



Gravitas

WINTER WHEAT



Limagrains UK, Rothwell, Market Rasen, Lincolnshire, LN7 6DT

Tel: 01472 371471 Fax: 01472 371386 www.limagrain.co.uk/gravitas

Email: enquiries@limagrains.co.uk

Bred by Nickerson

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Husbandry Guidelines

Introduction

Gravitas has been added to the 2011/12 HGCA Recommended List as the joint highest yielding soft milling wheat in treated trials.

Meeting the demands of a range of domestic and export market criteria, Gravitas has performed well across all HGCA regions of the UK with consistent yields both as a first and second wheat.

Gravitas meets the requirements of the traditional soft feed markets, notably the  export specification, and is acceptable to UK distillers. It will also be suitable for the bio-fuel market, as well as the domestic animal feed market.

An easy variety to manage, Gravitas provides the grower with solid genetic disease resistance which, when exploited in conjunction with modern fungicides, will ensure the threat from fungal pathogens can be kept to a minimum.

Limagrain introduced the concept of husbandry guidelines for new varieties many years ago and there is now sufficient information to produce this booklet for Gravitas. It is not intended as a rigorous blueprint, but provides sufficient technical support to enable growers to realise the genetic potential offered by this new and exciting variety.



Key Markets

- Distilling
- Bio-fuel
- Animal feed
- UK export



Key Points

- Soft milling feed wheat
- HGCA Recommended
- High yields as first & second wheat
- Resistant to orange wheat blossom midge
- Very good disease resistance

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Gravitas - Position in the Market

For many years the UK has demonstrated its ability to produce high yields of soft milling wheats. Varieties in this sector offer a wide range of market options for the farmer serving the animal feed, export, distilling and latterly the bio-fuel markets.

Current HGCA data (Table 1) clearly illustrate the ability of Gravitas to service these markets. For the soft feed sector,

Gravitas produces grain with both good specific weights and Hagberg falling numbers, an area which has been an inherent problem with many soft feed varieties in the past.



Gravitas has been placed in the  (soft wheat) category and will meet the specifications for this market.

Table 1: Market Specifications and Grain Quality

	Nabim Group	Endosperm Texture	Protein Content (%)	Hagberg Falling Number	Specific Weight (kg/hl)	Chopin Alveograph W	Chopin Alveograph P/L
 standard	3 or 4	Soft	10.5-11.5	-	-	≤ 120	≤ 0.55
Gravitas	4	Soft	10.5	211	76.5	91	0.3
Viscount	4	Soft	10.8	173	75.9	93	0.4
Alchemy	4	Soft	11.3	236	77.2	65	0.5

There is no UKS standard for Hagberg falling number or specific weight but 225 secs and 72.0kgs/hl are commonly used as the minimum required.

Source: HGCA Recommended List

Gravitas - Pedigree and Selection Mechanism

Pedigree: Alchemy x Robigus



Gravitas was produced using doubled haploid technology

The objective of this cross was to capitalise on the excellent soft milling characteristics of the two parents and strengthen the disease profile of each. High resistance to *Septoria tritici* was a priority because of the increasing difficulties of controlling this disease in the field.

Doubled haploid technology was used to produce Gravitas, enabling a true breeding line to be developed rapidly

with the best disease and grain quality characters fixed early on in the selection process.



Progeny of two proven varieties, Alchemy and Robigus



Gravitas demonstrates the highest yield potential within its market sector

Gravitas - Yield Potential

Gravitas demonstrates the highest yield potential within its market sector. This is seen in its treated and untreated yields in HGCA Recommended List trials.

In addition, Gravitas yields consistently across the UK and in all rotational positions, a sign of a stable variety (see Table 2).

Table 2: Yield Potential

	Yield (% treated control)		Regional Performance			Rotational Performance	
	UK Treated	UK Untreated	HGCA East	HGCA West	HGCA North	First Cereal	Second and more Cereal
Gravitas	104	90	104	104	(103)	104	103
Viscount	103	88	104	101	104	103	103
Alchemy	99	86	99	100	99	99	99

() = limited data

Source: HGCA Recommended List

Gravitas - Resistance to Diseases and Pests

A high level of durable genetic disease resistance is a key target in the Limagrain breeding programme.

The table below gives the disease resistance ratings for Gravitas, Viscount and Alchemy.

Table 3: Disease and Pest Resistance

	Mildew	Yellow Rust	Brown Rust	<i>Septoria nodorum</i>	<i>Septoria tritici</i>	Eyespot	<i>Fusarium</i> Ear Blight	Orange Wheat Blossom Midge
Gravitas	6	7	9	(7)	7	6	6	R
Viscount	7	5	9	(9)	5	6	6	R
Alchemy	7	9	5	7	7	6	7	-

() = limited data; R = resistant

Source: HGCA Recommended List

Septoria tritici is the most widespread and damaging disease of winter wheat, and resistance to this disease is the yardstick by which most varieties are judged. Gravitas has very good resistance to this disease, based on polygenic factors and not dependent on a single major gene. However, genetic resistance should be used in conjunction with a targeted fungicide programme to give the highest level of control.

Gravitas has very good yellow rust resistance, which is believed to be based on a similar polygenic resistance (when a number of minor genes work together) found in Alchemy and Claire. This polygenic background has proved to be durable in varieties for over 30 years.

Mildew resistance for Gravitas is good and this disease should not require routine treatment. Mildew is frequently associated with thick crops and high humidity within the canopy, which can be avoided by careful management i.e. using lower seed rates and careful nitrogen timing.

Gravitas has excellent resistance to brown rust and fungicide programmes targeted at *Septoria tritici* are likely to give adequate control of this disease. Brown rust tends to be localised, with certain areas of the country being affected more frequently than others. Historically a late season disease developing after ear emergence, brown rust has appeared earlier in some seasons where the winter has been mild and the autumn 'open'.

The development of eyespot will need to be monitored on Gravitas, with thicker crops on the heavier soil types being most at risk. Lesions penetrating the stem base are most likely to affect yield and increase the lodging risk, although correct disease identification is important.

Gravitas has good resistance to *Fusarium* ear blight and its current rating places it in the 'low risk' category in the HGCA Mycotoxin risk assessment.

Gravitas also has genetic resistance to Orange Wheat Blossom Midge and insecticide sprays used to control this pest will not be required on this variety.



Gravitas is resistant to Orange Wheat Blossom Midge

Gravitas - Agronomic Characteristics

Gravitas is similar to Alchemy in height and has the same good lodging resistance as Viscount and Alchemy when treated with a growth regulator. Gravitas responds well to PGR use and it is recommended that an effective programme is planned (see Page 11) for

Gravitas in most situations to ensure its very high yield potential is realised.

Gravitas has a similar ripening date to Alchemy, a reflection of its inherently good foliar disease resistance.

Table 4: Agronomic Characters

	Straw Height (cm) Untreated	Resistance to Lodging (with PGR)	Ripening (days ± Solstice, + = late)
Gravitas	92	7	+2
Viscount	84	7	+1
Alchemy	95	7	+2

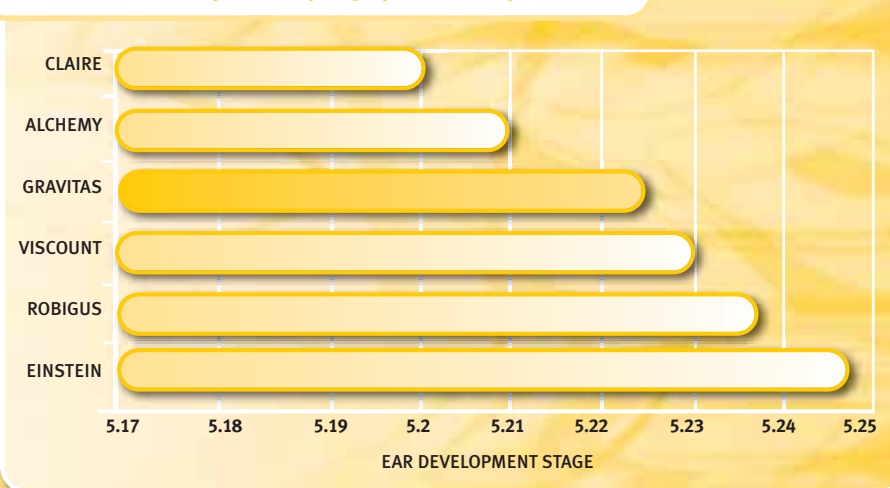
Source: HGCA Recommended List

Gravitas - Sowing Date, Seed Rate and Seed Treatments

The chart below shows the apical development pattern of a range of varieties. Gravitas has a 'medium' speed

of apical development, slightly faster than Alchemy but slower than Einstein. It has a relatively prostrate growth habit.

Chart 1 : Gravitas Speed of Spring Apical Development



Source: Limagrain UK

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

This development pattern precludes Gravitas from the early September sowing slot and growers should not be tempted to drill this variety before the second week of September. It will give its

optimum performance when sown between late September and the end of October. The latest safe sowing date for Gravitas is the end of February.

Seed Rates

To achieve optimum establishment, Gravitas should be drilled in to a warm, well consolidated seedbed. Recommended seed rates are shown in Table 5 but should

be finally decided by conditions at the time of drilling. In less favourable conditions, increase rates by 40-50 seeds per square metre to allow for losses during establishment.

Table 5: Seed Rates

Time of Sowing	Mid September	Late September	Early October	Mid October	Late October
Seeds/m ²	160 - 200	220-275	220-275	265-325	265-325

Source: Limagrain UK



Increase seed rates by 40-50 seeds/m² in poorer conditions

Seed Treatments

All Gravitas seed should receive a 'single purpose' seed treatment as routine in order to control the commonly occurring seed borne diseases. For earlier sowings, broad spectrum dressings offering improvements in standing power and early season foliar disease protection should also be considered in high risk situations. Where 'take-all' risk is high (second or third cereal crop) a specific dressing – such as Latitude

(www.monsanto.co.uk) or Jockey (www.agricentre.basf.co.uk) - should be considered.

Insecticide seed dressings such as Deter (www.bayercropscience.com) can provide good early season protection against aphids carrying Barley Yellow Dwarf Virus (BYDV) and help to reduce grain hollowing by slugs. In high risk situations this will need to be followed up with foliar aphicide application.

Gravitas – Plant Growth Regulator Use

Growers familiar with managing Claire should adopt a similar strategy with Gravitas. Where high yields are expected (greater than 8t/ha), a routine application of a chlormequat based product will provide a cost effective insurance against possible lodging and associated loss of yield and quality.

A split application with a 2/3 chlormequat product at GS 30 (or more precisely the 'glume primordial stage') and the balance at GS 31 (first node) is ideal for Gravitas. The addition of products such as Moddus (www.syngenta-crop.co.uk) or Canopy (www.agricentre.basf.co.uk) to the

chlormequat should be considered further where shortening of the lower internodes is required to reduce crop height and lodging risk.

Where soil type, seasonal growth and previous experience suggest a high lodging risk then a late season ethephon based product (such as Terpal) could be used (www.agricentre.basf.co.uk).

A managed approach should be adopted with Gravitas to reduce lodging by using the appropriate seed rate, controlling stem base diseases and correct nitrogen timing in conjunction with early spring PGR applications.

Gravitas - Herbicide Tolerance

Preliminary testing suggests that Gravitas is likely to be tolerant to chlorotoluron-based products but further evaluation is required before a recommendation can

be made. Growers are advised to check the manufacturers latest guidelines (www.mauk.co.uk) or consult their agronomist.



Blackgrass control is essential for optimum yield

Gravitas – Crop Nutrition

Nitrogen recommendations for winter wheat have recently been updated to reflect trial results, NVZ regulations and the relative prices of grain and fertiliser. It is important to recognise that allowance can be made for the high yield potential of varieties such as Gravitas when calculating the total amount of nitrogen fertiliser to apply and comply with 'N max' limits.

With increasing scrutiny on nitrogen use it is imperative growers can justify the amount applied and should refer to Defra RB 209, HGCA Guidelines or SAC Technical Note 625 (as appropriate) and use a FACTS qualified adviser when calculating the rates to be applied to Gravitas.

Early applications of nitrogen in late February or early March should be avoided. These applications are likely to increase disease threats and lodging pressure. Applying nitrogen during this period should only be considered for later sown or poorly established crops (with low tiller numbers), second/continuous wheats and on lighter soils with a risk of a spring drought.

The main application should be applied during early stem extension just prior to the terminal spikelet stage.



Early applications of nitrogen in late Feb/early March should be avoided

Approximately 50% of the total nitrogen planned for the crop should be applied at this stage with the balance applied two to four weeks later. For crops destined for distilling or biofuel, nitrogen applications should be completed by early May to avoid increases in grain protein at the expense of starch production.

On light soils, or those with a history of sulphur deficiency, 10 – 15kgs S/ha (25 – 40 SO³/ha) should be included with the first nitrogen application.

Trace elements such as manganese, copper, boron and iron are important during periods of rapid growth, especially around flag leaf emergence. Foliar applications of products such as Multimin (www.nickersondirect.co.uk) will ensure that any transient deficiencies are met and will aid flowering synchronisation. The use of magnesium at T3 will help to promote grain fill and improve specific weight.

Gravitas – Response to Fungicides

For many years Limagrain has conducted agronomy trials looking at the response of individual varieties to a range of fungicide programmes based around products from the main manufacturers. Gravitas has been tested for two seasons (harvest years 2009 and 2010) and the treatments are detailed in Tables 6 and 7. The costs shown are those for both fungicide and

application, and use grain prices of £100/t (2009) and £160/t (2010) to calculate a margin over cost.

Gravitas was sown as a first wheat in the two years and both seasons were characterised by unusually low levels of disease following dry conditions during the early spring.

Table 6: Fungicide Treatments and Costs 2009

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	BASF 1			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	BASF 2	Opus	0.3	Ennobe Bravo	1 1	Brutus Bravo	2 1	Brutus	1.5	113.50	20	133.50
6	BASF 3			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	Syngenta 1			Cherokee	1.33	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	66.37	15	81.37
8	Syngenta 2	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	Syngenta 3			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	Bayer 1			Proline Bravo	0.4 1	Firefly	1.2	Firefly	0.75	65.41	15	80.41
11	Bayer 2	Opus	0.3	Proline	0.6	Firefly	1.5	Firefly	1	88.89	20	108.89
12	Bayer 3			Proline	0.6	Firefly	1.5	Firefly	1	80.64	15	95.64
13	Farmacy			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

Table 7: Fungicide Treatments and Costs 2010

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	Total Cost £
1	Control	Untreated		Untreated		Untreated		Untreated		0.00
2	HGCA CEL Strob T2/T3	Talius Opus	0.15 0.5	Tracker Bravo Flexity	1.5 1 0.5	Opus Bravo Comet 200 Talius	0.75 1 0.75 0.15	Proline Comet 200	0.8 0.75	200.70
3	Triazole	Opus	0.3	Opus Bravo	0.5 1	Opus Bravo	0.75 1	Caramba	0.5	68.30
4	BASF 1			BAS 667 Bravo	1.125 1	BAS 667 Bravo	2.25 1	Sunorg Pro	0.5	101.50
5	BASF 2	Opus	0.3	Tracker Bravo	1 1	Tracker Opus Bravo	1 0.25 1	Sunorg Pro	0.5	85.80
6	BASF 3			Tracker Ennobe Bravo	0.75 1 1	Tracker Ennobe Bravo	0.75 1 1	Sunorg Pro	0.5	93.50
7	Syngenta 1			Cherokee	1.33	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	70.66
8	Syngenta 2	Opus	0.3	Cherokee	1.33	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	78.46
9	Syngenta 3			Cherokee Proline	1.33 0.3	Amistar Opti Opus	1 0.7	Amistar Opti Proline	0.75 0.3	84.76
10	Bayer 1			Proline 155 Bravo	0.36 1	Firefly	1.2	Firefly	0.75	61.42
11	Bayer 2	Opus	0.3	Proline 155	0.55	Firefly 175	1.35	Firefly 175	1	92.40
12	Bayer 3			Proline 155	0.55	Firefly 175	1.35	Firefly 175	1	84.60

Source: Limagrain UK

Treatment 1 received no fungicide, treatment 2 is a high fungicide input programme used in HGCA Recommend List trials, designed to keep disease to a minimum, and treatment 3 is a triazole only programme. Treatments 4 – 13 use a mixture of fungicide chemistry (mainly

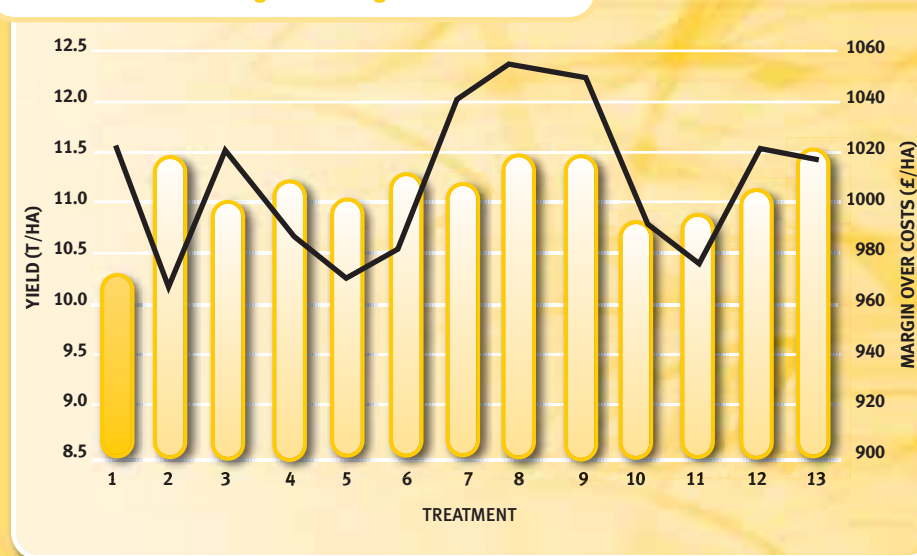
triazole and strobilurin) from the various manufacturers. It was not possible to test the latest SDHI chemistry in these trials, although Tracker (www.agricentre.basf.co.uk) is included in treatment 6 in both years as well as treatment 5 in 2010. Treatments 4, 6, 7, 9, 10, 12 and 13 had no T0 fungicide.

The yields and margin over chemical + application costs are presented in the following charts.

In 2009 (Chart 2) there was an average response of 0.96t/ha to all the fungicide treatments. The highest yield of 11.54t/ha

came from treatment 13, with treatments 2 (RL), 8 and 9 all producing very similar yields of 11.5t/ha. There was no response to a T0 fungicide, treatments with and without this early treatment both averaging 11.2t/ha.

Chart 2: Yield and Margins for Fungicide Trials 2009



Source: Limagrain UK

The margin over fungicide and application costs (black line) produced some interesting differences between the treatments. The average cost of a fungicide programme was £144/ha and this ranged from £80 to £190/ha. Bearing in mind the low disease pressure in this trial – as seen in the high untreated yield of 10.2t/ha – it is not surprising that some of the treatments gave margins over costs

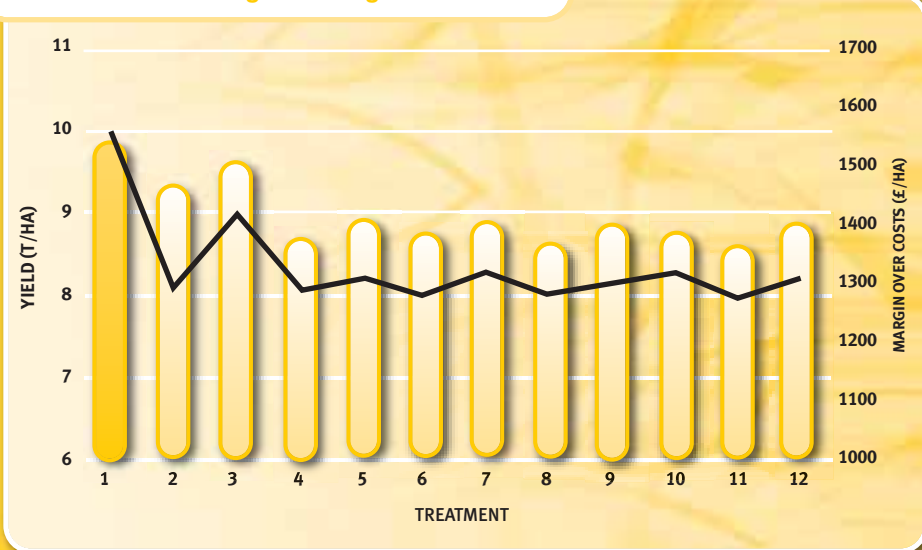
below that of the untreated, albeit by only a small amount (about £40/ha).

Treatments 7, 8 and 9 produced margins above the untreated. These had lower than average fungicide costs (£81 - £95/ha) and all received a strobilurin and chlorthalonil (www.syngenta-crop.co.uk) with a triazole at T2 and T3.

Chart 3 (below) shows the yields and margins for the 2010 season, using a grain price of £160/t to reflect the increase in price between the two years. The weather pattern for 2010 was similar

to 2009 with another prolonged dry period in the early spring giving rise to unusually low levels of disease in the untreated plots at the end of the season.

Chart 3: Yield and Margins for Fungicide Trials 2010



Source: Limagrain UK

All the fungicide treatments gave yields below that of the untreated with the majority showing a lower yield of around 1.0t/ha. Treatments 2 and 3 had the smallest reductions, in the region of 0.4t/ha. To put this in to context there were 11 varieties in total in the trial, including Gravitas, and all showed a similar yield loss to most of the fungicide treatments. A yield loss of this magnitude in fungicide treated trials is most unusual and must be related to the weather conditions and very low disease pressure during the spring and summer of 2010 in this trial.

Unsurprisingly all the treatments resulted in a lower margin over fungicide costs than the untreated (black line). Treatment 3 (triazole only), which was one of the cheapest and had the smallest yield loss, gave the highest margin of the treatments.

Clearly the results from these two trials have to be interpreted with care. Those from 2009 show the benefits of utilising Gravitas' good genetic disease resistance to use less fungicide in a low disease situation and give a positive margin. A high level of fungicide input applied as an insurance is unlikely to be necessary on Gravitas.

Gravitas - Fungicide Programmes

At the time of writing grain prices are higher, but more volatile, than have been seen for many years. With the prospect of high gross margins from wheat crops, using a sensible fungicide programme on Gravitas will deliver an excellent return on the investment. In HGCA RL trials over a five year period, including some high disease pressure years, Gravitas has shown an average response of 14% - equivalent to 1.5t/ha - from a comprehensive programme.

Fungicide programmes for Gravitas should be targeted and take in to account its genetic resistance to the individual disease 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 essential that *Septoria tritici* is controlled very effectively and crops receive adequate protection against mildew and eyespot.

Gravitas is likely to benefit from fungicides applied at the following timings:

T0 (Pre GS 30)

This fungicide is frequently used as an early pre-season 'clean up' and as insurance to help with disease management later on, particularly as an application with the first part of a sequential PGR programme is possible (see page 11).

Gravitas is unlikely to require a routine

T0 treatment but an application of chlorothalonil will help to delay *Septoria* development. Where disease levels in the crop at the end of the winter are high the addition of a low dose of a triazole could also be considered.

T1 (GS 31-32)

The main disease to be targeted at this time will be *Septoria tritici* and fungicides should be applied to keep the final leaf three disease free. Sprays should be based on a triazole e.g. Opus (www.agricentre.basf.co.uk) or Proline (www.bayercropscience.co.uk) using at least a half label rate mixed with chlorothalonil.

T0 and T1

If either mildew or eyespot is present at the T0 or T1 timings these will need to be targeted in the fungicide mix. A number of very effective mildewicides are available, Flexity (www.agricentre.basf.co.uk) has activity on mildew and eyespot, and Proline and Tracker (www.agricentre.basf.co.uk) are effective against eyespot and *Septoria*.

T2 (GS 37 - 39)

Aimed at keeping the top two leaves clean and maintaining *Septoria* control, triazoles (such as Opus) with chlorothalonil have proved to be very reliable at this timing. On Gravitas, which has very good resistance to *Septoria*, there is scope to use lower rates than on other more susceptible varieties but it is important that sufficient fungicide is applied at this time to maintain green leaf area of the upper leaves.

In crops with a high yield potential or where *Septoria* pressure is high, triazole mixtures including the new SDHI fungicides (Aviator XPro (www.bayercropscience.co.uk) and Seguris (www.syngenta-crop.co.uk)) could be used where their persistence and effects on green leaf retention are most likely to be of benefit.

Strobilurins are frequently included in the fungicide mix at the T2 timing. On Gravitas their contribution to disease control is likely to be small but their physiological effects may be useful.

T3 (GS 60 +)

An ear emergence fungicide will be valuable on Gravitas to re-inforce earlier disease control, provide protection against specific ear diseases and help to improve specific weight.

A number of products are available for ear disease control with those based on Proline ± a strobilurin performing well at this timing. A quarter to a half label dose is appropriate for additional disease control. A minimum of half dose is necessary for *Fusarium* control.

Gravitas - Husbandry Summary

- Drill between mid-September and the end of October, adjusting seed rate to sowing date and soil conditions
- Apply nitrogen in two or three doses, split between mid-April and early May, with a third (earlier) application for backward crops or where take-all is present.
- Use a three spray fungicide programme targeted at *Septoria* and catering for mildew and eyespot as necessary
- Assess lodging risk and use sequential spring PGRs in conjunction with seed rate, nitrogen timing and stem base disease control

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:

The data in Tables 1-4 is from the HGCA Recommended Lists database, full data at www.hgca.com. On the 1-9 scales, high figures indicate that a variety shows the character to a high degree.

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Always read the label. Use pesticides safely

Wheat Husbandry Portfolio

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



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