Animal &
Plant Health
Agency

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

## Hemp

**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 – Summary of VCU trial assessments required

## Hemp

| Observation | Reference | Description of assessment - Obligatory | Description of assessment – Additional (Assessed only if requested by applicant.) |
|---|---|---|---|
| Yield | Section C | **Plot seed yield** | |
| Yield | Section C | **Seed moisture content** | |
| Yield | Section C | **Stem yield** | |
| Impact of environment | Section C | | *Emergence* |
| Impact of environment | Section C | **Plant population (plants to be harvested)** | |
| Impact of environment | Section C | **Plant height** | |
| Impact of environment | Section C | **Standing ability** | |
| Resistance to harmful organisms | Section D | None routinely recorded | |
| Quality characteristics (Laboratory Tests) | Section D | | *Dry fibre yield* |
| Quality characteristics (Laboratory Tests) | Section D | | *Oil content and analysis* |

**Further measurements**

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

**Sowing date**
**Harvest date**
**Plot size**
**Bird damage**
**Seed loss**

# Section B – Seed handling procedures

## B.1 Seed handling procedures

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

## B.2 Authentication of VCU seed

B.2.1 APHA will notify the Seed Handling Operator of the DUS Test Centre to which a 200-gram sample of each variety of hemp should be sent for authentication.

# 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 a hemp crop to be grown and should have no history of disease or likely herbicide residues that could damage the crop.

C.2.3 Soil fertility and texture should be uniform across the site. The soil should be as uniform as possible, with no substantial variations in previous cropping, ridges, furrows, etc.

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

Seedbeds need to be well prepared but avoid excessive passes, over-consolidation and compacted soil. Prepare and compress the seedbed so that moisture levels are preserved and even (especially on light soils). The trial can then be drilled when conditions are optimum and from April 1st to June 10th.

Surround the trial with a hemp to avoid border effects on the test plots.

Rolling after drilling is usually necessary and beneficial on lighter and stony soils. Heavier soils should be rolled if there's a risk of moisture loss, but it is essential to avoid capping.

Trial Managers must check the emerging crop regularly

C.3.1 **Plot size**

C.3.1.1 The harvested plot area per variety should be not less than 20 m² per replicate for trials with a minimum of 3 replications. Plots should be drilled to a greater length than required and cut back to the required length prior to harvest. The plot width for calculating harvested area is measured centre gap to centre gap with an inter-plot gap in the range 0.5 m to 0.8 m.

C.3.2 **Plant population**

C.3.2.1 The target plant population is 300 plants per 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 seed**

Untreated seed must be sent as set out in accordance with the Seed and Fee Notice, directly to the Seed Handling Operator by the deadline set out in Appendix 3.

When drilling, every effort should be made to obtain even emergence.

C.3.4 **Trial layout**

C.3.4.1 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.3.4.2 The trial should be sown according to the plan produced by the Trial Design and Data Handling Operator and may be an incomplete block design. In an incomplete block

design, each replicate is split into a number of sub-blocks. Any splitting of replicates must be between sub-blocks and not through sub-blocks. Varieties can be moved within a sub-block but must not be moved from their sub-block. Varieties must not be moved around within the plan eg if drilling errors occur. If plots are moved out of their original sub-block they will have to be treated as missing plots. If there are any queries, please contact the Trials Organiser.

C.3.4.3 If there is a need to replace a planned variety eg if varieties are withdrawn, affected plots must be sown with any of the standard control varieties. Any such replacements must be agreed with the Trials Organiser. The control varieties are listed in Appendix 5.

C.3.5 **Drilling**

C.3.5.1 Care must be taken with drill settings and drilling speed to ensure satisfactory and uniform establishment and plant population from plot to plot. Drill at 1.5 – 4cm into a firm and fine seedbed. It is also important to ensure that there is no carryover of seed between plots.

C.3.5.2 At least one discard plot must be drilled on either side of the trial with the same drill and at the same time that the trial is drilled.

C.3.5.3 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.3.6 **Confirmation of trial layout**

C.3.6.1 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 Trial Design and Data Handling Operator.

- Return a completed site data 1 sheet including the following information:
- Site location details including how to get to the field.
- Sketch showing the layout of the trial in the field, in relation to other trials and showing access roads, gates, etc. The location of these features 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**

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**

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

A typical rate of nitrogen is to use 150–190 kg/ha minimum (including SMN).

Trial managers should be aware of other nutrient requirements and should be prepared, if necessary, to apply appropriate treatments.

### C.4.3 **Herbicides**

The herbicides to be used must be discussed with the Trials Organiser. Chemicals should not be used to which any variety is known to be sensitive.

The following factors should be considered:

Use the minimum dose that will kill the weeds.

### C.4.4 **Growth Regulators**

Plant growth regulators should not be used.

### C.4.5 **Pest and disease control**

### C.4.5.1 **Pest control**

Adequate measures should be taken to prevent or minimise damage by any pest.

If there is a risk of bird damage cover the trial with protective nets at sowing, these can be removed at the 2-3 leaf stage.

Assessments should be made wherever pest damage occurs since decisions have to be made on the validity of each plot affected.

For seed dressings, see Appendix 2.

### C.4.5.2 **Disease control**

The aim of fungicide application to hemp trials is a compromise between controlling severe outbreaks of disease which might invalidate the trial yields and allowing sufficient disease development to permit the assessment of varietal differences. Precautions should be taken to prevent disease levels in excess of about 10% leaf area cover, or about 10% of capsules infected, by applying appropriate fungicides according to the available approvals and label recommendations. Any disease which does develop should be recorded as described in Section E.

### C.4.6 **Irrigation**

If irrigation is required to establish the trial, seek the specific agreement of the Trials Organiser.

### C.4.7 **Pathways**

Internal pathways should be made after the risk of bird damage has passed.

# C.5 Harvesting

C.5.1 **Timing of harvesting**

It is the Trial Manager's responsibility to ensure that plots can be harvested without damaging neighbouring plots and without contamination: plots should be separated adequately as required.

C.5.2 **Harvesting method:**

C.5.2.1 The harvest is carried out on a plot of 1 m², corresponding for example to 5 rows over a length of 1.25 m in the case of a spacing of 16 cm between rows, within the basic plot. To avoid external effects, leave one meter unharvested at each end of the plot and two rows on the side.

C.5.2.2 Harvesting is done by cutting the plants (eg using a pruner) at a height of about 5cm from the ground. The harvested plants be artificially dried, immediately.

C.5.2.3 Harvesting the trial should normally be carried out as one process, but can be dependent on the maturity of the candidates:

- Plots should be harvested once mature (It is often estimated that maturity is 40 days after full bloom). Sequential harvesting might be required.at the late flowering stage of the latest variety for trials with late to very late varieties.

**In the case of varieties very early compared to the control, the harvest must be at maturity of the variety and can therefore be done in several stages.**

C.5.3 **Samples**

C.5.3.1 All bagged samples must be kept in good condition at a moisture content and temperature appropriate for long term storage. They should be clearly marked both inside and outside the container/bag.

C.5.3.2 Moisture content samples must be assessed from every yield plot (stem and seed) in the trial by the Growing Trial Operator. See Appendix 7.

C.5.3.3 Sample drying should be undertaken using a cold/warm air drier to reduce

moisture content to 9% or below.

C.5.3.3 All plot samples must be labelled with the trial identification number, variety name/breeders' reference, AFP number, plot number and Growing Trial Operator identification number

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

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

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

C.5.4.3 All samples should be sent to the appropriate 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:<br>1) map of site location showing nearby settlements and roads,<br>2) a sketch showing the layout of trials in the field with access points and<br>3) trial layout, showing plot numbers and variety codes/names.<br>4) trial diary. |
| 3. | **Site data part 2*** | Details of agrochemical applications and irrigation. |
| 4. | **Plot records** | Plot data. |

* Template available from Trials Organiser

C.6.1.1 An entry in the Diary sheet should be made on every trials 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, eg copy and safe storage. Whichever method is used, individual plot data will only be accepted by the appropriate Trial Design and Data Handling Operator in an approved format using the AFP number, variety name and units as listed in Sections C and D.

C.6.2.2 All observations should be checked at the time of recording to identify any unusual plot performance. These observations should be noted by the recorder and any possible causes identified, together with a recommendation for whether the data should remain in the analysis or should be excluded.

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 record this in any data file or hard copy medium as a symbol thereby indicating there is no recorded value associated with this plot.

C.6.2.6 Specific plot records 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 Trial Design and Data Handling Operator as soon as possible after they are completed

C.6.2.7 All records must be returned as soon as reasonably possible and when complete for the whole trial. Indicative deadlines are given in Appendix 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 **STEM YIELD AND MOISTURE CONTENT (OBLIGATORY) (kg)**

Stems should be weighed free of leaves and seeds.

The following information must accompany the yield data:

- The moisture content of the stems determined the oven method (Appendix 7).
- Harvested length: the length harvested in meters.
- Harvested width: the width of the harvested area in meters from outer row to outer row plus half of the inter-plot gap on either side. If these are not the same for every plot a separate record must be submitted.
- Yield (in kilograms). Note clearly any tare weight to be subtracted.

C.6.3.2 **SEED YIELD AND MOISTURE CONTENT (OBLIGATORY) (kg)**

Seed should be threshed and cleaned.

The following information must accompany the yield data:

- The moisture content of the seed determined the oven method (Appendix 7).
- Harvested length: the length harvested in meters.
- Harvested width: the width of the harvested area in meters from outer row to outer row plus half of the inter-plot gap on either side. If these are not the same for every plot a separate record must be submitted.
- Yield (in kilograms). Note clearly any tare weight to be subtracted.

C.6.3.*3* **EMERGENCE** **from all plots** **(OBLIGATORY)** **(1-9***)*

1 very poor
9 very good

C.6.3.4 **POPULATION** **from all plots** **(OBLIGATORY)** **(1-9)**

On the $m^2$ to be harvested count all plants participating in the yield.

C.6.3.5 **STANDING ABILITY from all plots** **(OBLIGATORY)** **(1-9)**

1 very poor
9 very good

Growing Trials Operators should assess standing ability at a stage that provides good discrimination between varieties and be prepared to repeat the assessment if further lodging develops.

C.6.3.6 **PLANT HEIGHT** **from all plots** **(OBLIGATORY)** **(cm)**

Record average plot height at the end of flowering before leaning or lodging takes place. If lodging has occurred, choose a representative area of the plot, lift 3 plants against the measuring pole and record an average height.

C.6.3.7 **SOWING DATE of each trial** **(OBLIGATORY)** **(Day/month/year)**

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

C.6.3.8 **HARVEST DATE** **(OBLIGATORY)** **(Day/month/year)**

This is recorded in part 2 of the Site Information Form.

C.6.3.9 **BIRD DAMAGE** **from all plots** **(OBLIGATORY)** **(1-9)**

1 all plants severely damaged
9 no plants damaged

Indicate the cause of damage and, in the Diary section, what action has been taken to minimise further damage.

C.6.3.10 **SEED LOSS** **from all plots** **(OBLIGATORY)** **(1-9)**

1 severe seed loss
9 no seed loss

and give an estimation of maximum % seed loss/boll loss.

Record before harvest if serious loss has already occurred. Base scores either on observation of boll loss or counts on the ground. Ensure that combines are set correctly to minimise losses at harvest. Assess any serious combining losses after harvest.

C.6.3.9 **Site factors**

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

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

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

C.6.3.10 **Trial Inspection**

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

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

1. Give inspectors reasonable access to trials and to provide full location and site

details (if not already given with site data1).

2. Provide the inspector with information (for example pesticide sprays applied etc) within seven days of a request.
3. Co-operate with the inspector in making any non-routine assessments required to establish the validity of the trial (for example population counts).
4. Carry out any action agreed in consultation with the inspector. In particular it is important that any requirement to shorten plots is undertaken. 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

**Disease observation tussocks**

No disease observation tussocks are carried out routinely.

## D.2 Naturally occurring disease in VCU growing trials

If disease levels increase to levels more than 5% of the leaf area (or 5% of infected plants as appropriate for the diseases) on the most affected variety a score should be made and sent to the Trials Organiser. Confirmation of the identity of a disease should be obtained from an appropriate plant pathologist if required. If disease infection persists, successive records should be made through the season.

Disease data should be received by 13 August

## D.3 Inoculated disease tests

No inoculated disease tests are carried out routinely.

# Section E – Quality testing procedures

## E.1 Responsibilities

E.1.1 The Quality Testing Operator appointed by the Trials Organiser is responsible for conducting approved quality tests according to these procedures.

## E.2. Quality assessment methodology

E.2.1 **Fibre content determination**

A methodology recognized by the National Authorities must be used.

E.2.2 **Sampling for chemical analysis (∆9-THC)**

A methodology recognised by the National Authorities must be used.

# 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 appropriate Trial Design and Data Handling Operator.

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

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

## F.2 Data recording

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

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

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

## F.3 Data processing

F.3.1 Processing of individual agronomic and disease variates.

F.3.2 A list of the agronomic, yield and disease variates, which may be recorded and processed, are specified in Sections C, D and E. After scrutiny, copies of the results will be

returned to the Growing Trial Operator for action as agreed by the Trials Organiser

## F.4 Other tests and trials

F.4.1 Any additional or alternative designs required for the assessment of additional VCU characters not detailed in Annex A of the **MINOR CROPS VCU TRIAL PROTOCOL** 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

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www.gov.uk/apha

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