reflection of its superior disease resistance profile. (See Table 5)

Table 5: Yield Potential and Fungicide Response

	Yield Treated	Yield Untreated	Average Response to Treatment (%)
Stigg	102	97	5.15
Grafton	101	88	11.28
JB-Diego	104	88	12.35
Oakley	106	80	45.78

Source: HGCA Recommended List

It is clear from the data presented in Table 5 that because Stigg has greater disease resistance than comparable hard feed varieties its response to fungicide inputs is significantly less. In fact at five of the 2010 HGCA Recommended List trial sites Stigg actually yielded more untreated than it did treated with fungicide.

All the HGCA Recommended List trials are carried out using a very intensive prophylactic fungicide programme. This programme is used in order to assess

'yield potential'. In order to assess the performance of Stigg in more realistic farm situations a number of trials are carried out by Limagrain across the UK with local farmers, using their preferred choice of inputs. The results of these 'Farmer Trials' are shown in Table 6.

It can be seen from these results that Stigg has the potential to produce very high yields when grown under a 'normal' farm input regime.

Table 6: Yield Potential and Fungicide Response in 'Farmer Trials'

	Yield in Farmer Trials		Mean Yield (%)
	2009	2010	
Stigg	104.3	106.4	105.4
Grafton	98.8	101	99.9
JB-Diego	103.3	103.5	103.4
Oakley	106.1	104.1	105.1

Source: Limagrain UK 'Farmer Trials' Figures expressed as a % of RL controls

Stigg - Seed Treatments

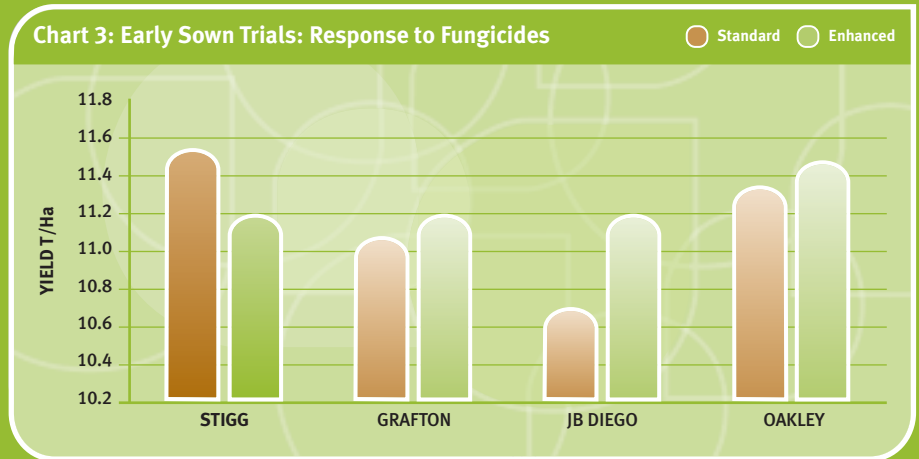
In first wheat situations a single-purpose treatment should be applied as routine, because in high-risk years even healthy looking grains can harbour disease. For early sown crops the application of a broad-spectrum seed dressing should be considered, as this is likely to improve early vigour and enhance standing power. A wide range of seed treatments are available and growers should seek advice as to the most appropriate product for their situation.

In second or continuous wheat situations, or where 'take-all' is likely to present a problem, products such as Jockey (www.agricentre.basf.co.uk) or Latitude (www.monsanto.co.uk) should be considered.

In earlier-sown situations, particularly in the south and south-west, protection against Barley Yellow Dwarf Virus (BYDV) should be considered. Treatments such as Deter (www.bayercropscience.com) alone are unlikely in themselves to eliminate the problem, but will considerably reduce the risk of heavy BYDV attack and will provide growers with some flexibility with regard to the timing of their spray programme.

Earlier-sown crops in general tend to be more at risk from increased levels of foliar and root diseases. While a variety such as Stigg is much less at risk from the increased foliar disease pressure, the addition of a product such as Multimax (multimax@limagrains.co.uk) will be particularly valuable in difficult or poor soils as it enhances rooting structure.

Stigg - Response to Fungicide Inputs



Source: Masstock Arable (UK) Ltd Early Drilled Trial

The data from Recommended List trials shown in Table 5 (page 9) demonstrates that Stigg's excellent disease resistance, and consequent very high untreated yield, results in a considerably lower response to a high input fungicide regime than that shown by other hard feed varieties. Further work was carried out by Masstock to compare the effects of a standard fungicide programme with that of an enhanced programme (this included an autumn fungicide and a T0 fungicide) on their early sown trials. The results can be seen in Chart 3.

These data sets show that when disease susceptible varieties are drilled in early September they will all show an increase

in yield if treated with an enhanced fungicide treatment programme in addition to their normal input regime. Presumably this is due to better control of over-wintering *Septoria tritici* and prevention of early yellow rust infection. In the case of Stigg these diseases are already controlled by the inherent resistance mechanisms of the variety, so any extra fungicide inputs would be unnecessary. Results of this trial appear to suggest that the additional applications had a significant detrimental effect on the yield of Stigg, but without detailed knowledge of the modes of action of the chemicals involved and their effect on the plants metabolism, it is difficult to speculate as to why this should be.



The correct seed treatment should be applied routinely

Limagrain Agronomy Trials

Each year Limagrain carry out agronomy trials on a range of varieties from the wheat programme to compare how they perform under different input regimes. The 2010 trials were badly affected by the droughted conditions in the spring and early summer, so all the data presented here is from 2009 trials. Although 2009 provided a relatively low-disease environment, there were late attacks of brown rust and *Septoria tritici*. The fungicide treatments used are outlined in Table 7.

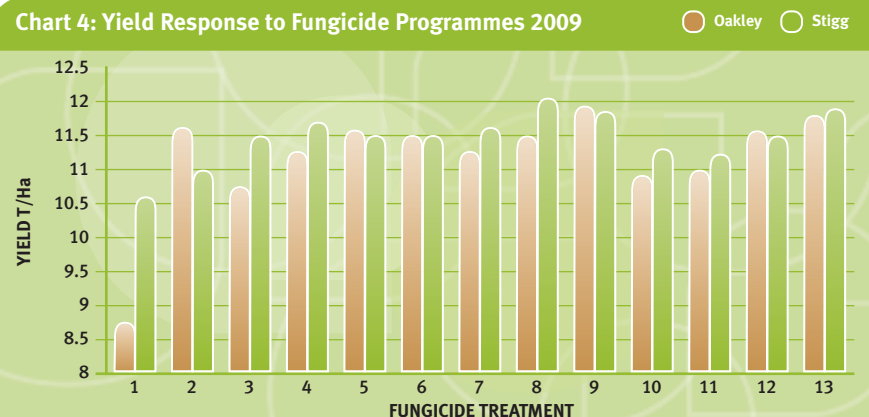
Treatment 1 involved no fungicide applications and was left completely untreated. Treatment 2 used the HGCA-CEL Recommended List trial protocol which has been designed to minimise any disease threat and this is reflected in the very high fungicide costs. Treatment 3 is based on triazole chemistry only and sets a standard for comparison with the other treatments which are based on triazole + strobilurin chemistry. For the sake of simplicity, grain prices of £100 per tonne were used, so it must be borne in mind that any differences in gross margins will be amplified at higher grain prices.

Table 7: Variety Fungicide Trial Treatments/Costs

Code	T0 Chemical	GS 30/31 L/Ha	T1 Chemical	GS 32 L/Ha	T2 Chemical	GS 39/45 L/Ha	T3 Chemical	GS 60/65 L/Ha	Chemical Cost £	Travel Cost (£5)	Total Cost £	
1	Control	Untreated	Untreated		Untreated		Untreated		0.00	0	0.00	
2	HGCA CEL Strob T2/T3	Flexity Bravo Opus	0.5 1 0.5	Proline Bravo Talius	0.8 1 0.15	Opus Bravo Comet 200	0.75 1 0.75	Fandango	1.25	170.02	20	190.02
3	Triazole	Opus	0.3	Opus Bravo	0.5 1	Opus Bravo	0.75 1	Caramba	0.5	64.77	20	84.77
4				Ennobe Bravo Comet 200	1 1 0.3	Brutus Bravo Comet 200	2 1 0.3	Brutus	1.5	119.79	15	134.79
5		Opus	0.3	Ennobe Bravo	1 1	Brutus Bravo	2 1	Brutus	1.5	113.50	20	133.50
6				Tracker Ennobe Bravo	0.75 0.9 1	Tracker Brutus Bravo	0.75 1.25 1	Brutus	1.5	123.18	15	138.18
7				Cherokee	1.33	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	66.37	15	81.37
8		Opus	0.3	Cherokee	1.33	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	74.62	20	94.62
9				Cherokee Proline	1.33 0.3	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	79.15	15	94.15
10				Proline Bravo	0.4 1	Firefly	1.2	Firefly	0.75	65.41	15	80.41
11		Opus	0.3	Proline	0.6	Firefly	1.5	Firefly	1	88.89	20	108.89
12				Proline	0.6	Firefly	1.5	Firefly	1	80.64	15	95.64
13				Prosaro Justice Bravo	0.75 0.15 1	Brutus Vivid Bravo	1.25 0.5 1	Amistar Opti Prosaro	1.25 0.6	119.64	15	134.64

Source: Limagrain UK

Chart 4: Yield Response to Fungicide Programmes 2009



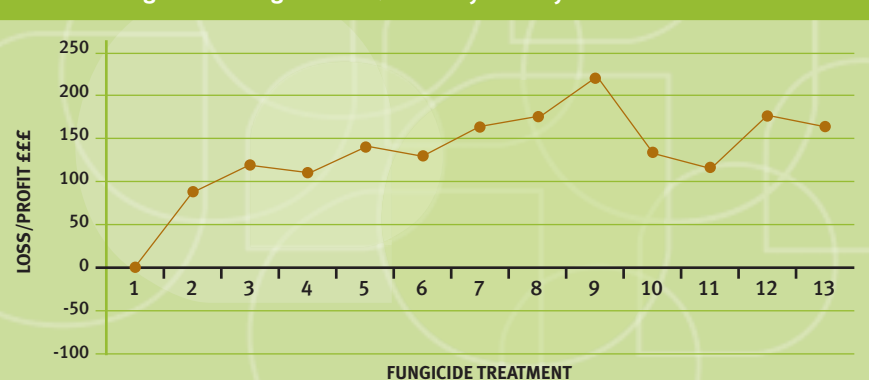
Source: Limagrain UK Agronomy H09

Chart 4 shows a comparison of the yields of Stigg and Oakley under these different fungicide regimes. As would be expected Stigg greatly out-performs Oakley in the absence of fungicide. However, it can also be seen that the only treatment that allowed Oakley to significantly out-yield Stigg was the very expensive HGCA-CEL protocol that is designed to eliminate all disease risks. This closely reflects the difference in yield between the two

varieties seen in the official trial data. The highest yield in the trial was achieved by Stigg, which was applied with the relatively inexpensive Treatment 8.

Chart 5 shows the economic benefit of these treatments on Oakley. As would be expected of any disease-prone variety, all of the treatments used increased the profitability of the crop. The corresponding graph for Stigg (Chart 6, page 14) demonstrates a totally different result.

Chart 5: Margin Over Fungicide 2009 - Variety: Oakley



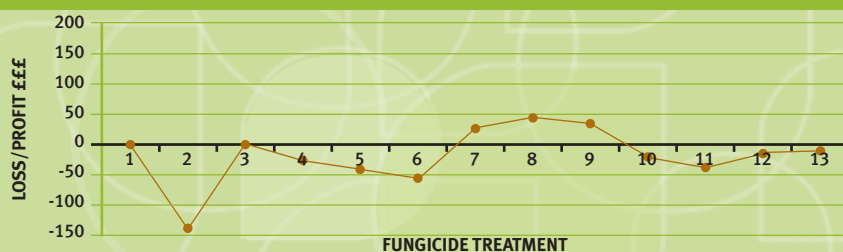
Source: Limagrain UK Fungicide Trial H09

Because the untreated yield of Stigg was so high the only fungicide treatments to provide an economic benefit were the relatively inexpensive triazole/strobilurin combinations of treatments 7, 8, and 9. It would appear that excessive fungicide treatment (as in the HGCA protocol Treatment 2) drastically reduced the profitability of the crop whilst not giving the same benefits in terms of outright yield as much cheaper treatments.

At the time of going to print grain prices are at a relatively high level. In these circumstances it is understandable that

growers will be prepared to invest in fungicide inputs to try and minimize disease losses and maximise the output of their crops. However, these results show that with a disease resistant variety like Stigg high yield and profitability are best achieved by using a simple and relatively inexpensive triazole/strobilurin mixture. The application of expensive treatments designed to control all possible disease threats is unnecessary as the yield potential of the crop is already protected by the genetic resistance of the variety.

Chart 6: Margin Over Fungicide 2009 - Variety: Stigg



Source: Limagrain UK Fungicide Trial H09

Stigg - Grain Quality

Stigg is a hard-endosperm Group 4 feed wheat variety. In recent years the Group 4 sector of the market has become more complex with hard and soft types being classified by different market requirements. However the largest usage for Group 4 feed wheat remains the animal feed market which accounts for over 6 million tonnes of domestic wheat annually.

In addition to the animal feed demand, the growing bio-fuel industry in the UK has not yet given any indication that it will

select between varieties or type of wheat and Stigg is likely to be acceptable for this market, which may need in excess of 2 million tonnes/annum of wheat by 2012.

The grain quality requirement for the feed wheat market tends to be a very simple specification of 72kg/hl specific weight 15% moisture and 225 Hagberg. Stigg easily meets these requirements in most seasons and having the highest Hagberg falling number in the Group 4 sector makes it a very secure variety in the event of difficult harvest conditions.

Stigg - Place in Rotation

The Recommended List Trial results show that Stigg produces consistent yield

results from a range of slots in the rotation (See Table 8).

Table 8: Yield Potential by Rotational Position, Sowing Date and Soil Type

	First Wheat	Second Wheat	Early Sowing (before 6th Oct)	Light Soils	Heavy Soils
Stigg	101	102	102	100	103
Grafton	101	104	101	101	102
JB-Diego	103	105	103	104	104
Oakley	106	105	106	106	106

() = limited data

Source: HGCA Recommended List

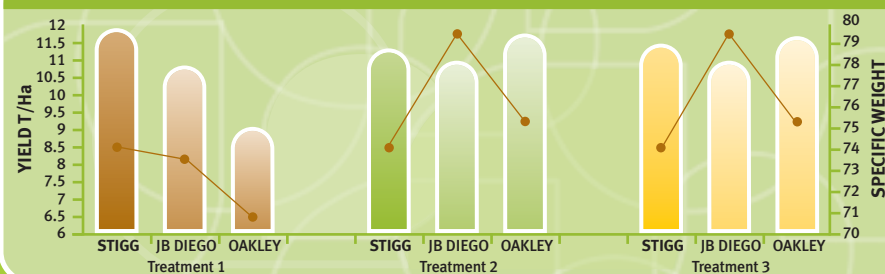
In 2010 Masstock ran trials to assess varietal performance under different input regimes in both the first and second wheat rotational slots. Table 9 shows the different inputs used and the yield and specific weight data is shown in Chart 7. From this it can be seen that Stigg has achieved high yields across the treatments and has maintained the same specific weight, which would indicate that Stigg has fulfilled its grainfill with no additional chemical and that its specific weight could not be influenced by the additional fungicide programmes.

Table 9: Fungicide Treatments for First Wheat Trials - Variety: Stigg

Trt no.	Mid-April		TR - GS 37-39	
	Product/s	Rate/ha	Product/s	Rate/ha
1	Untreated	-	*****	-
2	Proline 275	0.44	Proline 275	0.55
3	Helix	0.75	Brutus + Chord	0.75 + 1.0

Source: Masstock Arable (UK) Ltd Site: Tiptree, Essex

Chart 7: First Wheat / Fungicide Interaction - Variety: Stigg. Treatments as per Table 9



Source: Masstock Arable (UK) Ltd. Site: Tiptree, Essex

Table 10: Fungicide Treatments for Second Wheat Trials - Variety: Stigg

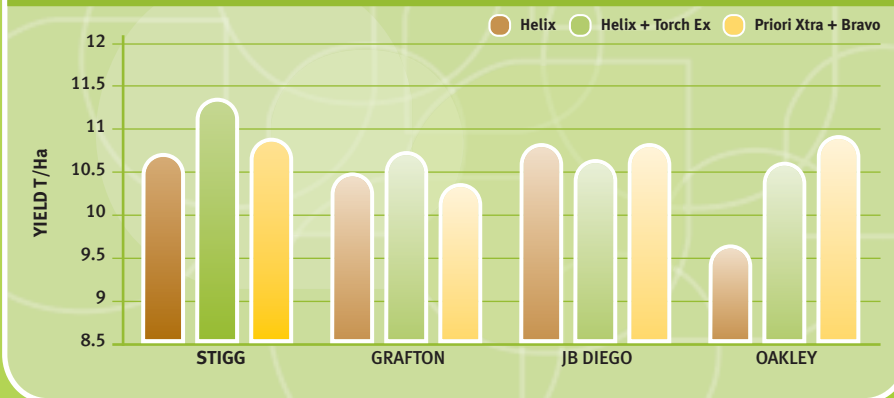
Treatment no.	Mid-April		T2 - GS 37-39	
	Product/s	Rate/ha	Product/s	Rate/ha
1	Helix	0.312	Helix	0.4
2	Helix + Torch Extra	0.75 + 0.1	Helix + Torch Extra	0.95 + 0.1
3	Priori Xtra + Bravo	1.0 + 1.0	Brutus + Chord	1.0 + 0.75

Source: Masstock Arable (UK) Ltd

Table 10 shows the treatments used on the trials drilled in a second wheat situation, and Chart 8 displays the subsequent yield data. This shows that Stigg can maintain a very high level of yield under a range of treatments when drilled as a second wheat. It should be noted that the relatively low yield of Oakley treated with Helix was due to the

plots being infected with yellow rust. Under this treatment Stigg did not display the same drop in yield, underlining the fact that its superior disease resistance provides a level of insurance against yield loss due to disease pressure not demonstrated by varieties with more susceptibility to foliar disease.

Chart 8: Second Wheat Fungicide Trials - Variety: Stigg

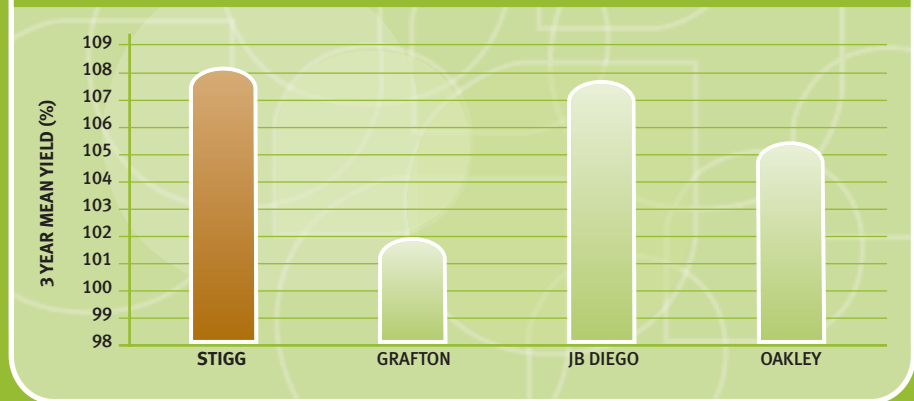


Source: Masstock Arable (UK) Ltd

In addition to this, results from the Limagrain 'Farmer Trials' referred to earlier show that when sown early on a very fertile site that has received liberal

applications of pig manure, Stigg can demonstrate a yield potential equal to or in excess of that supplied by other high-yielding feed varieties (See Chart 9).

Chart 9: Early Sown Yields (Fertile Soil Site) 2008 - 2010



Source: Limagrain UK

The early sowing slot is a very important and demanding part of the rotation for a variety to fill. Several varieties have been tried in this slot, but very few have all the necessary attributes to be successful. It is

desirable for varieties drilled at this time to be relatively short and stiff-strawed to negate the increased lodging risk, and to have a relatively slow spring development.



Chart 10: Early Sown Trials 2010



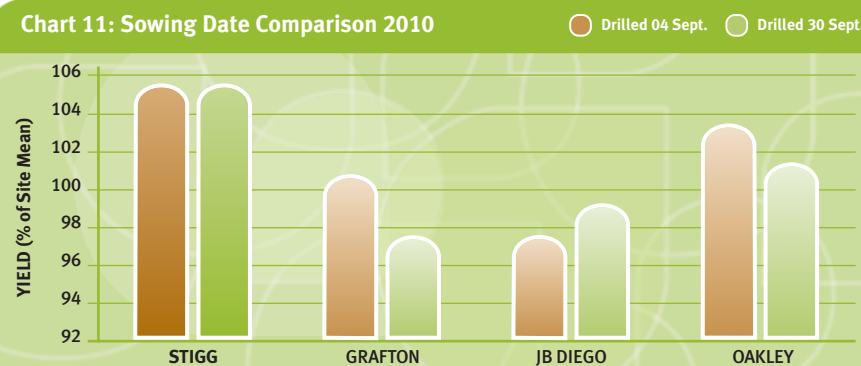
Source: AICC Early Sown Trials 2010

One of the consequences of early drilling is the increased disease pressure that arises. This is a natural consequence of early establishment, giving fungi the opportunity to attack new growth. Natural leaf damage and death during the winter months provides an ideal environment for attack by *Septoria spp.* This build up of inoculum means that high levels of resistance to these diseases is a pre-requisite for early sown wheat varieties. As Stigg has excellent disease resistance in addition to very stiff straw and a relatively slow speed of development from this drilling time it

was entered in to early drilling trials run by Masstock and AICC. The results can be seen in Chart 10 and Chart 11.

Chart 10 illustrates that even when exposed to the increased disease risks of an early sowing Stigg can maintain its yield potential even in the absence of fungicide treatment. Chart 11 shows that Stigg's consistency of yield enables it to maintain its yield potential better than many other varieties if drilling is delayed from the beginning to the end of September.

Chart 11: Sowing Date Comparison 2010



Source: Masstock Arable (UK) Ltd Early Drilling Trials 2010

Stigg - Husbandry Summary

- Sow from early September onwards, adjusting seed rate to sowing date and soil conditions
- Flexible variety for a range of rotational positions
- Offers the opportunity to reduce fungicide input because of excellent disease resistance, particularly to *Septoria tritici*

Disclaimer:

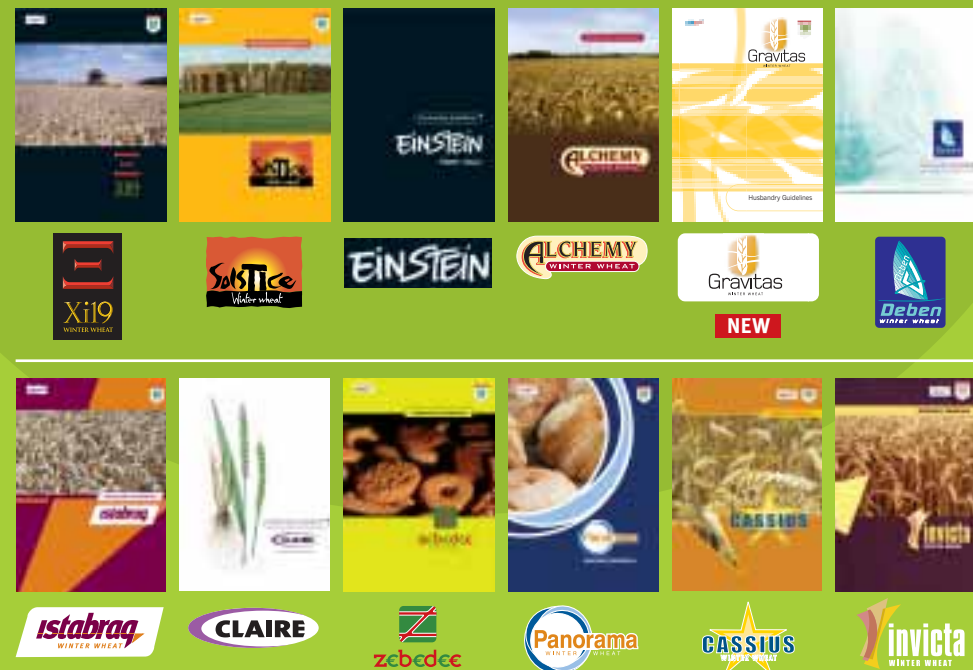
The information in this document is for guidance only and does not constitute a recommendation. Limagrain cannot accept any liability in connection with the use of this information.

Notes:

HGCA data is from the HGCA Recommended Lists database, full data at www.hgca.com unless stated otherwise. On the 1-9 scales, high figures indicate that a variety shows the character to a high degree.

Wheat Husbandry Portfolio

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



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