RECOMMENDEDLISTS

AHDB Recommended Lists (RL) for cereals and oilseeds: Early Sown Winter Wheat Trials protocols (2022–26)

This protocol was believed to comply with relevant agrochemical, environmental and other regulations at the time of writing but it is the responsibility of the contractor to ensure that it continues to comply. In the event of non-compliance the protocol should not be followed but the Field Trials Manager should be notified at once of how the protocol requirements would breach regulations.

Any deviation from this protocol other than under the circumstances described above may result in a breach of contract and should be agreed in advance.

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Changes from previous version

Page no.	Section	Details of change
5	1	Amended to “where early sowing of wheat is of relevance”
5	1	Trial site locations amended
5	1	Removal of reference to “Claire” as a benchmark variety
6	2.4	Amended from “Redigo Deter” to “Redigo Pro”
8	2.6.6	Plant Growth Regulators: Substantial change
10	2.7	Completion of records: table updated
11	2.7.2	Amended timing of assessments
17-20	Appendix 1	Updated fungicide protocol
21-23	Appendix 2	Updated PGR protocol

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Part 1: Trial distribution

The Early Sown Winter Wheat trial series is intended to show the performance of a selection of winter wheat varieties when sown in late August or early September. The trials are to be grown at six first-wheat sites where early sowing of wheat is of relevance.

All management and inputs will be identical to other Recommended List trials, as will the data required from them if not otherwise specified in this protocol.

Early Sown Winter wheat trial sites

RL Trial ID	Trials at site	Location
WW507	3 rep +F 1 rep DOP	Central England
WW518	3 rep +F 1 rep DOP	Lothians, Scotland
WW525	3 rep +F 1 rep DOP	Yorkshire Wolds
WW530	3 rep +F 1 rep DOP	Fife, Scotland
WW534	3 rep +F 1 rep DOP	Northumberland
WW535	3 rep +F 1 rep DOP	South or East England

The varieties to be included will be determined by AHDB: up to a maximum of 35 varieties.

Standard control varieties

A 'benchmark' variety suited to early sowing may be included.
P1 & P2 varieties deemed suitable for early sowing by breeders/agents.
Current RL candidates deemed suitable for early sowing by breeders/agents.
NL2 varieties (i.e. that may be promoted into RL trials as candidates) deemed suitable for early sowing by the breeders/agents.

1.1 Description of trial

The Early-sown yield trials will be a three replication, incomplete plot design, which should receive a full fungicide programme and plant growth regulators. A single replicate of disease observation plots (DOP) will also be grown to provide disease infection data. The DOPs should be untreated with fungicide but should receive the same full plant growth regulator treatment as the yield trial.

1.2 Soil type definitions

As per RL protocol.

1.3 Trial specifications

The trials should be sown within the period 25th August to the 14th September.

The optimum time of sowing is the first week of September but it is accepted that it may be necessary to sow in the last week of August if seedbed conditions are good and the weather forecast is not.

Contact the Field Trials Managers if it is impossible to sow before the 14th September.

1.4 Trial design and treatments

The RL Data Team will generate trial layouts. They will be transferred to the appropriate trial centres in electronic format as Excel workbooks. Instructions concerning the recording and transfer of data will be issued separately.

Fungicide and PGR treatments are to be applied to the yield trial and PGR only to the DOPs. These form part of the trial contract and may constitute a breach of the contract if not adhered to. The special protocols for use are revised annually in December and revised versions will be circulated early in the calendar year for use after this time.

Part 2: Trials

2.1 General – see RL protocol

2.2 Randomisation of trials – see RL protocol

2.3 Plot dimensions, discards and surround – see RL protocol

2.4 Trial seed

Bulks of seed sufficient to sow the specified trials will be sent to trial managers direct from suppliers by 20th August. It is the responsibility of individual trial managers to obtain seed for the area immediately surrounding the trial.

Trial seed must be pre-treated by the supplier with Redigo Pro only. If new-season seed is unavailable (e.g. due to a delayed harvest) it may be over-yeared. It is the responsibility of each trial operator to prepare plot packets from the bulk of seed supplied and to ensure that the correct plant population is achieved.

Variety names, codes, thousand seed weight and germination information will be sent to trial managers, usually by e-mail.
Surplus trial seed may be bulked together and used for discard and buffer plots or filling in but for no other purpose without the prior consent of the Field Trials Managers.

2.5 Drilling

The amount of seed sown per plot must be adjusted according to the thousand seed weight and germination for each individual seed lot.

2.5.1 Target population

The target population (in the spring) is 120 plants per m^2.

2.5.2 Seedrate calculation

The germination% of the submitted seed will be supplied to allow the trial managers to calculate the seedrate. Trial managers should estimate the likely establishment % based on the prevailing weather and seedbed conditions.

The following formulae may be used to calculate the amount of seed to be sown.

Seed rate (kg/ha) = (([1]target population * thousand seed weight) * 100) / ([1]establishment% * germination%)

Drilled plot area = drilled plot length (m) x drilled plot width (number of drilled rows x inter row dimension (m)).

Weight of seed per plot (grams) = Seed rate (kg/ha) x Drilled plot area / 10

[1] The target population is that achieved in the spring. The establishment% figure should take into account any losses that are considered likely over the winter.

2.6 Husbandry guidelines

2.6.1 Site Selection – as RL protocol

2.6.2 Timing of sowing

The trials must be sown within the period 25th August to the 14th September (the trial should not be sown after 14th September). <u>The preference is for sowing to take place in the first week of September.</u>

2.6.3 Herbicides

As RL protocol, but trial managers should be aware of the increased weed burden likely with very early sowing.

2.6.4 Fungicides

See Appendix 1.

Fungicides should be applied to the treated yield trials only – not the DOPs.

The fungicide protocol is reviewed annually and usually circulated at the beginning of the calendar year (the protocol for use until January 2023 is given in Appendix 1). The schedules comprise a core of 'compulsory' and 'optional' applications. All compulsory applications should be made at the prescribed growth stage and dose rate, irrespective of disease levels in the trial. The optional applications are available if required.
Due to the extended period of growth in the autumn, disease is more likely to develop in these early-sown trials to levels where application of the optional autumn programme is required. Trial operators are asked to be particularly vigilant.

In exceptional circumstances it may be necessary to deviate from the programme, e.g. reduced rates may be required for drought stressed trials under low disease pressure. The Field Trials Managers must be notified before taking such a decision and given at least one working day to respond.

In principle, fungicide applications should be made when the majority of varieties are at the correct stage for treatment unless specified otherwise by the fungicide protocol. Note in the diary sheet if the growth stage of any variety(ies) is/are notably different at the time of application.

2.6.5 Fertilisers

End-user quality samples will not be taken from these trials and so there is no requirement to apply extra (late) nitrogen to boost grain protein content. Otherwise the protocol is as for RL trials.

2.6.6 Plant Growth Regulators (PGR)

See Appendix 2. PGR should be applied to the treated yield trial and the DOPs.

The PGR protocol will be based on the programme devised for standard winter wheat trials but this will be modified to meet the added lodging risks attached to early sowing

The PGR protocol is reviewed annually and circulated at the beginning of the calendar year.

In principle, PGR applications should be made when the majority of varieties are at the correct stage for treatment. Note in the diary sheet if the growth stage of any variety(ies) is/are notably different at the time of application. Due to the speed of development of varieties in this type of trial, varieties may reach growth stage 30 before the timing of the first planned fungicide. If this is the case, the first PGR applications can be applied separately.

There are restrictions on the use of plant growth regulators in ALL crops, as well as special directions for their use specifically in variety trials. The manufacturer's instructions should be followed. Any departure from the protocol should be reported to the Trials Coordinator.

2.6.7 Pest control

Trial managers should be vigilant to the extra risk of pest damage (e.g. BaYDV via aphids) from early sowings and be prepared to take appropriate action. Trials seed will be treated with an insecticide but it is expected that autumn application(s) of pesticide(s) will also be necessary. If the trial is in jeopardy, effective control measures e.g. netting, insecticides, molluscicides must be applied to the whole trial.

2.7 Completion of records

The trial workbook should be used to record all data.

Completed data should be returned to trials@ahdb.org.uk as soon as records are taken and by the deadlines shown in the table below:

Report	Deadline	Sheets to be returned (use return macro to submit the required workbook tabs)
1) Confirmation of sowing and notification of changes to plan	With 5 days of sowing	Confirmation that the trial has been sown and if it has been sown to plan. Trial layout – clearly labelled changes if trial has not been sown to plan
2) Site data	Autumn sown trials: within two months of sowing. Spring sown trials: as soon as possible and within one month of sowing.	Site data Map of area Field layout sketch Trial layout Trial diary
3) Early data	Autumn sown trials: within two months of sowing. Spring sown trials: within one month of sowing. Some measures maybe recorded after this time.	Early data recording tab Trial diary update
4) Disease data	Winter crops - As soon as recorded and by 11th July. Spring crops plus Autumn sown Spring wheat – As soon as recorded and by 22nd August. Data submitted by these dates will be used in the calculation of disease ratings but if disease develops after this date, records should be taken and submitted as soon as possible and will be used when practicable.	Disease data recording tab Trial diary update
5) Harvest data	Within 5 days of harvest	Harvest data recording tab Agchem details Trial diary update

Early, disease and harvest plot data tabs contain columns for records likely to be undertaken during the recording period and which may or may not be required by the protocol. Any additional recording columns can be added on the relevant data tabs.

2.7.1 Confirmation of sown to plan

Confirmation that the trial has been sown and if it has been sown to plan. If the trial has not been sown to plan, confirmation of the changes much be received clearly marked on the trial layout. A new workbook is likely to be issued to you with updated data tabs to reflect these changes and prevent confusion at time of data submission.

2.7.2 Site plot data (Site data, location and plan details)

For autumn-sown trials this information should be returned shortly after full establishment and within two months of sowing. The information for spring-sown trials should be returned as soon as possible and within a month of sowing.

This report should include:

- Confirmation of sowing to plan or full details of any changes to plan.

This should be done by clearly highlighting the changes on the trial layout tab contained in the workbook. On receipt of the returned workbook the RL Data Team will ensure that the plan has been modified correctly within all areas of the workbook and may re-issue an updated workbook to include these changes in all areas of the workbook including the data tab. If a new workbook is issued it is recommended that any older versions of the workbook are deleted.

- Completed site data tab
- Map of area. Site location details i.e. how to get to the field by road.
- Field layout sketch. Sketch showing the layout of the trial(s) in the field, in relation to other trials and showing access roads, gates etc.
- Trial layout. Trial sketch showing plot numbers and variety IDs.
- A short post-establishment report of the condition of the trial in the diary tab.

2.7.3 Early data

This sheet will contain

- All agronomic plot data to be recorded upto heading date (GS55)
- For each measure you will need to provide, date of recording, and the growth stage at time of assessment.
- Please submit data as it is assessed

2.7.4 Disease data

This sheet will contain

- Disease data relevant to your crop and trial purpose
- For each measure you will need to provide date of recording, and the growth stage at time of assessment.
- Please submit data as it is assessed

For winter crops valid data returned by 11th July and for spring crops including autumn sown spring wheat by 22nd August can be used to calculate disease ratings and used for the next AHDB Recommended List.
Data returned after these dates will be stored in the database for future use.

Where disease levels are very low and a disease assessment is not possible please enter this information in the trial diary each time the trial is visited.

2.7.5 Harvest data

This sheet will contain:

- All plot data, including yield, dry matter and all remaining agronomic data (see 2.7.7).
- For each measure you will need to provide date of recording, and the growth stage at time of assessment.
- Trial treatments and agrochemical inputs.
- Trial diary comments. Note any factors that may affect the validity of the trial.

2.7.6 Disease data

To be recorded in the Disease Observation Plots and returned as soon as recorded and by 11th July.

2.7.7 Agronomic data recording

The list below details the records required and the scales that should be used. Data should be recorded in the Excel recording sheets within the trial workbooks.

“De-rand” is a de-randomising macro that will allow you to conduct an initial validation of the data. This can be found in the Return macro, a copy of which can be found on the RL extranet. Access to the extranet can be requested via the RL data team at trials@ahdb.org.uk. This function should be used just after an assessment has been carried out for checking disease data so the values can be double checked in the field if necessary. Make a note in the trial diary that this has been done.

The growth stage should be recorded for each observation. The correct growth stage key is given in Appendix 3.

Plot numbers and variety codes must correspond to those on the trial plan within the workbook.

In order to make records comparable across sites, it is essential that the names and units used should be as indicated below. Records of other characters will be processed and stored but may not be used.

Data should be taken from all plots unless noted to the contrary.

Characters and Scales

Characters to be recorded are listed below. They are listed as:

Obligatory: where the trials should be scored routinely even though the character may be scored at zero for the whole trial - particularly useful in characters such as lodging.

Selected sites: where records are required from a sub-set of the UK trials only. The list of trial sites from which data are required are listed below.

If present: e.g. disease.

Optional: at the discretion of the trials operator.

Agronomic characters

Winter hardiness (1-9) **OBLIGATORY**

Obligatory, from all plots. After any period of cold weather, varieties should be scored on a 1-9 scale (where 9 = no damage). See Appendix 4.

Growth stage 31 **OBLIGATORY**

Obligatory. Record the approximate date on which each variety reaches GS31. Under certain conditions when sown very early, some varieties may reach this stage in the late autumn/winter. Only one rep needs to be assessed. It is hoped that this will give an indication of the relative speed at which varieties change from the vegetative to the reproductive stage.

Straw length (cm) **OPTIONAL**

Do not record unless considered relevant for validation purposes.

Leaning% **OBLIGATORY**

Obligatory, from all plots

Where areas of the plot are leaning to not more than 45º to the vertical.

An additional record should be made at harvest even if the character has been recorded previously.

Lodging% **OBLIGATORY**

Obligatory, from all plots

Where areas of the plot have gone down, from the base of the plant to an angle greater than 45º to the vertical. Lodging and leaning should be assessed at the same time. Trial operators should routinely check for eyespot during recording to assess if it is a contributory factor (use the trial diary to record these observations).

Record lodging (and leaning) as soon as it occurs, as there may be observable differences at this stage that cannot later be seen.

An assessment at harvest should always be made at harvest even where no lodging is present (i.e. all values are 0) and even if it has been scored previously.

There are two types of lodging, stem lodging and root lodging. Root lodging is the result of a failure below ground. The whole root structure moves as forces acting on the plant above ground overcome the plant's anchorage, allowing the plant to fall. Where lodging and/or leaning has occurred, examine the plots and assess what proportion of the lodging is above ground (stem) or below ground (root). This record does not replace the standard lodging and leaning scores and the sum total of root and stem lodging should equal the total lodging score. *The differentiation between these two types of lodging may not be possible where both types are present within plots. Advise the Field Trials Managers Team if this is the case.

Lodging%: obligatory from all plots. The lodging plot value must be equal to the sum of the stem and root lodging scores for the same plot.

Stem lodging%: *obligatory, from all plots

Root lodging%: *obligatory, from all plots

The sum of the plot values taken on the same day for stem lodging + root lodging should be equal to the lodging% score.

Date of GS55 (heading date/ear emergence) **OBLIGATORY**

Obligatory. Records for this character should be taken from all treated yield plots. Record the date of ear emergence in the format dd/mm/yyyy for each treated yield plot in winter wheat.

In winter wheat, record for each plot the date on which 50% of ears are 100% emerged.

Ripening date **OBLIGATORY**

Obligatory. Records for this character should be taken from all yield plots. Assessed when the grain is first hard, difficult to divide by thumbnail (GS91). The crop may not necessarily be ready to cut at this stage.

Record in the format dd/mm/yyyy.

Ripening date can be assessed as described below.

- The assessment should take place where the earliest variety is at GS91. Use a 1-9 scale to record maturity:

9	8	7	6	5	4	3	2	1
Ripe	2 days later	4 days later	6 days later	8 days later	10 days later	12 days later	14 days later	16 days later

- Record each plot in the trial on the 1 to 9 scale. A second visit to confirm the earlier observation would be advisable.

- Convert the 1 to 9 scale to dates. Please send in the ripening dates not the 1-9 assessments.

Example:

Plot	Score	Estimated ripening date
1	9	02/08/17
2	8	04/08/17
3	5	10/08/17
4	4	12/08/17
5	2	16/08/17
6	7	06/08/17

Bird damage (1-9) **OBLIGATORY**

Where 9 = no bird damage. If present mid-season and obligatory at harvest from all plots. Assessments should be made wherever it occurs in a trial since decisions have to be made on the validity of each plot affected. A record should be made at harvest even if the character has been recorded previously and even if all scores are 9 (no damage).

Whiteheads whole plots% **IF PRESENT**

Obligatory from all wheat plots if present.
Record the occurrence of whiteheads within the trial. Note the likely cause(s) of the whiteheads (especially if the cause appears to be eyespot).

Shedding (1-9) **OBLIGATORY**

Obligatory just prior to harvest by assessing the number of grains on the ground.

Where 9 = no shedding. Occurs mainly in wheat and oats in the mature plant. If losses are seen, estimate the number of grains lost per m^2 for the lowest and highest scores recorded so that the severity of yield loss can be estimated. A record should be made at harvest even if the character has been recorded previously and even if all scores are 9 (no shedding). Trial operator to provide an assessment key.

Sprouting% **OBLIGATORY**

Obligatory if present in the ear at harvest even if all scores are zero. Record if present at any other time. If sprouting is seen, either in plots or harvested samples, the Field Trials Managers should be informed.

Combine losses (1-9) **OBLIGATORY**

Obligatory from all plots.

Where 9 = no loss. Combine losses should be assessed straight after the trial has been harvested and a record submitted even if all scores are 9 (no losses). If losses are seen, estimate the number of grains lost per m^2 so that the severity of yield loss can be estimated. Trial operator to provide an assessment key.

Harvest date **OBLIGATORY**

Obligatory. Record in the format dd/mm/yyyy.

Yield (kg) and Dry matter% **OBLIGATORY**

Obligatory from yield plots. Notify the Field Trials Managers that harvest has taken place on the day of harvest, or first thing the following day. Yield with dry matter should be returned in report four within five days of the harvest of the trial, together with any outstanding other data.

Plot dimensions

Plot length	The plot length harvested, in metres
Plot width	The width of the harvested plot in metres from outer row to outer row plus half of the inter plot gap. If the inter-plot gap varies it should be measured for each plot

Growth stage

Usually 92 at harvest.

Record all plots. The fresh yield should be recorded in kg. Any tare weight should be subtracted before submitting the data. Return with the yield the completed Agchem sheet and note in the diary any factors which may have affected the yield of the trial or individual plots. If, within the harvested plot area, any drill rows, or part of rows are missing, the following information should be supplied:

i.) The plot number containing the missing row(s).
ii.) The length of row(s) missing.
iii.) Whether the missing row is internal or one of the two outer ones.
iv.) The number of rows normally drilled.
v.) The dimension between drilled rows (in metres)

The dry matter% of each plot must be determined. This can be assessed by the oven method, by electronic moisture analyser (within a specified moisture range), NIR or NMR (see Appendix 9).

2.7.8 Disease assessment, recording and sampling for UKCPVS

See disease assessment section of main RL cereal protocol. Samples should be taken for the UKCPVS if appropriate and/or requested.

Appendix 1 - Fungicide Protocol

Introduction

Recommendations by Paul Gosling, BASIS registration number R\E\8107\IFM.

RL Trials Co-ordinator:	Mark Bollebakker	01480 482989
NL Co-ordinator:	Jeremy Widdowson	01353 653846

This programme is for use on AHDB Recommended List and National List cereal trials in 2022/23:

- For spring and summer applications to trials for harvest 2022
- For autumn/winter applications to trials to be harvested in 2023

It is an experimental protocol and is designed to meet the protocol aim of keeping disease levels in treated plots below 5% infection in all varieties and in all trials. It is not intended to follow commercial practice.
Please note that most treatments are compulsory, and the rates and timings specified should be adhered to as closely as possible. The protocol is robust and, if applied correctly, should be effective. If, however, disease levels rise above 5% (e.g., if weather conditions do not allow optimal application), please contact Mark Bollebakker (RL) or Jeremy Widdowson (NL) to discuss an appropriate course of action.

Fungicides should be applied at the stated dose rates unless agreed otherwise with the RL Trials Co-ordinator or NL Co-ordinator. Changes to dose rates will only be sanctioned in exceptional circumstances, such as drought-stressed trials under low disease pressure.
Please contact the RL Trials Co-ordinator or NL Co-ordinator if you have any difficulty in sourcing a particular product.

In some cases, two or more products may be available from a company with the same active substances and formulation; if you wish to use such a product and it is not listed in this protocol, contact the RL Trials Co-ordinator or NL Co-ordinator. Generic products should be avoided as they may contain the same active substances but in a different formulation.

Important: Every care has been taken to ensure that all mixtures, rates, and timings are approved, meeting COSSH regulations and manufacturers and statutory guidelines. However, it is the responsibility of the Trial Manager to ensure that they meet all current regulations at the time of application. It is recommended to seek advice from a qualified BASIS advisor for suitability to local conditions and regulatory compliance. The RL Trials Co-ordinator or NL Co-ordinator should be notified of any conflict between the protocol and current regulations.

In accordance with FRAC guidelines, only two applications of strobilurin fungicides and two SDHI fungicides are to be applied to any crop.

Products, active substances and manufacturers

Product	Active substances	Amount of active substance	Manufacturer
Comet 200	Pyraclostrobin	200 g/l	BASF
Cyflamid	Cyflufenamid	50 g/l	Certis
Elatus ERA	Benzovindiflupyr Prothioconazole	75 g/l 150 g/l	Syngenta
Entargo	Boscalid	500 g/l	BASF
Fandango	Fluoxastrobin Prothioconazole	100 g/l	Bayer CropScience
Imtrex	Fluxapyroxad	62.5 g/l	BASF
Arizona	Folpet	500g/l	Adama
Proline 275	Prothioconazole	275 g/l	Bayer
Prosaro	Prothioconazole Tebuconazole	125 g/l 125 g/l	Bayer
Revystar XE	Mefentrifluconazole Fluxapyroxad	47.5/100 g/l	BASF
Siltra Xpro	Bixafen Prothioconazole	60/200g/l	Bayer
Talius/Justice	Proquinazid	200 g/l	DuPont
Tebuconazole	Tebuconazole	250 g/l	Belchim/Rotam
Univoq	Fenpicoxamid Prothioconazole	50 g/l 100 g/l	Corteva

When you are applying optional treatments make sure you adhere to product labels regarding maximum total dose and maximum number of treatments.

Winter Wheat

Treatment Timing	Growth Stage (GS) - target timing or disease	Product / active ingredient	Rate
Contact Trials Manager if significant yellow rust pre T0.			
T0	**GS30 (with no later than when 50% of varieties at GS30)**		
		Cyflamid +	0.25 – 0.35 l/ha
		Metconazole 250+	0.5 l/ha
		Comet 200	0.4 – 0.6 l/ha

T1	**GS32 (with most varieties at GS32)**		
For eye spot situation		Revystar XE +	1.0 –1.25 l/ha
		Entargo +	0.5 l/ha
		Arizona +	1.0 l/ha
		Talius/Justice	0.15 l/ha
For heavy rust situation		Revystar XE +	1.0 – 1.25 l/ha
		Elatus Era +	0.6 l/ha
		Arizona+	1.0 l/ha
		Talius/Justice	0.15 l/ha

T1.5	**GS33 (targeting leaf 2 emerging)**	
In a rust situation **Note: 14-day interval between T1.5 Tebuconazole application and T2 application**	Tebuconazole 250	0.75 l/ha
Or in a septoria situation	Prothioconazole 275	0.6 l/ha
Note: Arizona can only be used at one timing either here or at T3	+ Arizona	1.0 l/ha

T2	**GS39–45 and no later than 4 weeks after T1 application**	
	Univoq	1.25 – 1.5 l/ha
Note: <u>Strongly</u> recommended for rust in East and Southern regions.	Tebuconazole +	0.75 – 1.0 l/ha
	Arizona	1.0 l/ha
Optional - If mildew established	*Cyflamid*	*0.25 – 0.35 l/ha*

T3	**GS55–61 Timing for Fusarium control (very early anthesis preferred).**	
	Prosaro +	0.8 – 1.0 l/ha
	Comet 200 +	0.4 – 0.6 l/ha
Optional - if not used at T1.5 can only be used up to GS59.	*Arizona*	*1.0 l/ha*

Post T3
For extreme septoria or brown rust situations please contact the relevant trials co-ordinator

<u>Note</u>

No more than TWO applications of a SDHI product should be applied to any cereal crop

Depending whether "Knock down" or protectant activity is required, applications of Cyflamid (eradicant) and Talius/Justice (protectant) can be swapped at T0 or T1. DO NOT APPLY CONSECUTIVE APPLICATIONS OF PRODUCTS CONTAINING CYFLAMID

For Cyflamid, the maximum number of treatments is TWO PER CROP on ALL recommended cereals, to be applied ONLY IN SPRING

Appendix 2 - Plant Growth Regulator Protocol

Recommendations by Paul Gosling, BASIS registration number R/E/8107/IFM.

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The following notes are given for guidance in the use of plant growth regulators (PGRs) on Recommended List trials (there is a separate protocol for VCU trials). The full manufacturer instructions should be consulted prior to the storage, handling or use of any agrochemical product. The instructions and advice given on product labels should be followed at all times. There should be no conflicting advice between that given in this protocol and on the product label. If there appears to be any conflict, inform the Trials Co-ordinators before the application is made.

Table 1: Summary of Plant Growth Regulator applications for RL trials

Crop	Fungicide treated plots	Plots or DOP's without fungicide	Lodging trials
Winter wheat	Yes	Yes	No
Spring wheat (late autumn or spring sown)	Yes	Yes	N/A
Winter barley	Yes, unless the crop is stressed and the risk of lodging is negligible.	Yes, unless the crop is stressed and the risk of lodging is negligible.	No
Spring barley	Only if a high risk of lodging	No	No
Winter oats	Yes, +F/+PGR plots only.	Yes	No
Spring oats	Yes, +F/+PGR plots only.	No	N/A
Winter rye	Yes	Yes	N/A
Winter triticale	Yes	Yes	N/A

Plant growth regulators should **not** be applied to trials grown specifically for the assessment of lodging. There are important restrictions relating to the use of plant growth regulators.
Crop damage can occur if manufacturers' guidelines are not followed.
Common restrictions are those relating to crops that:

- are sited on soils of low fertility
- are suffering from herbicide damage
- are under stress from drought, waterlogging or any other cause
- were sown in the very late spring

Trial managers should consult the manufacturer's instructions to see if any of these restrictions apply.

In all cases, plant growth regulator should be applied to designated plots only as specified in the AHDB Recommended List cereal trials protocol.

General guidance and notes specific to the use of PGRs on variety trials

Products should be used according to current manufacturers' instructions. It is the responsibility of the Trial Manager to ensure that the growth stages of all of the varieties in the trial are within the manufacturer's guidelines for use. The following notes are intended to highlight matters of particular relevance to the use of PGR products on variety trials and timings are relevant to earliest varieties.

The **Terpal** doses in this protocol are below full rate (**2.0 l/ha**).
Consult the Trials Co-ordinators if you feel that a higher dose is needed e.g. if there is a risk of severe lodging. However, be aware that late applications of **Terpal** (e.g. at around the flag leaf emergence stage) at higher doses can lead to crop damage or stimulate the production of secondary tillers.

Winter wheat and late autumn sown Spring wheat

Product	Crop	Rate & timing
Either split dose 3C Chlormequat 750+ Moddus	Winter wheat only	3C Chlormequat 750 at 1.0 l/ha at GS25–30 PLUS †Moddus at 0.1 l/ha if applied at the G.S. 30 timing. followed at GS31–32 by 3C Chlormequat 750 at 1.0 l/ha PLUS †Moddus at 0.1 – 0.2 l/ha. Do not apply if any variety is beyond the GS32 timing.
OR SINGLE DOSE (Winter wheat and late sown autumn sown spring wheat) 3C Chlormequat 750 + Moddus	Winter wheat	3C Chlormequat 750 at 1.5 – 2.0 l/ha at GS30–31 (in the North and North-west regions this can be delayed to GS32) PLUS †**Moddus** at 0.1 – 0.2 l/ha. Do not apply if any variety is beyond GS32.
	Spring wheat	3C Chlormequat 750 at 1.25 l/ha at GS30–31 (in the North and North-west regions this can be delayed to GS32) PLUS †**Moddus** at 0.1 – 0.2 l/ha. Do not apply if any variety is beyond GS32.
Terpal		Either single-dose of 0.75 – 1.5 l/ha (depending on lodging risk and *condition of the crop) at GS32–37. OR (particularly for the early sown crops) a split dose of 1.0 l/ha at GS33 plus 0.75 l/ha at GS37. Maximum individual dose is 2.0 l/ha, maximum total dose is 2.0 l/ha and maximum number of treatments is 2 per crop.

***Terpal** should not be applied to any variety in the trial if the leaf sheaths have split and the ears are visible.

- **DO NOT** apply **Terpal** if the crop is suffering from herbicide damage or physical stress caused by e.g. waterlogging, drought, take-all.
- **DO NOT** apply in temperatures above 21°C. If, in Winter wheat/Spring wheat trials there are large differences in growth stages; contact the RL Trials Co-ordinator / NL Co-ordinator.

† **Moddus** - Apply unless the crop is stressed or the lodging risk is negligible.

Appendix 3 - Growth stage key

Seedling growth		**Tillering**	
10	first leaf through coleoptile	20	main shoot only
11	first leaf unfolded	21	main shoot and 1 tiller
12	2 leaves unfolded	22	main shoot and 2 tillers
13	3 leaves unfolded	23	main shoot and 3 tillers
14	4 leaves unfolded	24	main shoot and 4 tillers
15	5 leaves unfolded	25	main shoot and 5 tillers
16	6 leaves unfolded	26	main shoot and 6 tillers
17	6 leaves unfolded	27	main shoot and 7 tillers
18	8 leaves unfolded	28	main shoot and 8 tillers
19	9 or more leaves unfolded	29	main shoot and 9 or more tillers
Stem elongation		**Booting**	
30	Ear at 1 cm	41	flag leaf sheath extending
31	1st node detectable	43	boots just visibly swollen
32	2nd node detectable	45	boots swollen
33	3rd node detectable	47	flag leaf sheath opening
34	4th node detectable	49	first awns visible
35	5th node detectable		
36	6th node detectable		
37	flag leaf just visible		
39	flag leaf ligule/collar just visible		
Inflorescence (ear emergence)		**Anthesis**	
51	First spikelet of inflorescence just visible	60	beginning of anthesis
52	¼ of inflorescence emerged	61	
55	½ of inflorescence emerged	64	anthesis half-way
57	¾ of inflorescence emerged	65	
59	inflorescence completed	68	anthesis completed
		69	
Milk development		**Dough development**	
71	caryopsis watery ripe	83	early dough
73	early milk	85	soft dough
75	medium milk	87	hard dough
77	late milk		
Ripening			
91	caryopsis hard (difficult to divide by thumb-nail)		
92	caryopsis hard (can no longer be dented by thumb-nail)		
93	caryopsis loosening in daytime		

Reference: Tottman D R, Broad H (1987), Decimal Code for the Growth stages of Cereals Annals of Applied Biology 100, 683-687

Appendix 4 - Winter hardiness assessment key

1-9 scale. A high figure shows good resistance to winter hardiness.

1	76% to 100% of plants dead.
2	Very severe leaf damage, 51% to 75% of plants dead.
3	Very severe leaf damage, 26% to 50% of plants dead.
4	Severe leaf damage, up to 25% of plants dead.
5	Severe leaf damage and a few dead plants.
6	Severe leaf tipping
7	Moderate leaf tipping
8	Slight to very slight leaf tipping
9	No damage

Note: Damage is frequently not apparent until several days after the end of a cold period.

Appendix 5 - Foliar disease assessment key

1) Examine top 4 leaves. If top leaf has been fully expanded for less than 14 days, refer to 2nd leaf as 'top leaf'.
2) Ignore all naturally senescent leaf tissue.
3) Include all chlorosis and necrosis attributable to disease.
4) Record % infection; use interpolated values (e.g. 3%) if necessary. **Data must be submitted as a percentage score**.
5) If foci present, record average over the plot as a whole.

1-9 scale	% Infection	Mildew	Yellow rust	Brown rust
1	0	No infection observed		
2	0.1	3 pustules per tiller	1 stripes per tiller	25 pustules per tiller
3	1	5 pustules per leaf	2 stripes per leaf	100 pustules per leaf
4	5	2 lower leaves appear ¼ infected	Most tillers infected but some top leaves uninfected	Top leaf - numerous pustules but leaves appear green overall
5	10	2 lower leaves appear ½ infected	All leaves infected but leaves appear green overall	Top leaf - pustules sufficiently dense to give brown appearance in patches
6	25	Leaves appear ½ infected ½ green		
7	50	Leaves appear more infected than green		
8	75	Very little green leaf tissue left		
9	100	Leaves dead - no green tissue left		

1-9 scale	% Infection	Septoria
1	0	No infection observed
2	0.1	1 lesion per 10 tiller
3	1	2 small lesions per tiller
4	5	Small lesions beginning to form areas of dead tissue across width of leaf
5	10	2 lower leaves - largeareas of diseased tissue some covering 1/3 of leaf
6	25	Leaves appear ½ infected ½ green
7	50	Leaves appear more infected than green
8	75	Very little green leaf tissue left
9	100	Leaves dead - no green tissue left

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Appendix 6 - Ear blight of wheat key



Notes of assessment

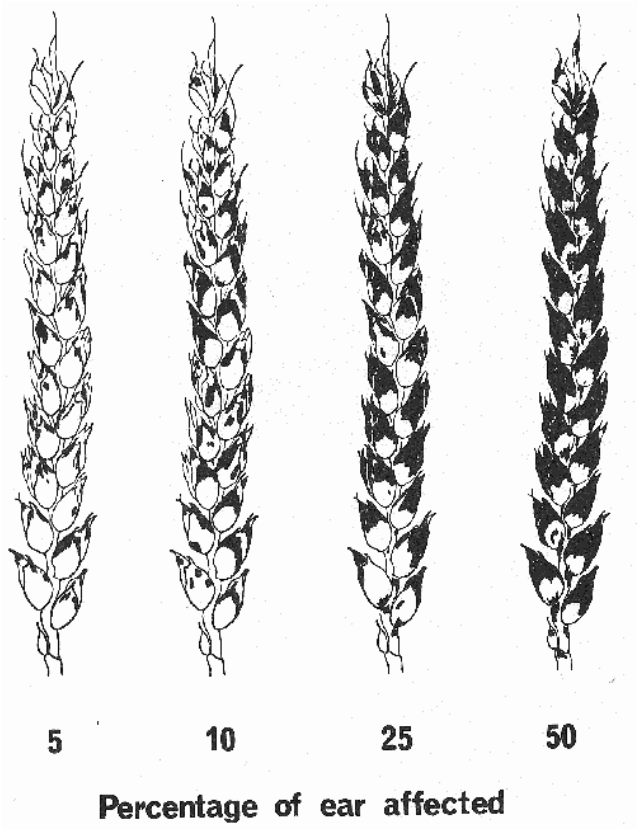
1) Carry out the assessment between GS 80-90.
2) Select 20 ears at random from each plot.
3) Estimate the percentage area infected on individual ears using the illustrations above as a guide.
4) Record the mean value from the 20 assessments.

For further details see Parry D W, Bayles R A & Priestley R H (1984).
Resistance of winter wheat varieties to Ear Blight (*Fusarium culmorum*).

Journal the National Institute of Agricultural Botany 16, 465-468.

NIAB-TAG, Cambridge CB3 OLE

Appendix 7 - Wheat glume blotch key



Notes:

1. Crops may be examined at any growth stage after GS 60 if glume blotch has appeared.
2. Assess 30 ears selected at random from each plot.
3. Assess the % ear affected on both sides of the ear and record a mean figure for that ear. Interpolate if necessary, e.g., if an ear falls between 10 and 25% give it a score in between, say, 15-20%.

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Appendix 8 - Eyespot of wheat key

Eyespot of Wheat (*Oculimacula yallundae* and *O. acuformis*)

Infection category	Disease severity description
0	Uninfected.
1	Slight eyespot (one or more small lesions occupying less than half the circumference of the stem).
2	Moderate eyespot (one or more lesions occupying at least half the circumference of the stem).
3	Severe eyespot (stem completely girdled with lesions; tissue softened so that lodging would readily occur).

Notes of assessment

1) Examine 20 tillers per plot.

2) Assign each tiller to one of the infection categories above.

3) Write the number of tillers in each category on the record sheet.

4) An index will be calculated from the data as follows:

$$\text{Disease index} = \frac{(0 \times a) + (1 \times b) + (2 \times c) + (3 \times d)}{(a + b + c + d)} \times \frac{100}{3}$$

Where a, b, c and d are the number of tillers examined which fall into the categories 0, 1, 2, and 3 respectively.

For further details, see Scott, P R and Hollins, T W (1975). Effects of eyespot on the yield of winter wheat. Annals of Applied Biology 78, 269-279.

NIAB-TAG, Cambridge CB3 OLE 1985

Appendix 9 - Determination of Dry Matter on Cereals

Oven Method

Principle

Samples are dried until constant mass is achieved. For expediency it is permissible to dry samples for a fixed time provided it can be demonstrated that this is sufficient to reliably achieve constant mass for samples even when the chosen apparatus is fully loaded with samples.

Apparatus and Equipment

Oven
Electrically heated and controlled in such a way that, during normal working, the mean temperature of the air and of the shelves carrying the test samples is 100°C and operates within the range 96 - 104°C.

The oven should be regularly maintained and regularly checked for correct operation.

Sample drying trays
Durable under test conditions and being of a size which enables the test sample to be distributed evenly within the tray and at depth which does not protract the drying time.

Balance
Accuracy 0.1g ± 0.05g. The balance should be regularly serviced and calibrated. Frequent checks on its correct operation should be made during the period when the balance is in use.

Method

The test samples are received direct from the combine in hermetically sealed bags or containers. Weigh a fully representative 100g sub-sample or an accurately recorded catch-weight between 100-110g and place into the drying tray with an identifying label. Place the drying trays containing the test samples into the pre-heated oven. Dry the test samples for the pre-determined period or until constant mass is achieved (see below).

Remove the test samples from the oven and record the dry weight of the test sample to 0.1g.

If achievement of constant mass is to be directly measured, five check samples should be removed from a range of positions within the oven after a period of about 16 hours. The dry weight of these samples should be recorded as above. The check samples should be returned to the oven and dried for a further 2 hours and the dry weight again recorded. A dry matter content of less than 0.3% between the two determinations will be accepted as representing constant mass. If constant mass has not been achieved, the check samples should be returned to the oven for further periods of two hours until constant mass is observed.

Results

The dry matter content of the test sample is calculated as follows;

$$\text{Dry Matter (\%)} = \frac{\text{Dry test sample weight}}{\text{Original test sample weight}} \times 100$$

Near Infrared Reflectance (NIR) & Nuclear Magnetic Resonance (NMR)

Contact Field Trials Managers Team.

Electronic moisture analyser (moisture meter)

Principles

Moisture analysers, either separate instruments or probes on combines, may be used for determining the dry matter of harvested grain. There are no restrictions on the make or model of moisture analyser that may be used, provided the conditions described below are met.

The manufacturer's recommendations for use must be followed. On-combine analysis must only be carried out on equipment specifically manufactured for this purpose. 'Desk-top' analysers should not be used on the combine because it has been shown that heat and vibration can cause inaccuracy.

Equipment

The analysing equipment must:

- be regularly calibrated according to the manufacturer's instructions using check samples (see reference below) and have a moisture content accuracy of plus/minus 0.5%. The calibration data should be retained for a minimum of one year.
- be serviced regularly, especially just prior to harvest, according to manufacturer recommendations. The action taken should be documented and the information held for a minimum of one year.
- be fit for use in accordance with manufacturer instructions. It should have an adequate power supply throughout operation. Instructions should be held with the machine and all operators adequately trained in its operation.

In the field

- The determination of dry matter should be the same for all plots in a trial replicate. For this reason, there should be minimal risk of rainfall during the harvest of a replicate. If there is a significant risk then backup samples should be taken from all plots to allow comparison through the oven method or NMR.
- The grain samples to be analysed must be between 83 and 88% dry matter (12 to 17% moisture content). If it is possible that samples in a replicate may fall outside this range, samples must be taken from all plots so that the oven method or NMR may be used should it be necessary. Suitable polythene bags or plastic pots and labels should be obtained locally and made available at all times during the harvest to allow this to be carried out.
- The grain to be analysed must be fully ripe with no green ears/grains in any sample. In these cases the samples for the oven method or NMR should be used.
- The data sent to NIAB-TAG must be in the form DRY MATTER%.

References: BS 4317-24:1990, ISO 7700/1-1984 Method of checking the calibration of moisture meters for cereals.

Appendix 10 - Deadlines and milestones

It is required that RL Project Consortium trials will be grown to the highest standards and that contractors will give them priority. Failure to meet the trial specification without good reason will be a breach of the contract and could result in reduced or no payment of the agreed fee for that trial.

If any operation, for example drilling, disease recording or harvesting, are delayed or carried out in poor conditions, it is the responsibility of the contractor to inform the Field Trials Managers Team and to explain the reasons for the delay/ problem. **Failure to inform the Field Trials Managers Team will constitute a breach of the contract.**

Failure to return data and / or samples by these deadlines without good reason will constitute a breach of contract.

Report	**Deadline**	
Confirmation of sowing and notification of changes to plan	Within 5 days of sowing.	Confirmation that the trial has been sown and if it has been sown to plan. Trial layout sheet, clearly showing changes if trial has not been sown to plan
Site data Early plot data	Autumn sown trials: within two months of sowing. Spring sown trials: as soon as possible and within one month of sowing.	Site data Map of area Field layout sketch Trial layout Trial diary
Early data	Autumn sown trials: within two months of sowing. Spring sown trials: within one month of sowing. Some measures maybe recorded after this time.	Early data recording tab Trial diary update
Disease data	Winter crops - As soon as recorded and by 11th July. Spring crops plus Autumn sown Spring wheat – As soon as recorded and by 22nd August. Yellow rust in winter wheat – within 3 days of assessment Data submitted by these dates will be used in the calculation of disease ratings but if disease develops after this date, records should be taken and submitted as soon as possible and will be used when practicable.	Disease data recording tab Trial diary update
Harvest data	Within 5 days of harvest	Harvest data recording tab Agchem details Trial diary update

Responses to trial queries	
Response to email or telephone queries from the Trials Coordinator during the season	Seven days after the request or by harvest if this is sooner
Response to email or telephone queries from the Trials Coordinator after the trial has been harvested	One working day

Quality samples	
Grain quality samples	To be received by laboratory (as designated by the Field Trials Manager) within three days of harvest unless drying is required when they should be sent within five days.
Physical quality (wheat)	To be received by laboratory (Campden BRi) within three days of harvest
All other samples	To be received by laboratory designated by the Field Trials Manager within three days of notification that they are required.

Appendix 11 – Payments for abandoned or rejected trials

AHDB Recommended List trials

Payments for abandoned or rejected trials or parts of a trial

Problem	Reason for failure or loss of data		Payment	
			Proportion of: Trial	Replicate
Trials abandoned before harvest				
Trial not drilled	Factors outside of the trial operator's control (e.g. weather).		25%	N/a
Trial not drilled	Controllable factors (e.g. missed opportunity to drill)		0%	N/a
Failed to establish	Factors outside of the trial operator's control (e.g. waterlogging where there is no history of any problem).		50%	50%
Failed to establish	Controllable factors (e.g. bird damage).	See note 1	0%	0%
Abandoned mid-season	Excessive OSR volunteers in OSR trial if in an unsuitable rotational position (<5 yrs since OSR crop).	See note 2	25%	25%
Abandoned mid-season	Excessive OSR volunteers in OSR trial if in a suitable rotational position (>5 yrs since OSR crop).		50%	50%
Abandoned mid-season	Excessive cereal volunteers in 1st cereal trial.		25%	25%
Abandoned mid-season	Excessive cereal volunteers in 2nd cereal trial.		50%	50%
Abandoned mid-season	Factors outside of the trial operator's control (e.g. drought or waterlogging where there is no history of any problem).		50%	50%
Abandoned mid-season	Controllable factors (e.g. excessive weeds or pest damage).	See note 3	25%	25%
Trial not harvested (but all other work carried out)	No fault attributable to the trial manager.	See note 4	75 - 100%	
Data unavailable	Incorrect treatment mid-season (trial operator or host farm error).	See note 4	50%	50%

Problem	Reason for failure or loss of data		Payment Proportion of: Trial	Replicate
Data unavailable or loss of accuracy.	Trial drilled with errors (e.g. laid out incorrectly, invalidating alpha lattice design) or by not following the plan correctly.	See note 5	TBC	TBC
Trials harvested but rejected for use in the database				
Data omitted	Factors outside of the trial operator's control (e.g. take all or drought)		100%	100%
Data omitted	Factors under the control of the operator at harvest.		50%	50%
Grain samples post-harvest				
Samples unavailable	Not taken or not received by testing laboratory		90%	N/a
Samples in poor condition	Samples not correctly dried.		90%	N/a

Note 1 Controllable factors: This assumes that it has been possible to take corrective action but it has not been done. If the operator has been unable to take action due to (e.g.) weather the payment will be 50%.
Note 2 Unless there has been written prior agreement to place trial on a site that has grown OSR <5 years ago.

Note 3 This includes trials sown in a location that increases the risk of damage (e.g. too close to a wood or other potential sources of animal activity such as a badger sett).

Note 4 If the trial inspector agrees that the trial should be taken to harvest then payment should be 100%. If the operator wishes to take the trial to harvest against the advice of the inspector, these payments apply.

Note 5 A decision on payment for this problem can only be determined on a case by case basis, depending on the amount of data or accuracy lost.