Animal &
Plant Health
Agency

# United Kingdom National List Trials: Protocol for Official Examination of Value for Cultivation and Use (VCU)

## Minor crops: linseed, soya bean, spring lupin, forage rape, swede, sunflower, forage rye, fodder kale, mustard, fodder radish, forage oat, fodder beet and hemp

**March 2020**

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APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.

## Contents

# 1. Introduction

1.1 An agricultural plant variety is accepted by the National Authorities onto a National List in accordance with the provisions of the Seeds (National List of Varieties) Regulations 2001 (S.I. 2001 No. 3510).

1.2 It is a condition of acceptance, (under Regulation 5 (3) (c) of the Regulations), that a variety must be of satisfactory value for cultivation and use.

1.3 Value for cultivation and use is assessed by tests and growing trials, in accordance with this protocol.

# 2. Purpose

2.1 The requirements for conducting growing trials, tests and assessments in relation to official examinations of VCU of varieties of Fodder Beet entered for National List Trials are set out in this Protocol and the following associated procedure documents.

1. VCU Trials Procedures (Fodder Beet).
2. VCU Trials Design and Data Handling Procedures.
3. VCU Data Review, Standard Setting and Decision Making Procedures.

# 3. Scope

3.1 This protocol applies to all varieties of linseed, soya bean, spring lupin, forage rape, fodder kale, swede, sunflower, tall fescue, mustard, forage rye, forage oat, fodder beet and hemp entered for UK National List trials. Special procedures and responsibilities for Genetically Modified (GM) varieties are set out in Section 7.

# 4. Responsibilities

4.1 The growing trials, tests and assessments in this protocol are carried out under the responsibility of the Secretary of State for Environment, Food and Rural Affairs, the Scottish Ministers, Welsh Ministers and the Secretary of State for Northern Ireland (the National Authorities).

4.2 They are supervised, by representatives of the National Authorities, ie the Animal and Plant Health Agency (APHA),the Scottish Government Directorate for Agriculture and the Rural Economy (SGDARE), the Department of Agriculture, Environment and Rural Affairs (DAERA) and the Welsh Government (WG).

4.3 This protocol is authorised by the Plant Variety and Seeds Committee (PVSC). It cannot be amended without their approval. Requests and suggestions for amendment of the protocol should be put in writing to APHA Varieties and Seeds.

4.4 This protocol is administered by:

Plant Varieties and Seeds
Animal and Plant Health Agency
Eastbrook
Shaftesbury Road
Cambridge Tel. No: 02080 265993
CB2 8DR Fax. No: 02084 152504
Email: pvs.helpdesk@apha.gov.uk

4.5 Committees and Technical Groups

The structure and responsibilities of relevant committees and technical groups is detailed in Appendix 1.

4.6 Organisers and Operators

All organisers and operators involved in the procedures referred to in paragraph 2.1, must be approved by the National Authorities and have access to suitable facilities and expertise. A list of approved organisers and operators is published annually.

The roles of organisers and operators are detailed in Appendix 2.

# 5. Compliance with the Protocol

5.1 If non-compliance occurs or there are concerns regarding the validity of any data, tests or trials, this must be reported to APHA.

# 6. VCU Decisions

6.1 The **VCU Data Review, Standard Setting and Decision Making Procedures** must be followed for making VCU decisions. These ensure a consistent and objective approach is taken when assessing whether a candidate variety is an overall improvement in its value for cultivation and use.

6.2 The National List and Seeds Committee makes proposals for VCU decisions as indicated in Appendix 1.

# 7. Procedures for Genetically Modified (GM) Varieties

7.1 No VCU growing trials of GM candidates can be undertaken until a Release Consent permitting release into the environment is given by the relevant authorities. Applicants intending to enter GM candidates must consult both APHA and the GM Regulatory Authorities, well in advance of their National List application.

7.2 APHA is responsible for liaison with the applicant and Trial Organiser to produce any additional procedures for the conduct of any test or trial for GM varieties of Fodder Beet, should any be entered for National List trials.

7.3 The National List and Seeds Committee must approve the additional procedures and any future proposed amendment.

7.4 GM Release Consent Holders are responsible for GM releases. All parties involved in VCU work operating under a GM Release Consent must adhere to the instructions of theRelease Consent Holder, where necessary, to comply with the relevant consent conditions. If non-compliance with the consent conditions occurs, this must be reported to the consent holder and Trials Organiser who must notify APHA immediately.

# 8. Authentication of Seed Stocks

8.1 A VCU seed sample from all year 1 and year 2 candidate varieties should be authenticated by a DUS Test Centre according to procedures approved by the National List and Seeds Committee.

# 9. Summary of VCU Tests and Assessments

9.1 The (mandatory) VCU Field and Disease tests to be carried out for each minor crop are given in the relevant Annex to this protocol

A list of approved, additional characters, for which testing may be requested by the applicant, is also included in the relevant Annex.

9.2 The **VCU Trial Procedures** for Minor Crops must be used for the assessment of VCU characters.

9.3 The Procedures Development Group will review the **VCU Trial Procedures** at least annually. Any changes required to comply with relevant legislation must be addressed.

9.4 Amendments to approved procedures for the measurement of characters, or the design and operation of trials and data handling may be made by the Procedures Development Group only if they are based on sound scientific knowledge, which can be

validated. The data produced by revised methods must be reliable and consistent and any changes must maintain the overall integrity of VCU decision-making. Changes that are likely to have an effect on variety ranking must be agreed by the National List and Seeds Committee.

9.5 All growing trials and tests detailed in this protocol and associated documents must be independently inspected. The inspection must assess both whether the trial is compliant with the protocol and associated documents and whether the trial is fit for the purpose.

9.5 All growing trials and tests detailed in this protocol and associated documents must be independently inspected. The inspection must assess both whether the trial is compliant with the protocol and associated documents and whether the trial is fit for the purpose. Reports must be produced and disseminated in accordance with the **Data Review, Standard Setting and Decision Making Procedures**.

# 10 Assessment of Additional VCU Characters

10.1 The applicant may request the assessment of additional characters at the time of application. A list of approved additional characters recognised by the National Authorities is in the relevant Annex for each minor crop. The assessment of these approved characters must follow this protocol and the associated **VCU Trials Procedures.**

10.2 An additional test for characters **not** specified in this protocol may be requested by the applicant. APHA is responsible for liaison with the applicant and Trial Organiser to produce a procedure for the conduct of a special test or trial.

10.3 The special test or trial must be approved by the National List and Seeds Committee.

10.4 The approved special test or trial procedure should be considered as additional to the standard requirements of the protocol. Once agreed by the National List and Seeds Committee, and approved by the PVSC, the character should be added to the relevant Annex and the assessment method should be added to the **VCU Trials Procedures**.

10.5 The applicant will be advised by APHA of arrangements.

# 11 Control Varieties

11.1 Control varieties must be included in all trials and tests and should normally be on the UK National List or relevant Common Catalogue. The varieties to be used are recommended annually, by the Procedures Development Group for VCU field trials and the Pathology Trials Operator for inoculated disease trials. A list of both sets of controls is appended to the **VCU Trial Procedures**.

11.2 The Trials Organiser is responsible for organising the supply of seed of control varieties for all tests and trials.

# 12 Additional Non Candidate Varieties

12.1 In the first instance, only NL candidates and control varieties are authorised for inclusion in the VCU growing trials. However, other **non-GM** varieties, which are already on the UK National List or Common Catalogue, may be included, with the agreement of APHA.

12.2 Varieties, which have completed the normal VCU assessment period, but for which a National List decision has not been made, and other varieties (e.g. varieties not on the Common Catalogue (CC) or candidates entered in VCU in another EU Member State), may be considered for inclusion only with the specific permission of the National List and Seeds Committee.

# 13 Growing Trials

13.1 Trials are normally sown in at least two consecutive years.

13.2 Trials should be conducted following agricultural best practice and the associated **VCU Trials Procedures**.

13.3 A scientifically recognised trial design must be used, which maximises precision, minimises bias, and reflects the number of and types of varieties being tested. The Data Handling Operator is responsible for specifying the design and randomisation for each trial in accordance with the associated **Trials Design and Data Handling Procedures**.

# 14 Records

Records of field assessments and tests should be in a format agreed by the Data Handling Operator. The format must be sufficiently consistent over sites and operators to enable effective comparisons between candidates and trials to be made. Any other factors, which may have an effect on the performance of candidate varieties, should be recorded.

All records must be completed following the associated **VCU Trials Procedures**.

# Appendix 1 - Structure and Responsibilities of Groups and Committees

| Groups/ committees | Role | Membership |
|---|---|---|
| PVSC | Policy on NL and seeds,<br>Variety representations,<br>Protocol approval,<br>Licensing and contract award for NL | *Representatives from:*<br>Defra, SGDARE, DAERA, WG |
| NLSC | Technical direction and co-ordination on VCU, DUS and seeds systems,<br>Routine variety decisions,<br>Protocol development and recommendation to PVSC,<br>Technical advice to PVSC. | *Representatives of:*<br>APHA, SASA, AFBI, WG |
| IDSG | Statistical advice on VCU, DUS and seeds systems and specific cases | BioSS, DARD, APHA, NIAB |
| Procedures Development Group | Variety testing systems advice;<br>VCU procedure development | *Representatives from[1]:*<br>AFBI, APHA, SASA, Trial inspectors, BSPB plus specialists attending as required. |

Notes:

[1] Representation according to interest in crop group

# Appendix 2 -Roles of Organisers and Operators

| Organisers/Operators | Responsibilities |
|---|---|
| Trial Organisers | In accordance with the arrangement between the Trial Organiser and the National Authorities;<br><br>(a) Find potential Growing Trial Operators and Handlers for each trial series.<br><br>(b) Manage day to day activities to ensure that all requirements are met in respect of seed distribution, conduct of tests and trials, and submission of data. |
| Trial Design and Data Handling Operator | Produce trial plans, receive and validate data from Growing Trial, Quality Testing and Pathology Operators, in accordance with the Trials Design and Data Handling Procedures and instructions issued by the Trials Organiser. |
| Growing Trial Operators | Conduct NL VCU growing trials in accordance with VCU Trial Procedures and instructions issued by Trial Organisers. |
| Seed Handling Operator | Receive and prepare seed for sowing in VCU growing trials, and for possible authentication against DUS seed, in accordance with the VCU Trials Procedures and instructions issued by the Trials Organiser. |
| Trials Inspection and Technical Validation Operators | Inspect and report on VCU growing trials to assess compliance and fitness for purpose, in accordance with the arrangement between the Trial Inspection Operator and the National Authorities. |
| Quality Testing Operator | Conduct approved quality tests in accordance with the VCU Trials Procedures. |
| Data Review and Standard Setting | Review and quality assure VCU trials data and make recommendations regarding the inclusion or exclusion of |

| Organisers/Operators | Responsibilities |
| --- | --- |
| Operator | specific data. Calculate standards for VCU recommendations. |

# Annex A - VCU Tests and Assessments for Linseed

| Assessment | Character | Description |
|---|---|---|
| Yield | Grain Yield | Plot produce weighed and corrected to 9% moisture |
| Quality | Oil Content | Apparent oil content at 9% moisture, assessed using NMR |
| Resistance to disease | None routinely assessed | Records made if any diseases at a level likely to significantly affect yield |
| Behaviour with respect to factors in the physical environment | Standing ability (Winter linseed only)<br><br>Maturity (Spring linseed only) | % of plants lodged on a 1-9 scale<br><br>Visual estimate of canopy senescence. |

## Additional Approved VCU Characters for Linseed

The following table lists the additional VCU characters recognised by the National Authorities.

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Height | Height of plant (cm) |

| Character | Description of measure |
|---|---|
| Earliness of flowering | Estimate date of full flowering (1-9 scale) |
| Standing ability (Spring linseed only) | % of plants lodged (1-9 scale) |
| Maturity (Winter linseed only) | Estimate of canopy senescence (1-9 scale) |

# Annex B - VCU Tests and Assessments for Soya Bean

| Assessment | Character | Description |
|---|---|---|
| Yield | Grain Yield | Plot produce weighed and corrected to 9% moisture |
| Quality | Oil Content | Apparent oil content at 9% moisture, assessed using NMR |
| | Protein content | Crude Protein or Total Nitrogen Content using a recognised method |
| Resistance to disease | None routinely assessed | Records made if any diseases at a level likely to significantly affect yield |
| Behaviour with respect to factors in the physical environment | Plant population | Plants/$m^2$ |
| | Standing ability | % of plants lodged on a 1-9 scale |
| | Straw length | Measured after cessation of growth |
| | | Visual estimate of |

| Assessment | Character | Description |
|---|---|---|
| | Maturity | canopy senescence on a 1-9 scale. |

## Additional Approved VCU Characters for Soya Bean

There are no additional VCU characters recognised by the National Authorities.

# Annex C - VCU Tests and Assessments for Spring Lupin

| Assessment | Character | Description |
|---|---|---|
| Yield | Grain Yield | Plot produce weighed and corrected to 15% moisture |
| Quality | Protein content | Crude Protein or Total Nitrogen Content using a recognised method |
| Resistance to disease | None routinely assessed | Records made if any diseases at a level likely to significantly affect yield |
| Behaviour with respect to factors in the physical environment | Plant population | Plants/$m^2$ |
| | Standing ability | % of plants lodged on a 1-9 scale |
| | Straw length | Measured after cessation of growth |
| | Maturity | Visual estimate of canopy senescence on a 1-9 scale. |

# Additional Approved VCU Characters for Spring Lupin

There are no additional VCU characters recognised by the National Authorities.

# Annex D - VCU Tests and Assessments for Forage Rape

| Assessment | Character | Description |
|---|---|---|
| Yield | Dry matter yield | Plot produce weighed and corrected to dry weight |
| Quality | Dry matter content | % of plant that is dry material |
| Resistance to disease | Resistance to infection by<br><br>Powdery mildew | <br><br>Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population<br><br>Flowering date | Number of plants in plot<br><br>Date of flowering. |

## Additional Approved VCU Characters for Forage Rape

The following table lists the additional VCU characters recognised by the National Authorities.

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Height | Height of plant (cm) |

| Character | Description of measure |
|---|---|
| Lodging | % of plants lodged |
| Early vigour | Growth after emergence (1-9 scale) |
| Hardiness | Survival after frosts (1-9 scale) |
| Re-growth | Record incidence of auxiliary side shoots (1-9 scale) |
| Stem rotting | Number of rotting stems |

**Disease resistance characters**

| Character | Description of measure |
|---|---|
| Club root | % of plants with club root |

# Annex E - VCU Tests and Assessments for Fodder Kale

| Assessment | Character | Description |
|---|---|---|
| Yield | Dry matter yield | Plot produce weighed and corrected to dry weight |
| Quality | Dry matter content | % of plant that is dry material |
| Resistance to disease | Resistance to infection by<br><br>Powdery mildew | <br><br>Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population<br><br>Flowering | Number of plants in plot<br><br>Date of flowering. |

## Additional Approved VCU Characters for Fodder Kale

The following table lists the additional VCU characters recognised by the National Authorities.

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Establishment | Estimate of number of plants established (1-9 scale) |
| Height | Height of plant (cm) |

| Character | Description of measure |
|---|---|
| Lodging | % of plants lodged |
| Leafiness | Leafy type or stem type (1-9 scale) |
| Hardiness | Survival after frosts (1-9 scale) |
| Re-growth | Growth after cutting (1-9 scale) |
| Stem rotting | Number of rotting stems |

**Disease resistance characters**

| Character | Description of measure |
|---|---|
| Club root | % of plants with club root |

# Annex F - VCU Tests and Assessments for Swede

| Assessment | Character | Description |
|---|---|---|
| Yield | Dry matter yield | Plot produce weighed and corrected to dry weight to give variety root yield |
| Quality | Dry matter content | % of plant that is dry material |
| Resistance to disease | Resistance to infection by<br><br>Powdery mildew | <br><br>Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population<br><br>Bolting | Number of plants in plot<br><br>Number of bolters produced |

## Additional Approved VCU Characters for Swede

The following table lists the additional VCU characters recognised by the National Authorities.

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Neck length | Height of swede top (1-9 scale) |
| Top size | The size of bulb top (1-9 scale) |
| Root shape | Shape of bulb (1-9 scale) |
| Root colour | Colour of bulb (1-9 scale) |

| Character | Description of measure |
|---|---|
| Flesh colour | Colour of flesh inside swede (1-9 scale) |
| Skin texture | Texture of swede skin (1-9 scale) |
| Early vigour | Growth rate after emergence (1-9 scale) |
| Rotten root | Number of roots that are rotten (Number) |
| Split root | Number of roots that are split (Number) |
| Colour retention | Ability of variety to withstand bleeding (1-5 scale) |
| Root uniformity | Percentage of roots in 500-600g category (%) |
| Internal browning | Number of roots with internal browning (1-5 scale) |

**Disease resistance characters**

| Character | Description of measure |
|---|---|
| Powdery mildew on bulb | % of plants with mildew present on bulb or % of bulb affected by powdery mildew |

# Annex G - VCU Tests and Assessments for Sunflower

| Assessment | Character | Description |
|---|---|---|
| Yield | Grain Yield | Plot produce weighed and corrected to 14% moisture |
| Quality | Oil content | Apparent oil content at 14% moisture, assessed using NMR |
| Resistance to disease | Resistance to infection by | |
| | Botrytis | Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population | Plants/$m^2$ |
| | Standing ability | % of plants lodged on a 1-9 scale |
| | Straw length | Measured after cessation of growth |
| | Maturity | Visual estimate of canopy senescence on a 1-9 scale. |

# Additional Approved VCU Characters for Sunflower

There are no additional VCU characters recognised by the National Authorities.

# Annex H - VCU Tests and Assessments for Mustard

| Assessment | Character | Description |
|---|---|---|
| Yield | Grain yield | Plot produce weighed and corrected to 9% moisture content |
| Quality | | None routinely recorded |
| Resistance to disease | None routinely recorded | Records made if any diseases at a level to significantly affect yield |
| Behaviour with respect to factors in the physical environment | Maturity<br><br>Standing ability | Visual estimate of canopy senescence on a 1- 9 scale<br><br>% of plants lodged on a 1-9 scale |

## Additional Approved VCU Characters for Mustard

The following table lists the additional VCU characters recognised by the National Authorities.

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Plant height | Height of plant (cm) |
| Earliness of flowering | Estimate date of full flowering (1-9 scale) |

# Annex I - VCU Tests and Assessments for Forage Rye

| Assessment | Character | Description |
|---|---|---|
| Yield | Fresh yield | Plot produce weighed and corrected to 9% moisture |
| Quality | Dry matter content | Plot produce weighed and corrected to dry weight |
| Resistance to disease | Resistance to infection by<br><br>Mildew<br>Yellow rust<br>Brown rust | Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population | Number of plants recorded after emergence |

## Additional Approved VCU Characters for Forage Rye

There are no additional VCU characters recognised by the National Authorities.

# Annex J - VCU Tests and Assessments for Fodder Radish

| Assessment | Character | Description |
|---|---|---|
| 1. Yield | Dry matter yield | Assessed by agreed Protocol |
| 2. Quality | Dry matter content | Plot produce dried and weighed |
| | D-Value | Assessed by agreed Protocol |
| | Protein Content | Crude Protein Content using a recognised method |
| | Ash Content | % |
| | Germination | % |
| 3. Resistance to Disease | Resistance to infection by | Presence and severity of disease infection recorded in the field. |
| | *Alternaria* | |
| 4. Reaction to environment | Plant population | Number of plants recorded after emergence |
| | Flowering date | |

## Additional Approved VCU Characters for Fodder Radish

The following tables list the additional VCU characters that are recognised by the UK Testing Authorities

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| Emergence | Estimate of number of emerged plants (1-9 scale) |
| Establishment | Estimate of number of plants established (1-9 scale) |
| Height | Height of plant (cm) |
| Lodging | Number of plants lodged (1-9 scale) |
| Flowering | Number of plants flowering (1-9 scale) |
| Stem rotting | Number of rotting stems |
| Leafiness | Leafy type or stem type (1-9 scale) |
| Winter hardiness | Survival after frosts (1-9 scale) |
| Re-growth | Growth after cutting (1-9 scale) |
| Vigour | Growth after emergence (1-9 scale) |
| Frost damage | Number of plants damaged (1-9 scale) |

**Further measurements recorded following procedures in Section C**

Sowing date

Harvest date

Plot size

Harvest losses

Fresh yield

# Annex K - VCU Tests and Assessments for Forage Oats

| Assessment | Character | Description |
|---|---|---|
| Yield | Fresh yield | Plot produce weighed and corrected to 9% moisture |
| Quality | Dry matter content | Plot produce weighed and corrected to dry weight |
| Resistance to disease | Resistance to infection by<br><br>Powdery mildew<br>Crown rust<br>Oat mosaic virus<br>Barley yellow dwarf virus | Presence and severity of infection recorded in the field |
| Behaviour with respect to factors in the physical environment | Plant population | Number of plants recorded after emergence |

## Additional Approved VCU Characters for Forage Oats

There are no additional VCU characters recognised by the National Authorities.

# Annex L - VCU Tests and Assessments for Fodder Beet

| Assessment | Character | Description |
|---|---|---|
| 1. Yield | Root yield | Plot produce weighed to give variety root yield taking account of water content. |
| 2. Quality | Dry Matter Content | % of plant that is dry material |
| 3. Resistance to Disease | Resistance to infection in Growing Trials or Untreated Observation plots.<br>Disease % | Presence and severity of disease infection recorded in the field. |
| 4. Reaction to environment | Plant population<br>*Early Vigour*<br>Bolting<br>Crown Height<br>*Top size*<br>Root shape<br>*Rotten roots*<br>*Split roots* | Number of plants in plot<br>Growth rate after emergence<br>Number of bolters<br>Crown height above soil level<br>The size of root top<br>Shape of root<br>Number of rotten roots<br>Cracked Fodder Beet roots |

# Additional Approved VCU Characters for Fodder Beet

The following tables list the additional VCU characters that are recognised by the UK Testing Authorities

**Behaviour with respect to factors in the physical environment**

| Character | Description of measure |
|---|---|
| *Top Size* | The size of leaf (1-9 Scale) |
| *Early Vigour* | Growth rate after emergence (1-9 Scale) |
| *Rotten Roots* | Number of roots that are rotten (Number) |
| *Split Roots* | Number of roots that are split (Number) |

Trials for these assessments are normally sown in at least two consecutive years

**Disease resistance characters**

| Characteristic | Description of measure |
|---|---|
| Powdery Mildew | % of mildew present on leaf |

Trials for these assessments are normally sown in at least two consecutive years

Measurement of any of the above characters must follow the associated **VCU Trials Procedures**.

# Annex M - VCU Tests and Assessments for Hemp

| Assessment | Character | Description |
|---|---|---|
| Yield | Seed yield | Plot produce weighed and corrected to 9% moisture |
| | Stem yield | Yield of stems free of leaves and seeds |
| | Fibre yield | Dry fibre yield (straw yield x % of fibres) |
| Quality | Oil analysis | Delta 9 THC content |
| Resistance to disease | None routinely assessed | Records made if any diseases at a level likely to significantly affect yield |
| Behaviour with respect to factors in the physical environment | Emergence | Evenness of emergence |
| | Plant population | Number of plants to be harvested |
| | Plant height | Plant height at harvest |

| | | |
|---|---|---|
| | Standing ability | Stiffness of plant stems measured at harvest |

## Additional Approved VCU Characters for Hemp

There are no additional VCU characters recognised by the National Authorities.