Animal & Plant Health Agency

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

Forage Oats

August 2023

Contents

Changes

Section A – Summary of VCU trial assessments required.

Bold = Obligatory *Italics = Additional. Assessed only if requested by the applicant*

Type of character	Reference	Description of assessment
Yield	Section C	**Fresh yield**
Resistance to harmful organisms	Section D	**Powdery mildew** **Crown rust** **Oat mosaic virus** **Barley yellow dwarf virus**
Behavior with respect to factors in the physical environment.	Section C	**Plant population** *Early vigor Height* *Re-growth* *Hardiness*
Quality characteristics	Section E	**Dry matter content** **Digestibility from the main (1st) cut**

Further measurements

The following must be measured or recorded in all trials, following procedures in Section C.

Sowing date
Harvest date
Plot size

Section B – Seed handling procedures

B.1 Seed handling procedures

B.1.1 See GENERAL INFORMATION, SECTION 5 - Minor Crop VCU Procedures Introduction.

B.2 Authentication of VCU seed

B.2.1 For every variety submitted for VCU trialing, the Seed Handling Operator must forward 200 g of untreated sample of seed, for authentication by the DUS test centre by the date specified by APHA. The Trials Organiser will notify the minimum quantity required to Seed Handling Operators annually.

Section C – Growing trial procedures

C.1 Responsibilities

C.1.1 The Growing Trial Operators are responsible for conducting the trials according to these procedures.

C.2 Site suitability

C.2.1 The Growing Trial Operator will be responsible for providing a suitable site, which meets the following criteria:

C.2.1.1 Previous cropping should follow local best practice i.e., no oats grown in the previous two years.

C.2.1.2 Soil type should be typical of those on which oats are grown locally. Soil fertility and texture should be uniform across the site. The soil should be sufficiently uniform to avoid variation in the growth of the trial.

C.2.1.3 The trial should be sited away from trees, hedges, headlands and other features, which are likely to cause uneven growth or encourage damage from wild fauna.

C.2.1.4 The trial area should be cultivated in the direction of ploughing and drilled across the direction of ploughing and cultivation such that each plot receives similar treatments. Cultivations should follow best local practice.

C.2.1.5 The frequency, direction and approximate date of all cultivations carried out since the last crop should be recorded in the site details record sheet.

C.3 Sowing the trial

C.3.1 **Plot size**

C.3.1.1 Plots must be drilled to a greater length than required and then trimmed back to appropriate length prior to harvest. The plot width for calculating the harvested area is measured from outer row to outer row plus half the inter-plot gap on either side. The allowance for the inter-plot gap must be no greater than 0.45 m. The plots must be sown at a size sufficient to allow a minimum target harvested plot area, after trimming, of 15 m^2. There will be a minimum of three replicates sown.

C.3.2 **Plant population**

C.3.2.1 Plots should be sown to achieve a target final uniform plant population of approximately 300-325 plants/m².

The following formula will be used to calculate the seed rate for a given thousand seed weight:-

$$\text{Seed rate (kg/ha)} = \frac{((\text{Target population} \times \text{Drilled plot area}) \times 100)}{(\text{Establishment \%} \times \text{Germination \%})}$$

The likely establishment should be judged carefully depending on soil conditions and seedbeds. Growing Trial Operators are responsible for achieving the correct target populations.

C.3.3 **Trial layout**

C.3.3.1 The Trials Organiser following consultation with APHA produces provisional sowing lists. The Trials Organiser will make final sowing lists available to Growing Trial Operators, along with the trial plans produced by the Trial Design and Data Handling Operator.

C.3.3.2 The trial should be sown according to the plan produced by the Trial Design and Data Handling Operator and may be an incomplete block design. In an incomplete block design each replicate is split into a number of sub-blocks. Any splitting of replicates must be between sub-blocks and not through sub-blocks. Varieties can be moved within a sub-block but must not be moved from their sub-block. Varieties must not be moved around within the plan eg if drilling errors occur. If plots are moved out of their original sub-block they will have to be treated as missing plots. If there are any queries, please contact the Trials Organiser.

C.3.3.3 Buffer plots may be required in some instances. The Trials Organiser will advise if this is the case.

C.3.3.4 If there is a need to replace a planned variety eg if varieties are withdrawn, affected plots must be sown with any of the standard control varieties. Any such replacements must be agreed with the Trials Organiser. The control varieties are listed in Appendix 5.

C.3.4 **Drilling**

C.3.4.1 Care must be taken with drill settings and drilling speed to ensure satisfactory and uniform establishment and plant population from plot to plot. It is also important to ensure that there is no carryover of seed between plots.

C.3.4.2 At least two rows of discard should be drilled on either side of the trial with the same drill and at the same time that the trial is drilled

C.3.4.3 Precautions must be taken to avoid any missing rows. Any missing rows or parts of rows must be noted on the drilling plan and reported to the Trials Organiser within one month of emergence.

C.3.5 **Confirmation of trial layout**

C.3.5.1 After full establishment, and within one month of sowing, the Growing Trial Operator must confirm that the trial has been sown to plan or give details of any changes to plan. This should be done by clearly highlighting the changes in the electronic plan and returning it to the Trial Design and Data Handling Operator.

C.3.5.2 Return a completed Site data 1 sheet including the following information:

- Site location details including how to get to the field.
- Sketch showing the layout of the trial in the field, in relation to other trials and showing access roads, gates, etc.
- Trial sketch showing plot numbers and variety codes and/or names.
- A short post-establishment report of the condition of the trial.

C.4 Husbandry

C.4.1 **Agronomy**

Where not specified in these procedures' agronomy should follow best local practice.

C.4.2 **Fertiliser and spray application**

Applications of fertilisers and sprays should be uniform. It is normally best to apply these across the direction of the plots. The precision application of chemicals post-drilling down the rows is permitted where appropriate, but wheelings within or between plots post drilling are not acceptable unless they consistently occur in the same place in each plot.

C.4.3 **Fertiliser application**

Applications of fertilisers should take into account inherent fertility, previous cropping, winter rainfall and the best local practice. All fertiliser applications should take account of the AHDB Nutrient Management Guide (RB209), the corresponding advisory publications in England, Wales, Scotland and Northern Ireland and past trialing experience.

C.4.4 **Herbicides**

The Trials Organiser must be consulted. Application should be across the direction of drilling.

C.4.5 **Pest and disease control**

C.4.5.1 **Pest control**

Appropriate seed dressings must be applied as approved by the Trials Organiser. The chemical seed treatment applied to the trial seed should control some soil-borne pests and may provide some early-season control of insect-borne-virus vectors. However, appropriate pesticide treatments should be undertaken to control virus vectors throughout the season. Precautions should be taken against attacks by, for example, birds, deer, rabbits, hares, mice and insects.

C.4.5.2 **Disease control**

Trials should be treated with a fungicide according to the instructions in Appendix 7.

C.4.6 **Irrigation**

Irrigation will not be permitted without the specific agreement of the Trials Organiser.

C.4.7 **Pathways**

A gap (pathway) at the end of each plot of at least 1 m is required.

C.4.8 **Plot assessment**

Plots should be assessed at the time of the population count to determine whether they are suitable for harvest. Weak plots may occur due to mechanical or varietal problems. If the problem is considered to be varietal the plots must remain as part of the trial. If the problem is considered to be mechanical the plots should either be treated as missing or as half plots.

Plots affected should be notified to the Trials Organiser at the time of detection

C.4.8.1 **Half plots - plots with gaps or poor uniformity may occur.**

If plots have gaps due to mechanical or agronomic problems, it may be necessary to eliminate the poor area by reducing the plot to a uniform length. Removal must be across all rows - whole rows cannot be discarded. These plots should be measured and pegged at the time of the population counts

C.4.8.2 **Missing plots - plots with gaps or poor uniformity may occur.**

If plots are weak due to mechanical or agronomic problems throughout their entire length, it may be necessary to make the plots missing. These plots should be pegged at the time of the population counts and should be entered in subsequent data records with a symbol indicating there is no recorded value associated with this plot (see C.6.2.5). The plots should be clearly indicated when the data is sent to the Trial Design and Data Handling Operator.

C.5 Harvesting

C.5.1 **Timing of harvesting**

C.5.1.1 Date of harvesting will be according to a schedule which will be drawn up by the Growing Trial Operator. Two harvest cuts to be taken, one for main growth and one for regrowth (timings to be determined by the trials Officer).

C.5.1.2 Plots can be topped over at the discretion of the trials operator in the autumn/winter following sowing to provide a uniform plot canopy. Plots should be trimmed to their final harvest length as described in C.4.7 above. The plot dimensions must be measured prior to harvesting. If it is necessary to reduce the harvest size as described in C.4.8.1 above give clear details with the yield file. Individual harvested plot lengths should be recorded.

C.5.2 **Harvesting method**

C.5.2.1 All trials will be harvested by harvesting equipment approved by the Trials Organiser. There will be two harvest dates, a main cut and regrowth to be determined by the Trials Officer.

C.5.3 **Samples**

C.5.3.1 A sample of the chopped material (minimum 500 g) should be taken for dry matter analysis from each plot. A composite sample from all rows should be taken. Make every attempt to ensure that the sample is well mixed and representative of the plot.

C.5.3.2 All samples should be labelled with the labels provided by the Trials Organiser.

C.5.3.3 The samples should be delivered to the appropriate Quality Testing Operator as soon as practical after harvest.

C.5.4 **Submission of data and samples**

C.5.4.1 Appendix 6 lists the records, with deadlines, to be sent to the Trials Organiser. Diary sheets and any other field records should be returned to the Trials Organiser within 5 working days of harvest.

C.5.4.2 All plot records should be transmitted to the Trial Design and Data Handling Operator following the deadlines set out in Appendix 6. The Growing Trial Operator should ensure that data are free from errors before transmission. After scrutiny, copies of results will be returned to the Growing Trial Operator for action as agreed by the data handling operator.

C.5.4.3 All samples should be sent to the Quality Testing Operator following the deadlines set out in Appendix 6.

C.6 Records

C.6.1 There are four components:

1.	Diary	Field notes of trial status, recording and inspections
2.*	Site data part 1	Including full location details: 1) a map of site location showing nearby settlements and roads 2) a sketch showing the layout of trials in the field with access points and 3) trial layout, showing plot numbers and varietycodes/names.
3.*	Site data part 2	Details of agrochemical applications and irrigation.
4.	Plot records	Plot data.

* Template available from Trials Organiser

C.6.1.1 An entry in the Diary sheet should be made on every trial visit and any observations relevant to variety performance should be recorded. If the trial is in good condition, with no problems, this should be recorded.

C.6.2 **Plot records**

C.6.2.1 Plot data may be recorded directly onto a data logger using a system approved by the Trials Organiser or recorded on paper then entered and validated onto a computer using an approved system. A system of ensuring that data are recoverable, in the event of loss of original data, must be implemented, e.g., copy and safe storage. Whichever method is used, individual plot data will only be accepted by the appropriate Trial Design and Data Handling Operator in an approved format using the measure names and units as listed in Section C.6.3.

C.6.2.2 All observations should be checked at the time of recording to ensure that they lie within acceptable limits for the character recorded. Observations that have been designated as exceptional by the recorder should be identified with a note on the approved data file or hard copy medium describing the possible causes together with a recommendation for their exclusion or inclusion in the trial analysis.

C.6.2.3 Plot numbers on record sheets must correspond with the numbering on the field plan.

C.6.2.4 If a character is not recorded or is missing the Growing Trial Operator should indicate in the diary and on the recording sheet the reason why it has been excluded.

C.6.2.5 Where a plot record is missing the Growing Trial Operator should record this in any data file or hard copy medium as a symbol thereby indicating there is no recorded value associated with this plot.

C.6.2.6 Specific plot records must be made as counts or on the scales shown for each character. Only the character names as listed may be used. All records should be returned to the Data Handling Operator as soon as possible after they are completed.

C.6.2.7 All records must be returned as soon as reasonably possible and when complete for the whole trial. Indicative deadlines are given in Appendix 7. All records must be returned by the final deadlines.

C.6.3 **Procedures for recording characters**

C.6.3.1 The following procedures must be followed for measuring all characters to be used in NL decision-making.

C.6.3.2 **SOWING DATE (OBLIGATORY) (Day/month/year)**

This is recorded in Part 1 of the Site Information Form.

C.6.3.3 **FRESH YIELD from all plots (OBLIGATORY) (kg)**

Enter the total harvested weight in kg per plot and provide the harvested plot dimensions with the record. If the plot lengths or widths are not the same for every plot, a separate record must be submitted.

C.6.3.4 **DRY MATTER WEIGHT from all plots (OBLIGATORY) (kg)**

A detailed procedure for the assessment of dry matter content is given in Section E. Also specify the fresh weight taken for the sample. If the figures are DM% then enter the fresh weight of sample as 100.

C.6.3.5 **PLANT POPULATION from all plots (OBLIGATORY) (Count)**

Record the number of plants in the plot after full emergence by using a quadrat. Record the plot length counted and indicate any rows that have a low population.

C.6.3.6 **POWDERY MILDEW from all plots (OBLIGATORY if present) (%)**

Record if the most affected variety has over 5% of the leaf area affected using the foliar disease assessment key.

C.6.3.7 **CROWN RUST from all plots (OBLIGATORY if present) (%)**

Record if the most affected variety has over 5% of the leaf area affected using the foliar disease assessment key.

C.6.3.8 **OAT MOSAIC VIRUS from all plots (OBLIGATORY if present) (%)**

Record if the most affected variety has over 5% of the leaf area affected using the foliar disease assessment key.

C.6.3.9 **BARLEY YELLOW DWARF VIRUS from all plots (OBLIGATORY if present) (%)**

Record if the most affected variety has over 5% of the leaf area affected using the foliar disease assessment key.

C.6.3.10 **HARVEST DATE (Main) and SECOND DATE (regrowth)** **(OBLIGATORY)** **(Day/month/year)**

C.6.3.11 *EARLY VIGOUR* *from all plots* *(ADDITIONAL)* *(1-9)*

1 very thin
9 very thick

C.6.3.12 HEIGHT *from all plots* *(ADDITIONAL)* *(cm)*

Estimate the average canopy height for each plot, when variety has reached full height just before harvest.

C.6.3.13 WINTER HARDINESS *from all plots* *(ADDITIONAL)* *(1-9)*

1 complete loss
9 no damage

Scored following the key given in Appendix 8. Scores should be made 7-14 days after a cold period, to allow for expression of symptoms.

C.6.3.14 **Site factors**

Any factors which may have affected the yield of the trial or individual plots must be noted and accompany the yield data.

Where varietal differences are seen in pest or disease attack, records should be made either as an estimate % of plants affected, or as % leaf area attacked in accordance with the procedure in Section D for disease.

Records for other scores should be taken as % plants affected or on a 1 to 9 scale. Include definitions of 1 to 9 on the scale.

C.6.3.15 **Trial inspection**

All trials will be inspected by the Trial Inspection and Technical Validation Operator, and, in some cases, it may be necessary to visit on more than one occasion.

The requirements for Growing Trial Operators in respect of inspections are to:

1. Give inspectors reasonable access to trials and provide full location and site details (if not already given with site data 1)
2. Provide the inspector with information (for example pesticide sprays applied etc) within seven days of a request
3. Co-operate with the inspector in making any non-routine assessments required to establish the validity of the trial (for example population counts)
4. Carry out any action agreed in consultation with the inspector. In particular it is important that any requirement to shorten plots is undertaken. (Establishment % x Germination %).

Section D – Disease testing procedures

D.1 Assessment of natural infection

D.1.1 The Growing Trial Operator is responsible for carrying out these procedures.

D.1.2 **Naturally occurring disease in VCU growing trials**

D.1.2.1 Naturally occurring disease is normally recorded in the growing trials. Confirmation of the identity of a disease should be obtained from an appropriate plant pathologist if required.

D.1.2.2 **Recording methods**

D.1.2.3 Diseases are assessed using the timings and appropriate assessment keys given in Appendix 8. All disease records to be sent to the Trial Design and Data Handling Operator as soon as they are made.

Section E – Quality testing procedures

E.1 Responsibilities

E.1.1 The Quality Testing Operator appointed by the Trials Organiser is responsible for conducting approved quality tests according to these procedures. The Growing Trial Operators are responsible for producing representative samples for quality assessment as indicated in Section C.

E.2 Quality assessment methodology for obligatory and additional tests

E.2.1 **Dry Weight determination** **(OBLIGATORY)**

The treatment of samples and the time interval between cutting and weighing should be such that there is no significant moisture loss between the weighing of the plot fresh yield and the weighing of the fresh weight of the sample.

A fully representative sub-sample (min 500 g) of well-chopped fresh material is accurately weighed, or an accurately recorded catch weight (min 500 g recorded to one decimal place) taken. Although in some instances all of the sampling and weighing of fresh material may be carried out in the field, it is acceptable for samples to be brought to the laboratory for weighing. If the latter option is followed the representative sample is immediately sealed in a 500-gauge polythene bag and kept out of direct sunlight and as cool as possible until transported to the laboratory. Each sample is identified with a label.

The sample is placed in the drier which must be at a temperature of 100 °C ± 4 °C with the air recirculator set in the range 80-100% recirculation in order to restore the temperature to 100 °C ± 4 °C as rapidly as possible. When the temperature is restored to 100 °C ± 4 °C the air regulator is set at 80% recirculation i.e., 20 % fresh hot air. The air regulator is critical for even rapid drying. The samples are dried 100 °C ± 4 °C for such time as is necessary for complete drying.

E.2.1.1
Dried material from the main cut should be retained for digestibility analysis. Instructions for milling these samples are given below. Samples from each replicate should be bulked for each variety and milled following oven drying. Samples to be despatched to the Quality Testing Operator for analysis.

E.2.2 Quality tests

E.2.2.1 **Milling of dried samples for further quality analysis (see Section C.5.4)**

1. The dry matter samples from both replicate plots must be combined and a representative sample taken for milling (sufficient to provide 150 ml of milled material for analysis).
2. The mill must be a hammer mill fitted with a screen with 1.0 mm apertures. Screens must be checked for wear of the inside surface at regular intervals. Frequent use causes the circular 1.0 mm hole to elongate, and when the elongation reaches 1.2 mm the screen must be changed.
3. Samples for milling must be absolutely dry. This can be achieved either by milling immediately after weighing out of the dryer or by re-heating dried samples to 104 °C for 1 hour before milling.

4. The mill must be thoroughly clean before use.
5. The mill must be at maximum speed before the sample is introduced gradually to prevent the mill from labouring.
6. All of the sample must be removed from the receptacle and thoroughly mixed. Care must be taken at all stages to prevent the loss of fine powder which is a critical part of the milled sample.
7. After mixing, a representative sub-sample should be taken in the following manner:
   a) If less than 150 ml of milled sample, all of it should be placed in the sample tubs.
   b) If more than 150 ml of milled sample, the tub should be filled with a fully representative sub-sample that has been fully mixed before placing in the tub.
8. The sample tub must be sealed with a close-fitting lid and labelled with information in an approved format.

Section F – Trial design and data handling procedures

F.1 Plan validation and storage

F.1.1 After the trial has been drilled, the Growing Trial Operator must:

a) Confirm that the trial has been drilled according to plan and provide the sowing date, by returning site data 1 and associated trial sketch to the Trial Design and Data Handling Operator.
b) If any amendments to the plan have been made, return a hard copy of the plan to the Trial Design and Data Handling Operator with any amendments clearly indicated. Alternatively, amendments may be notified electronically with the agreement of the Trial Design and Data Handling Operator.

F.1.2 The Trial Design and Data Handling Operator will check these for statistical validity and, once this has been done, will load the plan on the database.

F.2 Data recording

F.2.1 Data are recorded using the methods and characters given in Sections C, D and E.

F.2.2. Site information is recorded for each trial including, for example, data on previous cropping, cultivations, soil details and fertiliser applications.

F.2.3 Details of any agrochemical applications are also recorded and forwarded to the Trials Organiser.

F.3 Data processing

F.3.1 Processing of individual agronomic and disease variates

F.3.2 A list of the agronomic, yield and disease variates, which may be recorded and processed, are specified in Sections C, D and E. After scrutiny, copies of the results will be returned to the Growing Trial Operator for action as agreed by the Trials Organiser.

F.4 Other tests and trials

F.4.1 Any additional or alternative designs required for the assessment of additional VCU characters not detailed in Annex D of the **MINOR CROPS VCU TRIAL PROTOCOL** will be added to these **Procedures** as and when approved by the NLSC.

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Any enquiries regarding this publication should be sent to us at

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