Animal &
Plant Health
Agency

Great Britain and Northern Ireland Variety List Trials: Trial Procedures for Official Examination of Value for Cultivation and Use (VCU) Harvest 2025

Flax

January 2025

Changes since last version

- Updated title from United Kingdom to Great Britain and Northern Ireland
- Removed oil content from additional Quality characteristics of Spring Flax
- Cleaned up language in C.5.2.1
- Added C.5.2.3 for more detail on harvesting
- Added C.6.3.2 STEM YIELD AND MOISTURE CONTENT
- Removed reference to spring in C.6.3.3
- Removed E.2.2 for flax
- Removed extraneous language from F.1.3

Contents

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	**Plant yield** **Plant dry matter**	
Impact of environment	Section C	**Standing ability** **Winter tolerance**	*Plant height* *Maturity*
Resistance to harmful organisms	Section D		None routinely recorded
Quality characteristics (laboratory tests)	Section E		

Spring Flax

Type of character	Reference	Description of assessment - Obligatory	Description of assessment – Additional (Assessed only if requested by applicant.)
Yield	Section C	**Plant Yield** **Plant dry matter**	
Impact of environment	Section C	**Standing ability**	*Plant height* *Maturity*
Resistance to harmful organisms	Section D		None routinely recorded
Quality characteristics (laboratory tests)	Section E		

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

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 flax 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 should be located within a commercial crop or surrounded by buffer plots to aid management and to reduce the risk of flax flea-beetle (FFB) damage in spring flax trials. The Trials Organiser should be consulted if this proves impossible or impractical. Previous cropping must be appropriate for a 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 flax, cover crops containing linseed 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 3rd week of April or when soil temperatures reach 8ºC and conditions are conducive to

rapid and even establishment. To reduce FFB losses in flax the drilling of the trial should coincide as closely as possible with that of the host crop of flax.

Winter flax trials should ideally be drilled between early September and by mid- October.

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.

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

C.3.1 **Plot size**

C.3.1.1 The drilled plot area per variety should be not less than 6 m² 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.

C.3.2 **Plant population**

C.3.2.1 Winter Flax is sown at a seed rate of 900 to 1100 seeds m² (on poorer soils). Drilling should be from mid-September to the end of October in the South of England.

Spring flax is sown at a seed rate of 1300 seeds m² on good quality land to 1500 seeds m² on stony land. This should be drilled from late February as soon as soil and weather allows.

The distance between rows 12.5 to 17cm.Sown at a depth of 1.5 to 2.5cm.

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.

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 at a depth 1.5 – 4cm into moisture in a firm and fine seedbed.

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. For winter and spring flax a typical rate of nitrogen is to use 60-100 kg/ha (including SMN). with the majority applied in the spring.

Apply a typical rate of sulphur when the crop is actively growing (20 - 50 kg/Ha).

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 linseed 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 with good (moist) seedbed conditions and with the appropriate application technique (e.g. water volume). Approved post-emergence herbicides can be effective against annual dicotyledons.

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.

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

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

C.4.4 **Growth regulators**

Plant growth regulators should not be used on flax trials.

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 flax FFB, in particular, are likely to be a significant pest during establishment, in winter flax pigeons can be a particular problem. 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. 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 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. In winter flax *Mycosphaerella* (Pasmo) is important.

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.
Plots should be harvested when stems are fully senesced and brown.

C.5.2 **Harvesting method:**

C.5.2.1 Trials may be desiccated prior to harvesting. 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.5.2.3 The stem yield harvest is carried out on a representative area of 1 m^2within the plot. To avoid external effects, leave one meter unharvested at each end of the plot and two rows on the side.

Harvesting is done by pulling the plants and weighed. Flax procedure has a lower nitrogen input.

C.5.3 **Samples**

C.5.3.1 Samples are required from all plots for moisture determination using the oven. 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.
- Are taken from the same source.

C.5.3.3 A single sample of 50 stems should be taken in a polythene bag for dry matter.

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 or recorded. 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

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 **PLANT YIELD AND DRY MATTER CONTENT (OBLIGATORY) (kg)**

The following information must accompany the yield data:

The dry matter content % of the harvested plant, determined by oven method.

Growth stage: usually 9.9 at harvest. The Growth Stage Chart for linseed and flax is in Appendix 7.

C.6.3.3 **STANDING ABILITY from all plots (Flax - 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.6.3.4 *PLANT HEIGHT from all plots (ADDITIONAL) (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.6.3.6 *MATURITY from all plots* **(Flax -***additional***) (1-9)**

Maturity should be judged by making a visual estimate of stem 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.6.3.7 **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.6.3.12 **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.6.3.13 **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 (O*idium 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* (Pasmo 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 13th 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 **Dry matter content**

The following procedure must be followed:

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

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

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 by conductance moisture meter is not acceptable to the Testing Authority.

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.

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

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.