Animal &
Plant Health
Agency

United Kingdom Variety List Trials: Trial Procedures for Official Examination of Value for Cultivation and Use (VCU) Harvest 2026

Fodder Beet

April 2025

Changes since last version

- Updated year of document and date of last update
- Updated email link to national archives at end of document

Contents

Section A – General Information

A.1 Purpose

A.1.1 This document sets out the approved procedures to be used for growing trials, tests and assessments as required by the current Protocol for Official Examination of Value for Cultivation and Use for Fodder Beet.

A.2 Scope

A.2.1 These procedures apply to all varieties of Fodder Beet.

A.3 Responsibilities

A.3.1 Procedures Development Group

The Procedures Development Group is responsible for reviewing these procedures annually and making amendments for which it has responsibility, in accordance with the provisions of the VCU Protocol.

A.3.2 Trials Organisers and Operators

England and Wales:

British Society of Plant Breeders Ltd (BSPB)
BSPB House
114 Lancaster Way Business Park
Ely
Cambridgeshire
CB6 3NX
Telephone number: 01353 653200
Email:mailto:bspb-trials@bspb.co.uk

Scotland:

SASA
Roddinglaw Road
Edinburgh
EH12 9FJ
Telephone number: 0131 2448899
Email: seeds@sasa.gov.scot

A.3.2.2 The Trials Organiser is responsible for ensuring all VCU Protocol and Procedures requirements are followed and liaison with all operators carrying out trials for Variety List purposes, including supply of seed and data handling.

A.3.2.3 **Data Handling Operator**

The Data Handling Operator identified by the Trials Organiser is responsible for trial design and data validation in accordance with the VCU Protocol and associated Procedures.

A.3.2.4 **Growing Trial Operators, Seed Handling Operators and Quality Testing Operators**

The Trials Organiser is responsible for proposing potential Growing Trial Operators and Quality Testing Operators to carry out trials and tests as determined by the Procedures Development Group annual review in accordance with the VCU Protocol, and these Procedures. The Trials Organiser is also responsible for finding Seed Handling Operators who are able to carry out seed handling. Seed Handling Operators prepare trial seed for sowing on behalf of any Growing Trial Operator in accordance with the VCU Protocol and these Procedures.

A.3.2.5 A list of all approved Organisers and Operators is shown in Appendix 1.

A.3.3 VCU Protocol and Procedures non-compliance

A.3.3.1 Where these procedures use the word “must” or “will” for any action then failure to carry out this action will result in non-compliance. Where the word “should” is used for any action then this is the method to be followed unless there are clear reasons not to, which can be justified by the operator as technically sound.

A.3.3.2 The Trials Organiser will forward any reports on VCU Protocol or Procedures non-compliance to APHA within 1 week of receipt. The Trials Organiser will obtain authorisation from APHA for any actions, including those necessary to remedy non-compliances, which are not within the requirements of the VCU Protocol. Such actions must be recorded as a non-compliance. Where emergency action is required and APHA staff are not available (for example, evenings or weekends) the Trials Organiser should act but report this to APHA at the earliest opportunity. Where GMOs are concerned the arrangements are as detailed in section 3.4.

A.3.4 Procedures for GM varieties

A.3.4.1 The National Authorities and Trials Organiser will develop procedures for GM varieties if an application for a GM candidate variety is received.

A.3.5 Handling of trial seed

A.3.5.1 The Trials Organiser is responsible for organising the handling of seed of candidate varieties submitted by the applicant, and seed of control, or other reference varieties, in accordance with the requirements set out in these procedures and the current VCU Protocol. The Trials Organiser will ensure that any seed treatments or additives are fit for the purpose. Seed treatment products are listed in Appendix 2.

A.3.6 Dispatch of seed

A.3.6.1 The Trials Organiser will arrange for seed to be dispatched by the agreed deadlines to the Growing Trial Operators, and, for authentication, to the DUS testing centres including, where appropriate, foreign testing authorities.

A.3.7 Monitoring of VCU Growing Trial Operators and Seed Handling Operators – Documentation

A.3.7.1 The Trials Organiser will take any necessary action to enforce deadline dates and quality standards for required documentation.

A.3.7.2 The Trials Organiser will ensure Growing Trial Operators and Seed Handling Operators have access to all current protocols and procedures relevant to them and that they are notified of any amendments.

A.3.8 Seed quantities

A.3.8.1 The Trials Organiser will determine the quantity of seed required for all VCU tests and trials in each annual series, including authentication, and will notify the applicant of quantities and delivery addresses.

A.3.9 Labelling of seed

A.3.9.1 The Trials Organiser is responsible for ensuring all seed is clearly labelled with variety name, breeders' reference and AFP number.

A.3.10 Seed quality

A.3.10.1 Seed submitted for VCU testing must meet the standards for the final generation of seed given in the appropriate seed regulations, in respect of germination, analytical purity and content of other seeds and any other impurities.

A.4 Summary of growing trials, tests, and assessments procedures

A.4.1 The number of trials and site locations are as detailed in Appendix 4.

A.4.2 Control varieties are listed in Appendix 5.

A.4.3 The Trials Organiser is responsible for informing the Growing Trial Operators of the additional characters, which must be recorded as and when requested by applicants, and any samples that may be required for analysis.

A.4.4 Special tests

An additional test for characters not specified in the procedures may be requested by the applicant. APHA is responsible for liaison with the Trials Organisers to produce a

procedure for the conduct of a special test or trial. This procedure would require the approval of the National Authorities.

A.4.5 Summary of VCU trial assessments required

- **Bold = Obligatory**
- *Italic = Additional if requested by the applicant*

Type of character	Reference	Description of assessment
Yield	Section C	**Root Yield**
*Resistance to harmful organisms	Section D	**Disease %**
Behaviour with respect to factors in the physical environment	Section C	**Plant population** *Early Vigor* **Bolting** *Top size* **Crown height** **Root shape** *Rotten roots* *Split roots*
Quality characteristics	Section E	**Dry Matter Content**

* There is no requirement to record any specific disease, but any disease infection where present at a level, which will affect variety performance, must be recorded.

Further measurements
The following must be measured or recorded in all trials, following procedures in Section C:

- **Sowing date**
- **Harvest date**
- **Plot size**
- **Harvest losses**

- **Fresh Yield**

Section B – Seed handling procedures

B.1 Seed handling procedures

B.11 See general information, section 5 - Minor Crop VCU Procedures Introduction.

B.2 Authentication of VCU seed

B.3.1 Results from the second year's submission will be compared, by the DUS centre, with the first year for authentication purposes.

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.2.2 Previous cropping should ensure no Beta species have been grown in the previous two years. Sites with a history of Beet cyst nematode should also be avoided.

C.2.3 Soil type should be typical of those on which fodder beet 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.2.4 The trial should be sited away from trees, hedges, headlands, and other features, which are likely to cause uneven growth or encourage grazing damage from fauna.

C.2.5 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 practice.

C.2.6 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.2.7 Organic manure should not be applied to the trial area after the preceding crop unless they can be applied accurately and evenly across the trials area. The use of Fresh Farmyard manure is not permitted.

It remains the responsibility of the trials manager to maintain the integrity of the trial.

C.3 Sowing the trial

C.3.1 Plot Size

C.3.1.1 Three rows are to be drilled at 0.5m row width, with the same row width between plots. Variation in row spacing of more than 10% between adjoining plots should be notified to the Trials Organiser. All rows of the plot will be harvested for yield and the plot size should be sown to allow a minimum target harvest plot, after trimming, of 10m^2. A minimum of 3m pathway between plot ends is required to facilitate machine harvesting.

To allow access for harvesting equipment a headland of a minimum of 24m is required around the trial. A minimum of four replicates will be sown. Replicates are dependent on the number of varieties to be tested.

C.3.2 Plant population

C.3.2.1 Precision drills should be used. Plots should be sown at a target seed spacing of approximately 15cm to 19cm to give an established plant population of approximately 100,000 plants per hectare. Permission must be obtained from the Trials Organiser if a smaller seed spacing is to be used.

C.3.2.2 If not sown to a stand, the trials should be gapped as near as possible at the 2 to 4 true leaf stage to give a uniform plant population of approximately 100,000 evenly distributed plants per hectare. If establishment is uneven the Growing Trials Operators should contact the Trials Organiser for guidance.

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 must not be moved around within the plan, for example, if drilling errors occur. If plots are moved out of their original sub-block they will have to be treated as missing plots. The Trials Organiser must be informed immediately if there are any departures from the original plan or if there any other anomalies.

C.3.3.3 If there is a need to replace a planned variety, for example, 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 Drills must be set up and calibrated in the field before commencing drilling.

C.3.4.2 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 carry over of seed between plots.

C.3.4.3 At least three rows of discard should be drilled on either side of the trial with the same drill and at the same time the trial is drilled.

C.3.4.4 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.3.4.5 Seed is supplied for trial purposes only. Unused seed must not be supplied to third parties without the permission of the breeder. It must not be used for any guard plot or pathway.

C.3.4.6 **Seed disposal**

All surplus packets and discard trial seed must be returned to the Seed Handling Operator for disposal and the date and quantity returned noted in the Trial Diary.

C.3.4.7 **Pathways**

A gap (pathway) between plots of at least 3m is required to avoid carry-over of roots by the harvesting equipment. The gap (pathway) should be cross drilled as it minimises edge effects on the beet at the end of each plot and improves their harvestability. Beet in the pathways must either be harvested or destroyed by any appropriate method that aims to create a level pathway which is free from beet and any weeds which will affect harvesting. Rotavating or cultivating pathways late in the season should not be carried out as it may create soft ground conditions that adversely affects harvesting. Only under exceptional circumstances may this be considered and only after seeking agreement from the Trials Organiser. Pathways must be gleaned pre-harvest for beet or beet fragments that are of a harvestable size.

C.3.5 Confirmation of trial layout

C.3.5.1 After the trial has been drilled, the Growing Trial Operator must:

a. Confirm the drilled plan by transmission of the sowing date and plan to the Trial Design and Data Handling Operator with any amendments to the plan clearly indicated.
b. Despatch a map of the site location, showing major roads and entry point to the site, as well as a detailed ground plan of the trial to the Trial Design and Data Handling Operator.

C.4 Husbandry

C.4.1 Agronomy

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

C.4.2 Pesticide application

All activities must take account of The Plant Protection Products (Sustainable Use) Regulations and the Code of Practice for Using Plant Protection Products (as amended). Applications of pesticides should be uniform. These must be applied across the direction of the plots.

C.4.3 Fertiliser application

Fertiliser application should take into account inherent fertility, previous cropping, winter rainfall, 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 trialling experience.

C.4.4 Herbicides

Chemicals should not be used if there are any known varietal sensitivities. The Trials Organiser must be consulted.

C.4.5 Pest and Disease Control

C.4.5.1 **Pest Control**

Appropriate seed dressings may be applied as approved by the Trials Organiser. The chemical seed treatment (as applicable – see Appendix 2) applied to the trial seed may 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 through the season. Precautions should be taken against attacks by fauna.

C.4.5.2 **Disease control**

Seedling diseases may be controlled by the routine seed-dressings used (as applicable – see Appendix 2) and viruses should be controlled by targeting their insect-vectors (see C.4.5.1). Trials should be treated with a fungicide according to the instructions in Appendix 6.

C.4.6 Irrigation

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

C.4.7 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 VCU Trials Organiser at the time of detection.

C.4.7.1 **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. The adjacent plots may have to be missing due to unfair advantage to their growth. These plots should be entered in subsequent data

records as '*' (an asterisk) (see C.6.2.5) and should be clearly indicated when the data is sent to the Trial Design and Data Handling Operator.

Where possible 'gapping-up' outside rows of missing plots should be considered to try to avoid an edge effect on the unaffected neighbouring plot. The plots should be clearly marked when the data is sent to the Trial Design and Data Handling Operator.

C.4.8 Trials not taken to plot harvest

It is the responsibility of the Growing Trials Operator to discuss with the host grower the forward management of trials not taken to plot harvest. The method and visits should be noted in the trial diary.

C.5 Harvesting

C.5.1 Timing of harvesting

C.5.1.1 Trials should normally be harvested by the end of December.

C.5.1.2 **Pathways**

(see C.3.4.7).

C.5.2 Harvesting method

All trials will be harvested by a harvesting method approved by the Trials Organiser.

C.5.3 Samples

C.5.3.1 Root samples must be taken for dry matter determination.

The sampling method used must be approved by the Trials Organiser in advance.

C.5.3.2 The samples should be delivered to the appropriate Quality Test Operator as soon as practical after harvest.

C.5.4 Submission of data

C.5.4.1 Appendix 7 lists the records, with deadlines, to be sent to the Trials Organiser. Diary sheets and 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 7. 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 Trial design and Data Handling Operator.

C.6 Records

Records should be clear and self-explanatory so that the trial can be carried on at a moment's notice by another person without difficulty.

C.6.1 There are four components:

1. Diary: Field notes of trial status, recording and inspections.
2. Site data 1: Site details including site sketch map and location, previous cropping, soil analysis, cultivations, and drilling.
3. Site data 2: Site details including fertiliser and sprays, herbicides, fungicides, insecticide, and harvest.
4. Plot record: Plot data.

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 direct 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, for example, copy and safe storage. Whichever method is used, individual plot data will only be accepted by the 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 or 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 enter '*' (an asterisk) in the approved data file or hard copy medium and, unless the non-recording of the plot has already been agreed with the Trials Organiser, append a note to the file explaining why a missing value has been entered for that plot. The Growing Trial Operator must not enter '0' for missing plots.

C.6.2.6 Specific plot records should be made as counts or on the scales shown for each character.

C.6.2.7 All records should be returned to the Trial Design and Data Handling Operator immediately after recording. Indicative deadlines are given in Appendix 7.

C.6.3 Procedures for recording Characters

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

- **Bold = Obligatory**
- *Italic = Additional if requested by the applicant*

C.6.3.1 *EARLY VIGOUR from all plots (ADDITIONAL) (1 to 9)*

Record on the basis of relative plant size in on the scale:

- 1 = very small
- 9 = very large

Record the size of the plants at each end of the scale.

C.6.3.2 **POPULATION COUNT from all plots (OBLIGATORY) (COUNT)**

Record the number of plants of the 3 rows in the harvest plot area, from the 6 to 8 true leaf stage onwards. Record the plot length and indicate any row that have a low population.

C.6.3.3 **BOLTER NUMBER from all plots (OBLIGATORY) (COUNT)**

A procedure should be in place to ensure that the number of bolters occurring in the harvest area are recorded, and pollen release, seed set, and shed is prevented.

C.6.3.4 **ROOT SHAPE from all plots (OBLIGATORY) (1 to 8)**

Record the most common root shape in each plot after the roots have been lifted using the key below (see also Appendix 9)

- 1= flat globe
- 2= round globe
- 3= oval
- 4= pointed block
- 5= tankard
- 6= carrot (wedge)
- 7= cylinder
- 8= long cylinder

C.6.3.5 *TOP SIZE from all plots (ADDITIONAL)(1 to 9)*

Score the relative top size of each plot just before harvest on the scale:

- 1= very small
- 9= very large

Also give an indication of the approximate top size (height and spread) for the extreme values recorded.

C.6.3.3.6 **CROWN HEIGHT from all plots (OBLIGATORY) (1 to 9)**

Score the height above soil level just before harvest on the scale:

- 1= Lowest leaf scar at soil level
- 9= Lowest leaf scar very high above soil level

Measure the actual height for extreme values used.

C.6.3.3.7 *ROTTEN ROOT NUMBER from all plots (ADDITIONAL) (COUNT)*

Record the number of rotten roots in the harvest area of each plot and exclude these from the plot weight.

C.6.3.3.8 *SPLIT ROOT NUMBER from all plots (ADDITIONAL) (COUNT)*

Record the number of roots with splits greater than 5mm in depth in the harvest area of each plot. Split roots should be included in the plot weight.

C.6.3.3.9 **DISEASE from all plots (OBLIGATORY if present) (%)**

Record all diseases seen at the point when the most affected variety has over 5% of the leaf area affected using the foliar disease assessment key.

C.6.3.3.10 **ROOT YIELD from all plots (OBLIGATORY) (Kg)**

Enter the total clean harvested weight in kg per plot and provide the harvested plot dimensions with the record. If the plot lengths or widths are not constant, then these must also be supplied with the final data. Rotten roots should not be included (see C.6.3.3.8).

C.6.3.3.11 **DRY MATTER WEIGHT from all plots (OBLIGATORY) (Kg)**

A detailed protocol for the assessment of dry matter content of roots 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 samples as 100.

C.6.4 Site Factors

Any factors which may have affected the yield of the trial or individual plots must be noted and taken into account when validating the trial.

If any other pest or disease attacks are observed, then plot records should be made in accordance with the procedure in Section D for disease.

Plot records for other scores should be taken as plants affected on a 1 to 9 scale. Include definitions for each rating on the 1 to 9 scales.

C.6.5 Trial Inspection

All trials will be inspected by the Trial Inspection Operator 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:

- Give inspectors reasonable access to trials.
- Provide the inspector with information (for example, pesticide sprays applied) at the time of inspection if requested.
- Co-operate with the inspector in making any non-routine assessments required to establish the validity of the trial (for example, population counts),
- Carry out any action agreed in consultation with the inspector.

Section D – Disease testing procedures

D.1 Assessment of natural infection

D.1.1 The Growing Trials 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 on a plot basis 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.1.2.2.1 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 are responsible for conducting approved quality tests according to these procedures.

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 of well chopped fresh material is accurately weighed, or an accurately recorded catch weight 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 re-circulator set in the range 80 to 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 such as, 20% fresh hot air. The regulator is critical for rapid drying. The samples are dried 100 °C ± 4 °C for such time as is necessary for complete drying.

The dried sample is carefully removed from the drier as soon as the sample is cool enough for accurate weighing. The dry weight is recorded to one decimal place.

Section F – Trial design and data handling procedures

F.1 Plan validation and storage

F.1.2 After the trial has been drilled, the Growing Trial Operator must confirm the drilled plan by transmission of the sowing date and plan to the Trial Design and Data Handling Operator with any amendments to the plan clearly indicated.

F.1.3 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, fertiliser, and agrochemical applications.

F.3 Other tests and trials

F.3.1 Any additional or alternative designs required for the assessment of additional VCU characters not detailed in Appendix 3 of the **VCU Trial Protocol** for fodder beet will be added to these **procedures** as and when approved by the NLSC.

Supporting document for appendices

Appendices for this main procedure are stored in a separate document, which is updated closer to the start of the growing trial to include the latest information on controls and trial organisers. This will be published on VCU protocols and procedures for testing agricultural crops.

This publication is available at www.gov.uk/government/publications

Any enquiries regarding this publication should be sent to us at

webmaster@apha.gov.uk

www.gov.uk/apha

The Animal and Plant Health Agency (APHA) is an executive agency of the Department for Environment, Food & Rural Affairs, and also works on behalf of the Scottish Government and Welsh Government.