



Animal &  
Plant Health  
Agency

# United Kingdom Variety List Trials: Trial Procedures for Official Examination of Value for Cultivation and Use (VCU) Harvest 2023

## Flax

February 2023

# Changes to Procedures

- Flax and Linseed procedures separated – March 2023

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# Section A – Summary of VCU trial assessments required

Winter Flax

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	
Impact of environment	Section C	Standing ability	<i>Plant height</i> <i>Earliness of flowering</i> <i>Maturity</i>
Resistance to harmful organisms	Section D		None routinely recorded
Quality characteristics (laboratory tests)	Section E		<i>Oil content</i>

## Spring Flax

Type of character	Reference	Description of assessment - Obligatory	Description of assessment – Additional (Assessed only if requested by applicant.)
Yield	Section C	Seed yield Seed Moisture content Straw Yield Straw dry matter	
Impact of environment	Section C	Standing ability Ease of combining Seed Maturity Straw Maturity	<i>Plant height</i> <i>Earliness of flowering</i>
Resistance to harmful organisms	Section D		None routinely recorded
Quality characteristics (laboratory tests)	Section E		<i>Oil content</i> <i>Straw quality assessment</i>

### 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 or boll loss
- Combine harvester losses

# **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 g sample of each variety of linseed 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 The trial must be located within a commercial crop to aid management if possible and to reduce the risk of flax flea-beetle (FFB) damage. The Trials Organiser should be consulted if this proves impossible or impractical. Previous cropping must be appropriate for a linseed/flax crop to be grown and should have no history of Fusarium wilt or likely herbicide residues that could damage the crop. There should be at least a 3-year (and preferably 5 year) gap between linseed/flax and any other crop susceptible to sclerotinia.

C.2.3 Soil type should be typical of those on which flax is grown locally. 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

Time of sowing is critical for rapid emergence and even establishment and to reduce the risk of damage by FFB. As a guideline, spring flax trials should be drilled between the last week of March and the 3<sup>rd</sup> week of April when soil temperatures reach 8°C and conditions are conducive to rapid and even establishment. To reduce FFB losses in spring flax the drilling of the trial should coincide as closely as possible with that of the host crop of flax. Seedbeds need to be well prepared but avoid excessive passes, over-consolidation and compacted soil. Prepare and compress the flax seedbed so that moisture levels are preserved and even (especially on light soils). The trial can then be drilled when conditions are optimum.

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

Trial Managers must check the emerging crop regularly and, if necessary, spray for FFB.



### C.3.1 Plot size

C.3.1.1 The harvested plot area per variety should be not less than 20 m<sup>2</sup> per replicate for trials with a minimum of four 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 Flax is sown at a seed rate of 600 to 800 seeds per square metre (aiming for plant population of 600 plants),

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

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

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

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

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

### C.3.3 Trial 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 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.3.4.3 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.3.5 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 moisture in a firm and fine seedbed. In spring flax, due to the very high risk of damage by flea beetles trial managers are advised to wait until conditions are conducive to good germination and rapid growth. 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 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

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, 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 trialling experience.

A typical rate of nitrogen is to use 100–125 kg/ha minimum (including SMN) as a split application; 60% when the rows are visible and 40% when 20cm tall / greed bud visible.

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. Pre-emergence herbicides should be used and it should be noted that under certain soil and weather conditions the flax crop can be intolerant of some approved post-emergence herbicide products. Post-emergence sulfonyl urea products can be damaging and should be avoided.

The following factors should be considered:

Approved pre-emergence herbicides are effective (eg Mesotrione - Callisto) with good (moist) seedbed conditions and with the appropriate application technique (e.g. water volume). Approved post-emergence herbicides (eg Bentazone – Basagran) can be effective against annual dicotyledons.

Post-emergence herbicide applications should be made when all varieties are taller than 15 cm (but always check the product label for any product variations on this). The risk is greater on light soils (e.g. chalks) and no variety should not be shorter than 10 cm.

Most damage is likely when soils are very dry and/or during extremes of temperature especially very hot conditions.

Experience has shown that the use of the following products can lead to damage and should be **avoided**:

Metazachlor eg Butisan

Metazachlor + quimerac eg Katamaran

Napropamide eg Devrinol

Clopyralid + picloram e.g. Galera

Bifenox eg Fox

**Use the minimum dose of herbicide that will kill the weeds.**

#### C.4.4 Growth regulators

If there is a high risk of severe lodging, applications of plant growth regulator can be used on spring flax to manage excessive or rapid growth. All applications should be discussed with the Trials Organiser.

#### 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. In spring flax FFB, in particular, are likely to be a significant pest during establishment. Trial managers must ensure that adequate pre- and/or post-emergence control measures are taken.

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

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. In spring flax, the diseases which are most likely to be encountered are *Botrytis* spp. and *Alternaria* spp. in wet seasons, and Powdery Mildew in dry seasons.

#### 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 pigeon 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 Trials may be desiccated prior to combining unless there is a reason for not doing so, the control varieties must be at an overall suitable stage of development.

C.5.2.2 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.5.2.2 Immediately prior to desiccation, a representative 2m sq.area of the plot should be pulled by hand to provide samples for quality testing. The roots and the seed capsules should not be removed. The samples should be left to dry for 24 hours to dry the samples before dispatch. The samples should be sent as soon as possible to the address given in Section D.

C.5.2.3 When harvesting the cutter bar should be set so that no more than 10cm of stubble is left on the plot. After combining the straw should be collected and weighted. It is possible to use a Haldrup grass harvester to do this.

### C.5.3 Samples

C.5.3.1 Samples are required from all plots for moisture determination using the oven method and oil content determination. If additional samples are required, they will be notified to the Growing Trial Operator by the Trials Organiser. All samples should be labelled with the labels provided, giving variety name/breeders reference, AFP number, replicate number and Growing Trial Operator identification number.

C.5.3.2 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.5.3.3 Two samples should be taken from each plot at harvest. A 200g seed sample should be taken in a polythene bag for moisture content and oil content determination and a 300g sample of straw (ex-combine) in a polythene bag for moisture content. One label should be placed inside the bag, and this sealed by rolling over the top and securing the bags and the second labels with rubber bands.

C.5.3.4 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.5.3.5 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 All plot records should be transmitted to the Trial Design and Data Handling Operator following the deadlines set out in [Appendix 6](#). The Growing Trial Operator should ensure that data are free from errors before transmission. After scrutiny, copies of results will be returned to the Growing Trial Operator for action as agreed by the 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

6.1 There are four components:

1. **Diary** Field notes of trial status.
- 2.\* **Site data part 1** Including full location details:
  - a) map of site location showing nearby settlements and roads,
  - b) a sketch showing the layout of trials in the field with access points and
  - c) 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 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, e.g. copy and safe storage. Whichever method is used, individual plot data will only be accepted by the appropriate Trial Design and Data Handling Operator in an approved format using the 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 to [trials@ahdb.org.uk](mailto:trials@ahdb.org.uk)

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 SEED YIELD AND MOISTURE CONTENT (OBLIGATORY) (kg)

The following information must accompany the yield data:

The moisture content % of the harvested grain, determined by oven method.

### C.6.3.2 STRAW YIELD (OBLIGATORY) (kg)

All harvested straw for each plot should be collected and weighed. The yield should be recorded, and returned with details of harvested plot dimensions. A corresponding sample will be assessed for dry matter determination. 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 adjustment for the inter-plot gap should be no greater than 0.8 m.

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

Growth stage: usually 9.9 at harvest. The Growth Stage Chart for Flax is at [Appendix 7](#).

Yield (in kilograms). Note clearly any tare weight to be subtracted.

Yield, moisture content, plot length, plot width and harvest date should be sent to the appropriate Trial Design and Data Handling Operator within 5 days of harvesting the trial.

**C.6.3.2 STANDING ABILITY** **from all plots (OBLIGATORY)** **S 1** **( 1-9)**  
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.6.3.3 PLANT HEIGHT** **from all plots (OBLIGATORY)** **(cm)**

Record average plot height at 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.6.3.4 EARLINESS** *from all plots* **(ADDITIONAL)** **(1-9)**

1 very late  
9 very early

Record when the earliest variety is in full flower and score all varieties relative to this. An assessment on one occasion is normally sufficient. Estimate the date of full flowering for the earliest control variety.

**C.6.3.5 SEED MATURITY** **from all plots (OBLIGATORY) (1-9)**

Maturity should be judged by making a visual estimate of canopy senescence, where;

1 very late  
9 very early

Unrepresentative areas of the plot should be avoided when making assessments, for example, localised diseased infections.

**C.6.3.6 STRAW MATURITY** **from all plots (OBLIGATORY) (1-9)**

1 very late  
9 very early



One record is normally sufficient and should be based on the change in straw colour as the plants ripen.

**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 (or BOLL) 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.6.3.11 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 grains lost per m<sup>2</sup> for the lowest score given on the 1 to 9 scale.

**C.6.3.11 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.6.3.12 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

#### D.1.1 Disease observation tussocks

No disease observation tussocks are carried out routinely.

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

D.2.1 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.

D.2.1.1 The disease most likely to be encountered is Powdery mildew (*Oidium lini*), though both *Alternaria* and *Botrytis* may cause infections on the leaves. Capsules are most likely to be affected by *Alternaria* and *Botrytis*. Stem and whole plant symptoms are most likely to be caused by *Verticillium*, *Sclerotinia*, *Mycosphaerella* (Pasma disease), *Phoma*, Fusarium wilt and other *Fusarium* diseases.

## D.2.2 Recording methods

### D.2.2.1 Timing of assessments

A guide to probable assessment times in terms of growth stage is shown in the Table below.

Disease	Seedling/ Vegetative	Flower bud	Flowering	Capsule formation	Pre- maturity
Powdery mildew %	N/A	√	√	√	N/A
Botrytis %	N/A	√	√	√	N/A
Alternaria %	N/A	N/A	√	√	N/A
Fusarium %	√	√	√	√	N/A
Fusarium wilt %	√	N/A	√	N/A	N/A
Verticillium %	N/A	N/A	N/A	√	√
Sclerotinia %	N/A	N/A	√	√	N/A
Phoma %	√	√	√	√	N/A
Mycosphaerella %	√	N/A	N/A	√	√

D.2.2.2 Appropriate assessment keys are given in [Appendix 8](#). All disease records to be sent to the Trial Design and Data Handling Operator as soon as they are made.

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 Moisture content determination

The following procedure must be followed:

A 105 g *sample* ( $\pm 5$ g) is placed in the drier which must be at a temperature of  $100^{\circ}\text{C} \pm 4^{\circ}\text{C}$  with the air recirculator set in the range 80-100% recirculation in order to restore the temperature to  $100^{\circ}\text{C} \pm 4^{\circ}\text{C}$  as rapidly as possible. When the temperature is restored to  $100^{\circ}\text{C} \pm 4^{\circ}\text{C}$  the air regulator is set at 80% recirculation i.e. 20% fresh hot air. The air regulator is critical for even rapid drying. The samples are dried at  $100^{\circ}\text{C} \pm 4^{\circ}\text{C}$  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.

When all samples from a given trial have been recorded, the fresh and dry weights are immediately reported to the Trials Organiser electronically using the character names given in Section D10.3. When the dry weights are reported as a percentage, the fresh weight should be reported as 100.

#### **Moisture content determination of straw samples**

Dry 300g of chopped straw (10g) at  $104 \pm 4^{\circ}\text{C}$  for 16 hrs in a circulating air oven with 80% air recycling. Cool and weigh the sample. Weights must be recorded to two decimal places. Express result as percentage dry matter in the sample. A single determination is normally performed.

### E.2.2 Oil content determination

Analysis is performed using continuous emission NMR following ISO 5511:1992. Results are expressed as apparent oil as a percentage at 9% moisture.

The stability of the equipment is checked at two-hourly intervals through the working day by the use of weighed oil standards. A single determination is normally performed on each test sample.

#### E.2.2.1 STRAW QUALITY ASSESSMENT SAMPLES

Quality samples should be dispatched immediately after collection to the appropriate test centre.

#### E.2.2.1.1 RETTING

Each sample is divided into two approximately equal parts and one part set aside should a repeat analysis is required. The other part is tied in loose bundles and a waterproof label attached.

All the samples are placed together in a fibre-glass tank filled with fresh water from a natural source (not tap-water). The samples are kept submerged and the water temperature maintained at a constant 20°C.

The samples are retted for approximately 14 days, the actual end point of retting being determined subjectively base on the ease of separation of the bire bundles from the woody pith.

All the samples are removed at the same time and air-dried either naturally or at a low temperature drier and the samples allowed to reach equilibrium moisture content of 12% to 15% during a minimum storage period of two weeks.

#### E.2.2.1.2 SCUTTING

Fibre is extracted from the straw using a sample scutcher (Model SMT 200M). The sample is placed on a conveyor belt which passes the sample between crimping rollers and into the scutching turbine. The sample is held for a fixed time of 30 seconds while one end of the sample is scutched and then is automatically reversed out of the turbine. The sample is then turned over and the other end of the sample is scutched in the same way.

The weight of the sample is recorded before and after scutching and the weight loss during scutching calculated.

#### Hackling and fibre determination

The fibres are cleaned and separated into long fibre and tow (short fibre) by hackling (combing).

The fibre is hackled by hand by passing each end of the fibre four times over large pins (3,640 pins/m<sup>2</sup>) followed by combing on smaller pins (28,016 pins/m<sup>2</sup>) four times. The weight of the hackled fibre (long fibre) and the weight of the tow collected on the pins is weighed. The percentage of tow and long fibre is then calculated as the percentage of the original dried straw weight.

If woody material remains attached to the fibre after scutching this is removed during hackling. The loss in weight from the sample during hackling therefore indicates how well retted the original material was, and may indicate differences between samples in the ease of retting of the material.

Fibre length is determined by measuring the length of 40 randomly selected fibres to the nearest millimetre.

For fibre fineness a 20cm length is cut from the middle region of a sub-sample of the long fibre. Sixty unbranched fibres are selected at random, and these are then aligned and cut to a standard 10cm length which is weighed to three decimal places. Fibre fineness is determined by calculating the weight (g) per 10,000m which is expressed as Decitex.

Fibre fineness and length tests are only carried out on the long fibre samples

# 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:

- 1) 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.
- 2) 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.1.3 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, 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.



## Appendix 1 – Approved trial organisers/ operators for flax

Activity	Organisers / Operators responsible
Trials Organiser	BSPB
Seed Handling Operator	NIAB
Trial Design and Data Handling Operator	NIAB
Pathology Trials Operator	None
Trial Inspection and Technical Validation Operator	AHDB Cereals and Oilseeds
Quality Testing Operator	NIAB
Data Review and Standard Setting Operator	NIAB

## Appendix 2 - Seed treatment products for use on NL trials

No seed treatment to be used.

# Appendix 3 – Seed despatch deadline dates

VCU seed must be delivered to NIAB by 15 December

# Appendix 4 – Growing Trial Operators and Trial locations

## 1. Growing Trial Operators/Seed Handling Operators

Flax

Growing Trial Operator	Seed Handling Operator (if not trial operator)	Location of trial
TBC		TBC

## 2. Pathology Trials Operator

Pathology Trial Operator	Location of trial
Not applicable	-

## Appendix 5 – Control varieties for VCU assessments

### Flax

Lirina

## Appendix 6 – Dates by which records should be submitted

### A. To Trials Organiser

Record	Latest date of receipt by Trials Organiser
Site data part 1 (including site sketch)	Within 2 months of drilling trial (autumn sown trials) Within 1 month of drilling trial (spring sown trials)
Site data part 2	By the time trial is harvested
Plot records (in approved electronic format)	Growing Trial Operator should notify Trials Organiser that trial has been harvested within 2 days of harvest

### B. To Data Handling Operator

Record	Date
Plot records should be sent to Data Handling Operator	Within 10 days of record being taken

### C. To Quality Testing Operator

Samples	Date
Plot samples for quality testing should be sent to the Quality Testing Operator	Within 2 days of harvest

## Appendix 7 – Growth stages of Flax

Main Growth Stage	Growth stage	Description of Growth Stage
<b>Germination and emergence</b>	0.0	Dry seed
<b>Leaf production</b>	1.0	Both cotyledons unfolded and green
<b>Leaf production</b>	1.1	First true leaf emerged
<b>Leaf production</b>	1.2	Second true leaf emerged
<b>Leaf production</b>	1.3 etc	Third true leaf emerged
<b>Stem extension</b>	2.0	No internodes (rosette)
<b>Stem extension</b>	2.5	About five internodes
<b>Flower bud development</b>	3.0	Only leaf buds present
<b>Flower bud development</b>	3.1	Flower buds present but enclosed by leaves
<b>Flower bud development</b>	3.3	Flower buds visible from above ('green bud')
<b>Flower bud development</b>	3.5	Flower buds raised above leaves
<b>Flower bud development</b>	3.6	First flower stalks extending
<b>Flower bud development</b>	3.7	First flower buds yellow ('yellow bud')
<b>Flowering</b>	4.0	First flower opened
<b>Flowering</b>	4.1	10% all buds opened
<b>Flowering</b>	4.3	30% all buds opened
<b>Flowering</b>	4.5	50% all buds opened

<b>Main Growth Stage</b>	<b>Growth stage</b>	<b>Description of Growth Stage</b>
<b>Pod development</b>	5.3	30% potential pods
<b>Pod development</b>	5.5	50% potential pods
<b>Pod development</b>	5.7	70% potential pods
<b>Pod development</b>	5.9	All potential pods
<b>Seed development</b>	6.1	Seeds expanding
<b>Seed development</b>	6.2	Most seeds translucent but full size
<b>Seed development</b>	6.3	Most seed green
<b>Seed development</b>	6.4	Most seed green-brown mottled
<b>Seed development</b>	6.5	Most seeds brown
<b>Seed development</b>	6.6	Most seed dark brown
<b>Seed development</b>	6.7	Most seed black but soft
<b>Seed development</b>	6.8	Most seed black and hard
<b>Seed development</b>	6.9	All seeds black and hard
<b>Leaf senescence</b>	7.0	No description
<b>Stem senescence</b>	8.1	Most stem green
<b>Stem senescence</b>	8.5	Half stem green
<b>Stem senescence</b>	8.9	Little stem green
<b>Pod senescence</b>	9.1	Most Pods green
<b>Pod senescence</b>	9.5	Half pods green
<b>Pod senescence</b>	9.9	Few pods green



## Appendix 8 – Assessment of linseed diseases

The following key (next page) is suitable for foliar and capsule diseases. For stem diseases such as Sclerotinia, and Verticillium an assessment of the % of stems infected per plot should be made.

### Instructions:

- 1) Examine all leaves and capsules in 3 areas of each plot.
- 2) Ignore all naturally senescent tissue.
- 3) Include all necrosis and chlorosis attributable to disease.
- 4) Estimate % infection using the descriptions below. Record the average % infection from the 3 areas. Interpolate values if necessary.

Infection	Observation on Leaves	Observation on Capsules
0	No infection observable	No infection observable
0.1	Trace of infection	Trace of infection
1	Diseased leaves with 1 small lesion; plants with a few scattered lesions	Terminal raceme with a few scattered lesions
5	Leaves appear 1/10 infected; diseased leaves with 2 lesions	Terminal raceme appears 1/10 infected; diseased capsules with 1 or 2 lesions
10	Leaves appear ¼ infected; diseased leaves with few large or many small lesions	Terminal raceme appears ¼ infected; diseased capsules with 2 or more lesions
25	Area appears ½ infected ½ green	Area appears ½ infected ½ green
50	Area appears more infected than green	Area appears more infected than green
75	Very little green tissue left	Very little green tissue left
100	Leaves/capsules dead - no green tissue left	Leaves/capsules dead - no green tissue left



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