Animal &
Plant Health
Agency

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

Field beans – spring and winter sown

July 2023

Changes

- APHA proposed a change to the format of VCU procedures going forwards which will allow for an earlier publication of the main guidelines. Appendices for the main VCU procedure will be stored in a separate document, which will be updated closer to the start of the growing trial to include the latest information on controls and trial organisers. The PDG and NLSC will then be asked to review these changes before publication of the supporting document on gov.uk. - Feb 2023 PDG Meeting

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 Field Beans.

A.2 Scope

A.2.1 These procedures apply to all varieties of Field Beans.

A.3 Responsibilities

A.3.1. **Procedures Developments 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**

A.3.2.1 Trials Organiser

British Society of Plant Breeders Ltd
(BSPB)
BSPB House
114 Lancaster Way Business Park
Ely
Cambs.
CB6 3NX

Tel No: 01353 653846
Mobile: 07747 567351
Email: jeremy.widdowson@bspb.co.uk

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 National 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 potential Growing Trial Operators and Quality Testing Operators to carry out trials and tests as determined by the Procedures Development 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 (e.g. evenings/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 A.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 **Processing of seed**

A.3.5.1 The Trials Organiser is responsible for organising the processing 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 approved for the purpose. Approved 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 Trials Operators, and, for authentication to address(es) supplied by APHA. Dates are given in Appendix 3.

A.3.7 **Monitoring of 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 should 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.3.10.2 The seed should be free from pests and diseases, including stem nematode (*Dictylenchus spp*) and aschochyta.

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 VCU trial assessments required

Bold = Obligatory *Italics = Additional if requested by the applicant*

Type of character	Reference	Description of assessment - Obligatory	Description of assessment – Additional (Assessed only if requested by applicant.)
Yield	Section C	***Plot yield** **Moisture content**	
Behaviour with respect to factors in the physical environment	Section C	**Winter hardiness (winter beans only)** **Standing ability**	*Straw length* *Relative maturity*
Resistance to harmful organisms	Section D	**Downy mildew** **Chocolate spot** **Ascochyta** **Rust**	
Quality characteristics	Section E		*Protein content*

*Unlike treated trials which have a prescribed programme in the procedure, managed trials are grown to best local practise with disease managed to ensure it does not endanger the validity of the trial.

A.4.4.1 Further measurements

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

Sowing date
Plant population
Harvest date
Bird damage
Plot size
Pre-harvest shedding
Combine losses
Brackling

Section B – Seed Handling Procedures

B.1 Responsibilities

B.1.1 Seed Handling Operators or Growing Trial Operators are responsible for carrying out the following seed handling procedures.

B.2 Seed handling procedures

B.2.1 Seed Handling Operators/Growing Trial Operators will receive a sowing list from the Trials Organiser.

B.2.2 Seed Handling Operators/Growing Trial Operators must record receipt of seed from applicants by checking it off against the sowing list as it arrives. The Trials Organiser and Applicant should be notified of any damage to the packaging, loss of seed or identification problems within one working day of receipt.

B.2.3 Each Seed Handling Operator/Growing Trial Operator must retain 300 grams of the seed submitted of every variety in the trial, for authentication by the DUS test centre.

B.2.4 Cross contamination must be avoided by ensuring equipment is clean between weighing and treatments.

B.2.5 Each seed handling operator must retain a 100 gram sample of seed until one month after harvest.

B.3 Authentication of VCU seed

B.3.1 The Trials Organiser will notify the minimum quantity required for authentication to Growing Trial Operators/Seed Handling Operators annually. Authentication samples are not required from Growing Trial Operators who receive seed from another Seed Handling Operator. All samples for authentication must be retained until harvest.

B.3.2 All samples must be kept under suitable conditions for the authentication procedures required and must be clearly labelled and sealed.

B.3.3 APHA will select samples from Growing Trial Operators/Seed Handling Operators for authentication at DUS test centre.

B.3.4 Growing Trial Operators/Seed Handling Operators must send requested samples to the address(es) supplied by APHA and by the date specified.

B.3.5 Where there is more than one Seed Handling Operator, APHA will select samples for authentication from at least two Seed Handling Operators.

B.3.6 If the level of off types recorded in DUS tests or VCU authentication of a candidate exceeds 10%, the VCU tests will be considered invalid.

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 must be appropriate for field bean crops to be grown i.e. no pulse crop may be grown in the previous 4 years. Spring sown beans are susceptible to *Sclerotinia sclerotiorum* and should not be grown in any field with a known history of the disease.

C.2.3 Soil type should be typical of those on which field beans 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 wild 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 wheeling compaction. Cultivations should follow best local practice.

C.3 Sowing the trial

C.3.1 **Plot size**

C.3.1.1 The harvested plot area per variety must not be less than 15 m^2 per replicate for trials with 4 replications and 25 m^2 per replicate for trials with 3 replications. Plots must be drilled to a greater length than required and cut back to the required 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 0.6 m.

C.3.1.2 **Row width**

Autumn sown beans are normally drilled to a wider row width than spring sown to reduce the risk of the spread of Chocolate Spot.

Autumn sown - acceptable range 15 - 41 cm
Spring sown - acceptable range 12 - 35 cm

C.3.2 **Plant population**

C.3.2.1 The target populations is:

- Spring sown beans - approximately 40 plants/m².
- Winter sown beans - approximately 18 plants/m².

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

$$\text{Seed rate (kg/ha)} = \frac{(\text{Target population} \times \text{Thousand seed weight}) \times 100}{(\text{Establishment\%} \times \text{Germination \%})}$$

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

For operators using seed counters the following formula can be used to calculate required seed numbers per plot:-

$$\text{Seeds per plot} = \frac{((\text{Target population} \times \text{Drilled plot area}) \times 10{,}000)}{(\text{Establishment \%} \times \text{Germination \%})}$$

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 Data Handling Operator.

C.3.3.2 The trial must be sown according to the plan produced by the 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. The sub-blocks within a replicate must be sown adjacent to each other, as must plots within a sub-block. 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 e.g. 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 If there is a need to replace a planned variety e.g. 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 The latest sowing date for Winter Field Beans is 31 December. The trial operator must contact the Trials Coordinator to request an extension if this date cannot be achieved due to circumstances beyond the Trial Operators control.

C.3.4.2 Drills to be set up, calibrated and used only when conditions are right

C.3.4.3 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.3.4.4 Drilling depth should be suitable to avoid damage by herbicides and birds.

C.3.4.5 At least ***one*** row of discard plots must be drilled on either side of the trial with the same drill and at the same time that the trial is drilled.
C.3.4.6 Precautions must be taken to avoid any missing rows. Any missing rows or parts of rows must be noted in the trial diary 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 two months of sowing (autumn sown trials) or one month of sowing (spring sown trials), 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 Data Handling Operator.

Return a completed site data 1 sheet (provided by the Trials Organiser) 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. The location of the access gates should utilise the navigation platform: What3words.com.

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**

C.4.1.1 Where not specified in these procedures agronomy should follow best local practice, advisory and regulatory guidelines. Application of fertilisers and sprays should be uniform. It is normally best to apply these across the direction of the plots. Application wheelings should not run through the harvested plot area.

C.4.2 **Fertiliser application**

C.4.2.1 It must 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.4.3 **Herbicides**

C.4.3.1 Any sensitivity to herbicides to be reported to the Trials Organiser.

C.4.4 **Growth regulators**

C.4.4.1 These should not be used on field bean trials.

C.4.5 **Pest and disease control**

C.4.5.1 **Pest control**

If necessary, approved means should be used to prevent or minimise damage by field mice, birds and other vertebrate pests. Aphid transmission can lead to severe virus infection which can affect variety performance to the same extent as a severe fungal infection. Effective steps should be taken to control this.

C.4.5.2 **Disease control**

Field bean trials are normally managed. In exceptional circumstances it may be necessary to deviate from the programme; eg additional sprays may be required during periods of extremely high disease pressure, or reduced rates may be required for drought stressed trials under low disease pressure. The Trials Organiser must be consulted before taking such a decision. Winter field bean trials should receive a fungicide according to Appendix 2.

C.4.6 **Irrigation**

C.4.6.1 Irrigation will only be permitted to facilitate establishment.

C.4.7 **Pathways**

C.4.7.1 Internal pathways should be made before flowering and after the risk of pest damage has passed at approximately growth stage 16

C.4.8 **Prior to harvest**

Desiccation is frequently unnecessary, given satisfactory weed control, and should only be used as a last resort since it will affect relative maturities. The Trials Organiser should be consulted if desiccation is considered necessary and available.

C.5 Harvesting

C.5.1 **Timing of harvesting**

C.5.1.1 Date of harvesting will be determined by the Growing Trial Operator based on crop maturity and local weather conditions.

C.5.1.2 Plots should be trimmed to their final length prior to harvesting. The plot dimensions must be measured prior to harvesting. If it is necessary to reduce the size of any plot at harvest give clear details on the yield file. Individual harvested plot lengths should be recorded.

C.5.2 **Samples**

C.5.2.1 No samples ex harvest are routinely required except for moisture determination when using the oven method. If other samples are required they will be notified to the Growing Trial Operator by the Trials Organiser. It is essential that all samples:

- are representative of the variety/plot from which they are taken with minimal contamination. When sampling on-combine, it is essential to minimise the risk of contamination of grain from the previous plot
- are taken from the same source
- contain the weight of grain requested.

C.5.2.2 Moisture content samples must be assessed from every yield plot in the trial by the Growing Trial Operator. See Appendix 7 for electronic and dry matter samples.

C.5.2.3 All bagged samples must be kept in good condition at a moisture content and temperature appropriate for safe long-term storage. They should be clearly marked both inside and outside the container/bag.

C.5.2.4 Samples may not be required from every variety - the Trials Organiser will provide details of which varieties require samples, the quantities required and the tests to be carried out.

C.5.2.5 Sample drying should be undertaken using a cold/warm air drier to reduce moisture content to 15% or below.

C.5.2.6 All plot samples must be labelled with trial identification number, variety name/breeders' reference, AFP number, plot number and Growing Trial Operator identification number.

C.5.2.7 If Protein content is to be measured, the Trials Organiser will request the appropriate sample. A sample of 500 g from each plot must be taken at the time of plot weighing and sealed in a polythene bag. All harvest samples should be sent to the Quality Testing Operator as soon as practicable after harvest or after the completion of any drying where this is necessary. Notification of despatch should be faxed or emailed to the Trials Organiser at the same time.

C.5.2.8 Where additional quality tests are requested by applicants, the Trials Organiser will provide appropriate instruction. The samples should be dispatched to the appropriate Quality Testing Operator as soon as practical after harvest, or after completion of drying where necessary.

C.5.3 **Submission of data and samples**

C.5.3.1 Appendix 6 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

C.5.3.2 All plot records should be transmitted to the 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 Trials Operator for action as agreed by the Trials Organiser.
C.5.3.3 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.

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 variety codes/names.

3.*	**Site data part 2**	Details of agrochemical applications and irrigation.
4.	**Plot records**	Plot data.

*Template available from the 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 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, e.g. copy and safe storage. Whichever method is used, individual plot data will only be accepted by the Data Handling Operator in an approved format.

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 “*” 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 should 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. 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 should be returned as soon as reasonably possible. Indicative deadlines are given in Appendix 6. All records must be returned by the final deadlines.

C.6.3 **Procedures for recording characters**

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

C.6.3.1 **PLOT YIELD AND MOISTURE CONTENT (OBLIGATORY) (Kg)**

The plot seed yield must be recorded, and returned with details of harvested plot dimensions, the growth stage and moisture content to the data handling operator within 5 days of harvesting the trial.

The following information must accompany the yield data:

The moisture content % of the harvested grain, determined either by oven or an approved electronic method. See Appendix 7.

Plot length: the plot length harvested in metres.

Plot width: the width of the harvested plot in metres from outer row to outer row plus half of the inter-plot gap on either side. The allowance for the inter-plot gap should be no greater than 0.45m.

If these are not the same for every plot, a separate record must be submitted

C.6.3.2 **WINTER HARDINESS (for winter sown beans only) (OBLIGATORY) (1-9)**

This should be recorded after any period of adverse weather on the scale 1-9 where 1 = total loss of plant and 9 = no damage.

C.6.3.3 **STANDING ABILITY (OBLIGATORY) (1-9)**

This must be recorded at harvest time i.e. maturity.
One score (1-9) for standing ability. 1 = very poor 9 = very good

C.6.3.4 S*TRAW LENGTH (ADDITIONAL) (cm)*

Record average plot height after the end of flowering before leaning or lodging takes place (if practical take 3 measurements along the length of the plot). If lodging has occurred,

choose a representative area of the plot, lift a number of plants against the measuring pole and record an average height.

C.6.3.5 *RELATIVE MATURITY* *(ADDITIONAL)* (*1-9*)

Relative Maturity should be judged with a visual estimate of crop senescence and moisture content 18 to 20%, where;

1 = latest maturing
9 = earliest maturing

C.6.3.6 **DOWNY MILDEW** **(OBLIGATORY)** **(%)**

Downy Mildew must be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf or infected plants. see Section D

C.6.3.7 **CHOCOLATE SPOT** **(OBLIGATORY)** **(%)**

Chocolate Spot must be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf or infected plants. see Section D

C.6.3.8 **ASCOCHYTA** **(OBLIGATORY)** **(%)**

Ascochyta must be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf, pod or infected plants. see Section D

C.6.3.9 **RUST** **(OBLIGATORY)** **(%)**

Rust must be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf, pod or infected plants. see Section D

C.6.3.10 **SOWING DATE** **(OBLIGATORY)** **(Day/month/year)**

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

C.6.3.11 **PLANT POPULATION** **(OBLIGATORY)** **(1-9)**

Where there is evidence of establishment, at a level which will affect results, plant counts should be taken soon after full emergence.
9 = Target Population

C.6.3.12 **HARVEST DATE** **(OBLIGATORY)** **(Day/month/year)**

C.6.3.13 **BIRD DAMAGE from all plots** **(OBLIGATORY)** **(1-9)**

9 = no bird damage.

C.6.3.14 **PRE-HARVEST SHEDDING from all plots (OBLIGATORY) (1-9)**

This must be recorded.

9 = no shedding. Shedding should be assessed if the losses are thought sufficient to exclude the yield data from results. Indicate the estimated number of beans lost per m^2 prior to harvest for the lowest score given on the 1 to 9 scale.

C.6.3.15 **COMBINE LOSSES from all plots (OBLIGATORY) (1-9)**

This must be recorded. 9 = no combine losses. Combine losses should be assessed if the losses are thought sufficient to exclude the yield data from results. Indicate the estimated number of beans lost per m^2 for the lowest score given on the 1 to 9 scale.

C.6.3.16 **BRACKLING from all plots (OBLIGATORY) (%)**

Percentage of plants with buckling of the haulm at a point well above ground level. It may be a reflection of an overripe crop but varietal differences can occur at an earlier stage.

C.6.4 **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 in accordance with the procedure in Section D for disease.

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 and Technical Validation Operator and, in some cases, it may be necessary to visit on more than one occasion. To aid inspection in the absence of the Trial Officer, as a minimum plot 1 should be clearly labelled.

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

- To give reasonable access to trials to inspectors and provide full location and site details (if not already given with site data 1).
- To supply the inspector with information (for example sprays applied etc) within seven days of a request.

- To co-operate with the inspector in making any non-routine assessments required to establish the validity of the trial (for example population counts).
- To carry out any action agreed in consultation with the inspector. In particular it is important that any requirement to shorten plots is undertaken. The data on plots that the trials operator and inspector agree to exclude should not be submitted.

Section D – Disease testing procedures

D.1 Assessment of natural infection

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

D.1.1 **Diseases recorded**

D.1.1.1 The precise timing for assessment is best judged in relation to the development of disease in the trial, with the aim being to achieve the assessment, which shows the most differentiation between varieties. In practice, this usually means that two or three sequential assessments are necessary. If disease infection persists, numerical records should be made throughout the season.

D.1.1.2 Downy mildew should be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf or infected plants.

D.1.1.3 Downy mildew should be assessed using the key given in Appendix 8. it can be recorded and reported as a percentage

D.1.1.4 Chocolate spot, should be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf area.

D.1.1.5 Chocolate spot should be assessed using the key given in Appendix 8. It can be recorded and reported as a percentage

D.1.1.6 Ascochyta, should be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf or pod area.

D.1.1.7 Ascochyta, should be assessed using the key given in Appendix 8. It can be recorded and reported as a percentage

D.1.1.8 Rust, should be recorded routinely when the level of infection on the most affected variety is over 5% of the leaf area.

D.1.1.9 Rust should be assessed using the key given in Appendix 8. It can be recorded and reported as a percentage.

D.1.1.10 All disease assessments must be sent to the Data Handling Operator as soon as they are made, even if no disease is observed.

D.2 Assessment of disease in inoculated trials

The Pathology Trials Operator is responsible for carrying out these procedures.

D.2.1 **Diseases recorded**

D.2.1.1 The disease recorded is downy mildew.

D.2.1.2 The pathogen is maintained on seedlings. Conidia are increased to provide inoculum for mixtures of current susceptible varieties sown in polythene tunnels. These are irrigated to promote cycles of infection of downy mildew.

D.2.1.3 Inoculation

The resulting infected material is incorporated into the soil of the polythene tunnel area as it senesces, thus introducing a high and uniform level of oospore inoculum into the soil. The resulting area is planted directly with trial plots (1.5m lines, 4 replicates per variety) the following year, and collections of downy mildew isolates are made from naturally occurring field infections whenever possible and added to the seedling maintenance system. Tunnel areas are “updated” with new populations on a rotational system. It is not generally possible to use one tunnel area for more than three consecutive years, and new areas need to be developed as required.

D.2.1.4 Assessment of developing systemic and secondary infections are assessed using the key in Appendix 8.

Section E – Quality testing procedures

E.1 Responsibilities

E.1.1 NIAB is responsible for conducting the approved quality tests according to these procedures.

E.2 Quality assessment methodology for obligatory and additional tests

E.2.1 Preparation of samples prior to quality analysis

E.2.1.1 Samples should be:

- Relatively weed free
- Free from excessive numbers of broken grains
- Bright and of good colour
- Well filled and free from visual sprouting.

E.2.1.2 Sample cleaning

The samples should be cleaned to remove combining debris such as straw, chaff, and unthreshed pods and weed seeds. The cleaning may be by hand or with hand-held or mechanical sieves.

E.2.2 **Quality tests**

E.2.2.1 **Hammer milling of grain prior to analysis**

E.2.2.1.1 The mill must be a hammer mill fitted with a 1mm screen. 300g of sample are milled and the material must be totally removed from the receptacle. The sample must be spread thinly, either with a printer's roller or with a wide blade spatula. The sample must be re-formed into a pile and the process repeated four times.

E.2.2.1.2 After mixing, a representative sub-sample must be taken in the following manner:-

A sample jar of 250ml capacity should be filled in small stages re-mixing the bulk between stages and blending each stage within the jar.

The sample jar must be filled and then sealed with a close-fitting lid.

E.2.2.2 **Determination of crude protein or total nitrogen content**

E.2.2.2.1 Determination of protein content by NIR spectroscopy is permissible provided that the calibration utilised is commercially available and specific for pulse protein content measurement. Quality assurance of the analytical procedure must include regular analysis of a suitable test material – for example a sample of grain maintained for that purpose. Records should be kept to demonstrate that the instrument is performing correctly.

Each season, approximately 10% of the samples analysed by NIRS, should be analysed by a chemical method (as described below – E.2.2.2.2) to check the precision of the NIRS protein prediction. If appropriate and when sufficient variety, site and year chemical data is available, the NIRS calibration should be biased appropriately to improve the precision of the prediction.

E.2.2.2.2 Determination of Crude Protein or Total Nitrogen Content must be by a chemical method, recognised by competent authorities (IBD, AOAC, ISO, etc.) and which makes direct measurement of nitrogen content.

E.2.2.2.3 Methods acceptable to the Testing Authority are currently total nitrogen determined by the Kjeldahl method and total nitrogen using the Dumas method. These methods are only acceptable where instrumentation used is capable of analysing sample sizes greater than 0.5g.

E.2.2.2.4 Quality assurance of the analytical procedures should include regular analysis of a suitable test material - for example, a sample of flour maintained for that purpose.

E.2.2.2.5 Systematic errors in Kjeldahl nitrogen analysis should be controlled by the inclusion of blank analyses and by the analysis of a suitable analytical standard (Ammonium Sulphate, Methionine in a suitable bulking agent) for which the nitrogen content is known.

E.2.2.2.6 Instrument drift in Dumas nitrogen should be controlled by standardisation against a suitable analytical standard (EDTA, Glycine), for which the nitrogen content is known.

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 Data Handling Operator.
b) If any amendments to the plan have been made, return a hard copy of the plan to the Data Handling Operator with any amendments clearly indicated. Alternatively, amendments may be notified electronically with the agreement of the Data Handling Operator.

F.1.2 The 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, seed rates, soil details and fertiliser applications.

F.2.3 Details of any agrochemical applications are also recorded and retained by the Growing Trial Operator.

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 Field Beans 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 - GOV.UK (www.gov.uk).

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.