



Animal &
Plant Health
Agency

United Kingdom Variety List Trials: Trial Procedures for Official Examination of Value for Cultivation and Use (VCU) Harvest 2024

Perennial, Italian and Hybrid Ryegrass, Timothy,
Festulolium, Cocksfoot, Tall and Meadow Fescue

Appendices

September 2023

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Appendix 1 – Approved Trial Organisers/ Operators for perennial, Italian and hybrid ryegrass, timothy, cocksfoot, tall and meadow fescue and festulolium

Activity	Organisers/Operators responsible
Trial Design and Data Handling Operator	NIAB for England & Wales BioSS for Scotland AFBI for Northern Ireland
VCU Trials Organiser	BSPB for England, Wales & Northern Ireland BSPB & SASA for Scotland
Growing Trial Operator	DLF Seeds Ltd for England DSV UK for England NIAB for England IBERS for Wales SRUC for Scotland SASA for Scotland AFBI for Northern Ireland
Seed Handling Operator	NIAB
Pathology Trial Operator	NIAB Barenbrug
Trial Inspection Operator	NIAB and BSPB for England & Wales SASA and BSPB for Scotland AFBI and BSPB for Northern Ireland
Technical Validation Operator	NIAB for England & Wales BioSS for Scotland AFBI for Northern Ireland
Quality Testing Operator	NIAB

Activity	Organisers/Operators responsible
Data Review and Standard Setting Operator	NIAB

Appendix 2 – Seed treatment products for use on VL trials

None

Appendix 3 – Seed dispatch deadlines

VCU seed must be delivered to the Seed Handling Operator by 5th February.

Appendix 4 - VCU growing trials

Not all trials are grown at all sites in each year. The Trials Organiser will provide details.

Four different trial series are grown as follows:

Trial series	Species which may be included at the request of the applicant
<p>PRG, CFT</p> <p>Alternating conservation and simulated grazing over three harvest years</p>	<p>Perennial ryegrass</p> <p>Hybrid ryegrass</p> <p>Festulolium</p> <p>Cocksfoot</p>
<p>IRG, TF and FL</p> <p>Combined conservation and simulated grazing over two harvest years</p>	<p>Italian ryegrass</p> <p>Tall fescue</p> <p>Festulolium</p> <p>Hybrid ryegrass</p>
<p>HRG</p> <p>Combined conservation and simulated grazing over three harvest years</p>	<p>Hybrid ryegrass</p> <p>Italian ryegrass</p> <p>Tall fescue</p> <p>Festulolium</p>
<p>TIM and MF</p> <p>Alternating conservation and simulated grazing over three harvest years</p>	<p>Timothy</p> <p>Meadow fescue</p>

Hybrid ryegrasses and festulolium should only be tested in up to two of the three testing systems – PRG and HRG or HRG and IRG.

A brief description of the trials series are as follows:

PRG, CFT

Number of sowing years:	2
Number of harvest years	3 harvest years for first sowing and 2 harvest year for second sowing
Number of trial sites:	6
Number of replicates	2 in each trial
Heading groups	Early, Intermediate and Late heading varieties are grown in separate trials and cut on different dates under conservation management.
Ploidy groups	Diploid and tetraploid varieties of each heading group are grown in the same trial but candidates are compared with the appropriate control variety. See Appendix 5
Trial regimes	Top plots as required without weighing in sowing year. Conservation management in first harvest year. Simulated grazing management in second harvest year. Conservation management in third harvest year.
Number of control varieties	Two for each ploidy within each heading group plus a hybrid if required.

The applicant must allocate varieties to a specific maturity class. The heading group classification used to achieve this is given in Appendix 5

Where there are no candidates in a PRG maturity Group a control will be sown in the adjacent group.

IRG, TF and FL

IRG, TF and FL	
Number of sowing years:	2
Number of harvest years	Sowing year plus 2 harvest years
Number of trial sites:	3 + 3 additional sites
Number of replicates	2 in each trial
Heading groups	All candidates are considered in a single group
Ploidy groups	Diploid and tetraploid varieties are grown in the same trial but candidates are compared with the appropriate control variety. See Appendix 5
Trial regimes	As detailed in Section C.5. Maximum of 5 cuts in sowing year. Combined management in first and second harvest year.
Number of control varieties	One for each ploidy, plus hybrid control if required.

HRG

HRG	
Number of sowing years:	2
Number of harvest years	3 harvest years for first sowing and 2 harvest years for second sowing
Number of trial sites:	3 + 3 additional sites
Number of replicates	2 in each trial
Heading groups	All candidates are considered in a single group
Ploidy groups	Diploid and tetraploid varieties are grown in the same trial, but candidates are compared with the appropriate control variety. See Appendix 5.
Trial regimes	As detailed in Section C.5. Maximum 5 cuts in sowing year. Combined management in first, second and third harvest year.

HRG

Number of control varieties	One for diploid, two for tetraploid
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TIM and MF

TIM and MF	
Number of sowing years:	2
Number of harvest years	3 harvest years for first sowing and 2 harvest years for second sowing
Number of trial sites:	3
Number of replicates	2 in each trial
Heading groups	Early, intermediate and late heading groups are all grown in one trial
Ploidy groups	One group – all hexaploid
Trial regimes	Top plots as required without weighing in sowing year Conservation management in first harvest year Simulated grazing management in second harvest year Conservation management in third harvest year
Number of control varieties	2 – Early and intermediate varieties used as controls for all heading groups

The applicant must allocate varieties to a specific maturity class. The heading group classification used to achieve this is given in Appendix 5

Appendix 5 – Control varieties for VCU assessments

Species	Control Varieties
Early Perennial Ryegrass	Genesis (D) Glasker (D) Galgorm (D) Abertorch (T)
Intermediate Perennial Ryegrass	Abermagic (D) Galgorm (D) Glasker (Early) (D) Drumbo (Late) (D) Dunluce (T) Seagoe (T) Abertorch (Early) (T) Abergain (Late) (T)

Species	Control Varieties
Late Perennial Ryegrass	Aberchoice (D) Callan (D) NL1 Drumbo (D) NL2 Abermagic (inter) (D) Abergain (T) Meiduno (T) Dunluce (Inter) (T)
Italian Ryegrass	Alamo (D) Muriello (D) Hunter (T)
Hybrid Ryegrass	Aberecho (T) Astoncrusader (T) Pirol (D)
Timothy	Motim Comer
Cocksfoot	Sparta Lidacta
Meadow Fescue	Merifest

Species	Control Varieties
Tall Fescue	Dulcia

Maturity class

The applicant must allocate varieties to the correct heading group for perennial ryegrass and Timothy trials. The heading date of each candidate is checked as part of DUS testing procedures and candidates will have to re-start VCU tests and trials if they head more than four days outside the allocated group.

The heading group classification used is as follows:

PRG

PRG	
Early heading group	Heading date earlier than or equal to Lilora.
Intermediate heading group	Heading date later than Lilora but earlier than Barplus.
Late heading group	Heading date equal to or later than Barplus.

Timothy

Timothy	
Early heading group	Heading date earlier than Motim
Late heading group	Heading date equal to or later than Motim.

Appendix 6 – Dates for submission of records and samples

To Data Handling Operator

Record	Latest date of receipt
Site data part 1 (incl. site sketch)	Within 2 weeks of sowing the trial
Site data part 2	Annually by end of November
Yield records	Electronically to the appropriate Data Handling Operator within seven working days of each cut.
Plot records (in approved electronic format)	Annually by end of November

Plot samples to Quality Testing Operator

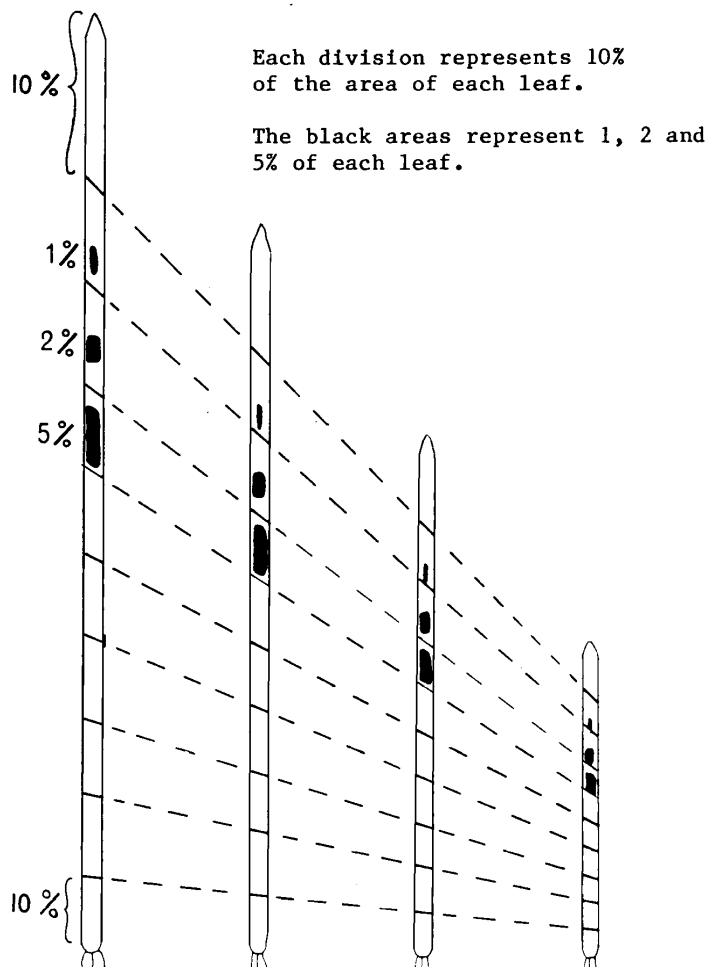
Quality testing – samples to be coarse milled	To Quality Testing Operator by 15 September
Quality testing – samples to be fine milled	To Quality Testing Operator by 15 September

Appendix 7 – Recording Methods and Ryegrass Leaf Area Guide

Leaf diseases

1. Select 4 points per plot. Part the foliage to expose all leaves.
2. At each point, estimate the % leaves showing disease symptoms.
3. For Mildew, Crown Rust, Dreschlera or Rhynchosporium, estimate the average % infection on the diseased leaves only, using the drawings below.
For Ryegrass Mosaic Virus, classify the type of infection on the infected leaves only as **Slight**, **Moderate** or **Severe** using the definitions below.
4. Use the tables below to calculate the average % infection per plot or the 0-100 disease index as appropriate.

Ryegrass leaf area guide



1 Each division represents 10% of the area of each leaf. The black areas represent 1, 2 and 5% of each leaf.

Disease % key for mildew, rusts, *Drechslera* and *Rhynchosporium*

Average % infection on diseased leaves only

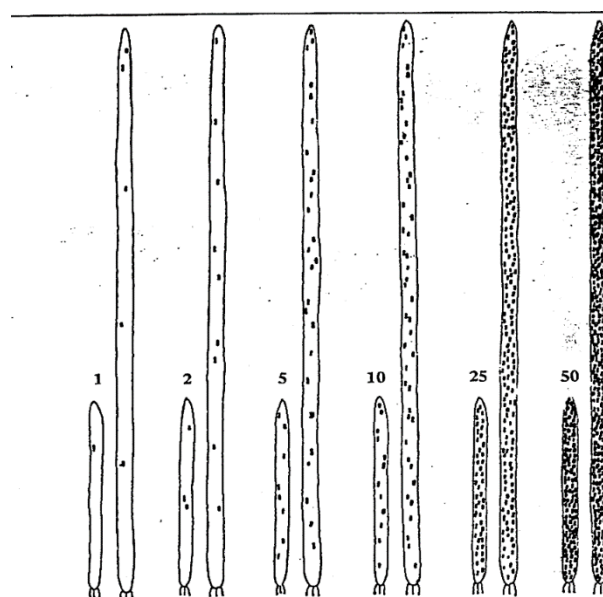
% leaves with infection	0%	1%	5%	10%	25%	50%	75%	100%
0	0	0	0	0	0	0	0	0
1	0	0.01	0.05	0.1	0.3	0.5	0.8	1
5	0	0.05	0.3	0.5	1	3	4	5
10	0	0.1	0.5	1	3	5	8	10
25	0	0.3	1	3	6	13	19	25
50	0	0.5	3	5	13	25	38	50
75	0	0.8	4	8	19	38	56	75
100	0	1	5	10	25	50	75	100

Disease index key for ryegrass mosaic virus

Slight Leaves green with mosaic of pale green streaks when held up to light.
Moderate Leaves green but with pronounced chlorotic streaks.
Severe Leaves and sheaths showing dark brown necrotic streaks over entire area.

% leaves with infection	Slight	Moderate	Severe
0	0	0	0
1	0.3	0.7	1
5	2	3	5
10	3	7	10
25	8	17	25
50	17	33	50
75	25	50	75
100	33	67	100

Ryegrass leaf spot – *Drechslera siccans* (Drechs) Shoemaker



Percentage of leaf area affected

Appendix 8 – Perennial ryegrass varieties submitted into wrong maturity group in VCU trials

The VCU maturity grouping of candidates is reviewed in November following each year of testing and the final decision on VCU maturity grouping is taken in November after the VCU trials have been completed, prior to the VCU decision meeting of the following February.

The following actions are required for candidates where the mean date of ear emergence recorded in DUS testing falls outside the VCU maturity group they were submitted into.

Rules for actions

Stage of testing	Maturity relative to submitted VCU group	Notification
After 1 st year of testing	Less than 1 day outside group	No action
After 1 st year of testing	More than 1 day outside group	Notify applicant of implications
After 2 nd year of testing	Outside the group by less than or equal to 4 days	If not informed after 1 st year, notify applicant of implications
After 2 nd year of testing	Outside the group by more than 4 days	Notify applicant of implications and indicate that this candidate is currently at risk of not being considered for VCU

Implications for the VCU decision:

At the time of the final VCU decision taking meeting, if the candidate is:

- less than or equal to four days outside the VCU maturity group to which it was submitted - the VCU performance data for the candidate will be transferred to the correct maturity group and its VCU considered against the standards for that maturity group.
- more than four days outside the VCU maturity group to which it was submitted - the VCU performance data for the candidate will not be transferred to the correct group and its VCU will not be considered. To be considered for listing the VCU testing must be re-started, and this will incur full trial fees.

Notes:

The VCU maturity of candidates is determined in spaced plant trials by comparison with delineating varieties as listed in Appendix 5.

VCU maturity grouping, and the DUS description of maturity may not necessarily match. This is because the VCU system has three maturity groups (early, intermediate and late) and the DUS system has five descriptive groups (very early, early, medium, late and very late).

Appendix 9: Guidance on Applications to Use Haldrup Plot Harvester On-board NIRS to Assess the Dry Matter Content of Herbage Varieties in UK National List Trials

Introduction

Traditionally, dry matter (DM) content has been assessed by oven drying a representative aliquot (normally 300 - 700 g) of freshly harvested plot material. Fresh samples are weighed then placed in a pre-heated forced draught oven at 104 °C and samples are dried until all the moisture is removed (typically 18 - 24 h).

Modern Haldrup plot harvesters are now typically supplied with on-board NIRS systems. With these on-board NIRS systems, forage passing through the sample chamber is scanned using electromagnetic radiation from the near infra-red region. Reflected sample spectra are used to develop calibrations against laboratory determined oven DM content which may then be used to predict DM content during routine harvesting. Samples used in the calibrations would typically cover multiple harvest years, cuts, and trials. If multiple plot harvesters are being used on the same site, it is considered to be good practice that the data from each machine contributes to the calibrations.

Minimum standards

To be considered any calibration must meet the following minimum standards: -

- The calibration should only be used to predict DM content of species included in the calibration.
- The calibration should be based on data from multiple cuts, harvest years and trials.
- Maximum SEP(C) (standard error of prediction (corrected)) ≤ 1.75 (please specify actual SEP(C)).
- For validation purposes a minimum of either 10 % of samples or 4 samples, whichever is the greater, must be taken at random from each harvest of each trial. These samples should be taken inside the Haldrup cab at the same time as the sample is scanned and the sample ID recorded, and DM content determined by oven drying. NIR predicted values should be reported. Alternative methods for validation will be considered by the NLSC on a case-by-case basis.
- A method of identifying odd spectra must be fully documented see example below.

- Under the following circumstances NIRS predicted values must not be used:
 - a. Any spectrum giving, e.g., Mahalanobis distance (M-value) above 2.0 (please specify actual M-value or equivalent).
 - b. Predicted DM content is outside the DM range covered by the calibration.
 - c. Any spectrum that is clearly unusual.
 - d. Atypical samples e.g., herbage with high surface moisture levels. Ideally such material should not be harvested but if this is

unavoidable then all spectra should be supported by DM determination by oven drying.

In any of the above circumstances DM content should if possible be determined by oven drying of a sample of the chopped forage ejected from the Haldrup and the sample IDs should be recorded.

- Validation data and data from a) in the bullet above – be aware that the M value may indicate an outlier due to sample abnormality, system error etc. and b) in the bullet above should be made available to expand the calibration.
- When submitting data to the data handling operator and PVS/APHA it must be made clear whether the DM% was determined by the oven drying method or predicted using NIRS specifying the calibration used.

Following initial approval an annual declaration must be made prior to the commencement of each cutting season. This should confirm that the calibration still meets or exceeds the original standards at the time of initial approval. This may be subject to Audit during Official Supervision Visits by the National Authorities. Applications and declarations must be made to PVS at:

[Plant Variety Rights Office for the UK](#)

APHA
Eastbrook
Shaftesbury Road
Cambridge
CB2 8DR

Telephone:- 02080 265930

Email:- pvs.helpdesk@apha.gov.uk

Application

Please provide the following details in your application:

General details of calibration

- The forage species you are seeking approval to use NIRS with.
- The person/company responsible for developing, supplying, and maintaining the calibration, including a version or release number.
- Make and model of the on-board NIRS instrument(s) used to scan calibration samples.
- Software used to capture and store spectra.
- Spectral wavelength range (e.g., 950 - 1690; 2 nm).
- Details of the maintenance schedules for the on board NIRS.

Specific details of calibration

- Identity of the species, number of samples of each species included in the calibration set.
- Geographical location (sites) of samples included in the calibration set and the trial management practices (i.e., the number of cuts per year, harvest year).
- Time period over which calibration samples were scanned on a location and species basis.

- Make and model of the on-board NIRS instrument to be used for DM prediction, and the number of contributing machines if the scanner make and model are the same.
- Software settings e.g., black and white references, wavelength standards and checks, number of scans averaged for each sample during scanning.
- Software used to develop and run the calibration.
- Details of the oven drying method (drying temperature, weight of fresh sample used (minimum and maximum), number of replicates, duration) used for calibration samples.
- Details of the calibration development
 - Spectral transformation
 - Regression method
 - Mathematical treatment of Spectra
 - Number of terms
- Calibration statistics
 - Number of samples in the calibration set.
 - DM content (%) covered by the calibration set (min, max, SD (standard deviation))
 - Cross validation statistics (SEC, SECV (standard error corrected variance), r² (coefficient of determination))

Routine scanning during harvesting (required for all calibrations)

- Provide a description of the process you employ to collect the scans using NIRS on-board.
- Detail your Quality Assurance processes undertaken on a daily/monthly/annual basis.
- Describe the safeguards you have in place to ensure that any data collected is fit for purpose e.g., real time visual checks on spectra, e.g., predicted DM content, Mahalanobis distances, low/high intensity warnings etc.

Routine validation process (required for all calibrations)

- Number of spectra examined, and the statistical methodology used to compare the predicted and observed DM values.
- Details of the oven drying method (drying temperature, weight of fresh sample used (minimum and maximum), number of replicates, duration) used for validation samples.
- Validation statistics
 - Correlation coefficient
 - SEP(C)
 - MSPE (mean squared prediction error) and components (bias, slope and random)
 - X-Y plot of NIRS predicted versus observed oven DM content.
- Tolerances for validation statistics
- Procedure to be followed when the validation statistics are out of tolerance.

Calibration equation maintenance program (required for all calibrations)

How often will the calibration performance be monitored other than the checks performed during routine scanning?

How frequently do you intend to expand/update the calibration routinely? If a high (please specify) proportion of scans are giving a high (please specify) e.g., Mahalanobis distance what action will be taken. (E.g., will the equation be updated more frequently?).



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