

NIAB/PGRO DESCRIPTIVE LIST TRIALS

PROTOCOL - SPRING LUPINS HARVEST 2008

Changes since last protocol - dated 17/03/2003

- Section 2 Distribution of trials - trials should be sited on low pH (acid) soils
- Section 3 Trial design – buffering may be required
- Section 10.1 Seed rate
 White lupins – semi-determinate 38pl/m²
 Yellow Lupins - determinate 100 pl/m²
- Section 10.2 Plot size and blocking paragraphs inserted
- Section 13.4 Plant population requirements
- Section 13.7 Standing ability description amended: This may be assessed on sequential occasions after rain but MUST be recorded at harvest time (maturity).
- Section 13.9 Fresh yield – moisture content determination
- Section 15.2 Quality samples – oil content included
- Section 15.4 Determination of oil content

Site data, plans, and trial records should be sent electronically, in the approved format, to niabstats@niab.com

27th March 2008

**UNITED KINGDOM RECOMMENDED LIST TRIALS
(England and Wales)**

PROTOCOL - SPRING LUPINS 2008

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PART I - GENERAL INFORMATION

1. ADDRESSES

Trials Organiser and Sponsor:
Processors & Growers Research Organisation
The Research Station
Great North Road
Thornhaugh
Peterborough PE8 6HJ
Tel: 01780 782585 Fax: 01780 783993

Co-ordinator:- NIAB Crops and Traits Huntingdon Road Cambridge CB3 0LE Tel. (01223) 342200 Fax (01223) 277602 Contact – Tricia Cullimore email: tricia.cullimore@niab.com Pathology contact – Jane Thomas email: Jane.thomas@niab.com	Seed Handling Unit:- NIAB Seed Handling Unit White House Lane Huntingdon Road Cambridge CB3 0LF Tel: 01223 342325 Contact - Christina Lewis email: Christina.lewis@niab.com	Park Farm:- NIAB Analytical Services Park Farm Villa Road Impington Cambridge CB24 9NZ Tel: 01223 233258 Contact – Peter Fletcher email: peter.fletcher@niab.com
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2. DISTRIBUTION OF TRIALS

To be decided annually. It is a requirement of lupin physiology that trials should be sited on low pH (acid) soils.

3. TRIAL DESIGN

Trial design will normally be a complete block design (winter lupins - normally complete block). The randomisation for each trial will be specified and produced by the Co-ordinator each year. Depending on the varieties included, blocking and buffering of maturity and growth habit types may be required.

4. REPLICATIONS

The number of replications will be three.

5. CONTROL VARIETIES

Control varieties will be specified each year by the Co-ordinator.

PART II - PROTOCOL OF THE TRIALS SYSTEM

6. GENERAL

The trials officer will be responsible for the choice of site, and for the establishment, supervision, recording and harvesting of the trial. Any decision to abandon the trial should be taken in consultation with the Co-ordinators (see address page 2).

In principle, the husbandry of the trial should be according to the best local practice.

All records should be clear and self explanatory so that the trial can be carried on “at a moment’s notice” by another officer without difficulty.

The seed has been supplied for trial purposes only, and must not be used for further multiplication unless special permission has been obtained. It is frequently supplied for testing while breeders’ rights are being established and on the condition that it is not multiplied for other purposes: it is the responsibility of the officer in charge of the trial to ensure that this does not occur.

7. LAYOUT AND RANDOMISATION OF TRIALS

Trial layouts will be generated by the Co-ordinators. They will be transferred to the appropriate trials centres in electronic format where possible. Instructions in the transfer/receipt of data electronically are available separately on request from the Co-ordinators. Where electronic transfer is not possible, Trials Officers may be sent two printed copies of the computer generated randomisations which must be updated with the following information:-

- a) ‘Trial drilled to plan’ - this will normally be the case and any deviation from the randomisation **MUST** be noted **IN RED INK**.
- b) Sowing date, recorded numerically e.g.. 28.02.03.
- c) Officer responsible with contact telephone number and address.

One copy should be retained and the other returned to the co-ordinators immediately after drilling and no later than the deadline specified in Appendix V. Send information electronically to niabstats@niab.com.

Sufficient room should be allowed around the trial and between replications to allow entry into individual plots for sequential harvesting.

8. SKETCH OF TRIAL LAYOUT

This separate sheet should be returned to the Co-ordinators immediately after drilling. On this sketch, the first and last plot number in each block should be shown. It is not necessary to show the individual plot codes or the variety names.

Please return completed randomisation sheets and trial layout sketches to the co-ordinators as soon as possible after drilling and no later than the deadline specified in Appendix VI. Send information electronically to niabstats@niab.com.

9. DESPATCH OF SEED TO TRIAL SITES

Seed including nominated controls will be despatched by the Co-ordinators and will normally have been treated with single-purpose seed treatment.

10. DRILLING

10.1 Seed rate

Seed will be provided in pre-weighed plot modules where possible. The target population will be as follows:

<i>Species</i>	<i>Type</i>	<i>Target seed ate(plants/m²)</i>
<i>White lupins</i>	<i>Semi-determinate</i>	<i>38</i>
<i>Yellow lupins</i>	<i>Semi-determinate</i>	<i>70</i>
	<i>determinate</i>	<i>100</i>
<i>Blue lupins</i>	<i>Indeterminate/semi determinate</i>	<i>70</i>
	<i>determinate</i>	<i>100</i>

To calculate optimum seedrates it is necessary to take account of germination %, seed size, target population and a field loss factor based on sowing date and soil type.

10.2 Trial layout

The harvested plot area per variety must not be less than 15 m² per replicate for trials with 4 replications and 30 m² per replicate for trials with 3 replications. Plots must be drilled to a greater length than required and cutback 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 0.45m

Determinate varieties will be blocked together within the randomisation and each block should be bordered on either side by a determinate buffer plot. The non-determinate varieties should be bordered on either side by a non-determinate buffer plot. Within the non determinate block, blue and white lupins should be blocked separately. Buffering of the blue and white types is not required.

It is essential that the plots are drilled with sufficient inter plot gap to allow sequential harvesting of individual plots.

10.3 Timing and drill selection

Spring lupins should be sown from Mid March onwards. In most situations it is preferable to delay drilling rather than force a seedbed at the risk of creating soil structure problems. Seed bed preparation should be kept to a minimum and cultivations should cross the direction of plots.

The Oyjord and Hege drills are suitable for variety trials and offer the advantages of accurately delivering a predetermined seedrate and of self-emptying. One disadvantage is the risk of blockages, particularly with large seeded varieties and at faster forward speeds. Blockages can be greatly reduced in the Oyjord by using a head adapted for large seed. Conventional drills must be calibrated for each individual variety/treatment.

11. HUSBANDRY GUIDELINES

Note: It is essential to follow the instructions on the approved label before handling, storing or using any crop protection product.

11.1 Site Selection

Lupins do not tolerate alkaline soil types and selected sites should be below pH7.0. It is particularly important to select a site with soil free from structural defects and of uniform type, depth and texture. Lower lying, wetter areas of fields should be avoided. For reasons of pests and diseases the site should not have grown peas, field beans, broad beans, dwarf beans, vetches, tares, or lupins over at least the preceding 4 years and should never be grown immediately following other legume crops.

11.2 Cultivations

Seedbed preparation should be kept to a minimum and all cultivations should cross the direction of plots. Lupins are sensitive to soil compaction and differential wheelings along plots can lead to increased error values. If soil conditions permit the plots should be rolled with soon after drilling to help conserve moisture, improve the efficacy of pre-emergence herbicides and ease of harvesting.

11.3 Herbicides

Where varietal susceptibility to herbicides is known to occur such chemicals should not be used. If in doubt, the Co-ordinators (see address page 2) should be consulted. Application must be across the direction of drilling. It is generally safer to apply pre than post-emergence.

11.4 Fungicides

A spray at early flowering is advisable to control potential anthracnose infection

11.5 Fertilisers

No nitrogenous fertiliser should be applied. Phosphorous and potash should be applied according to inherent fertility with due regard to ADAS guidelines. Applications of fertilisers and sprays should be uniform. It is normally best to apply these across the direction of the plots. Seed should be inoculated with the Rhizobium inoculant supplied.

11.6 Pest control

If the trial is in jeopardy, effective control measures e.g. netting, insecticides, molluscicides, must be applied to the whole trial. 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.

11.7 Harvesting

It is essential that harvest date is timed to the requirements of individual varieties. Failure to carry out combining at the optimum time for each individual variety is likely to bias yield results. Trials should be direct combined. Where desiccation is required it is essential that desiccation is timed to the requirements of individual varieties. Plot boundaries should be parted by hand prior to combining.

12. SITE DATA

Note: Examples of the site data sheets are given in Appendix I. Part 1 should be returned after sowing. Part 2 should be returned by harvest at the latest. Send information electronically to niabstats@niab.com.

13. PLOT RECORDS

13.1 All data should be transferred electronically; rough notes should be avoided. Plot records should be made in the approved electronic format. Details of standard variate names are given in Appendix III. The growth stage should be recorded for each observation. The correct growth stage key is given in Appendix II.

13.2 Plot numbers and variety codes should correspond to those on the computer trial plan.

13.3 Records are processed using a computer so all records should be clear and the names used should be those indicated in capital letters below. Records other than the following will be processed but not stored; please indicate the character name and clearly define the scale used.

Plot records should be made using the following scales and guidelines.

Data should be sent to the Co-ordinators as soon as records have been made and no later than the deadlines given in Appendix VI.

- 13.4 **PLANT POPULATION/RECORDED AREA*** (POP)
Only required when there is evidence of poor establishment, at a level which will affect results, plant counts should be taken soon after full emergence.

Plant counts should be taken soon after full emergence. With autumn sown beans it may be necessary to conduct a second count in the spring if winter plant loss is suspected. Two methods can be used:-

1. Take three or four random linear metre counts per plot from the middle rows. * It is important that the row width and length measured (in metres) are entered after the character name so that the number of plants per m² can be calculated.

2. Count the plants within three or four quadrats per plot. The quadrats should be 0.25m to 1m² in size. * The size used must be quoted.

Record will be converted and stored as number of plants per m².

- 13.5 **WINTER HARDINESS (1-9)** (*W HARD-winter lupins only*)

After any period of cold weather, varieties should be scored on a 1-9 scale, where 9 = no damage. (See Appendix IV).

- 13.6 **STRAW LENGTH (CM)** (*STRAW*)

Straw length should be measured on 5 or more randomly selected plants per plot after cessation of growth. The measurement should be the full length from ground level to the top of the extended main stem.

- 13.7 **STANDING ABILITY(1-9)** (*STAND*)

1 = very poor
9 = very good

This may be assessed on sequential occasions after rain but **MUST** be recorded at harvest time (maturity).

- 13.8 **RIPENING DATE** (*RIPEN*)

Ripening date is defined as the date the crop is first fit to combine. That is as soon as the lupins will thresh without damage i.e., at a moisture content of about 20-25%.

- 13.9. **FRESH YIELD (KG)** (*YLD*)

The fresh seed yield should be recorded, and returned with details of harvested plot dimensions. The moisture content % of the harvested grain, determined either by oven

or an approved electronic method. See Appendix V. A corresponding sample will be assessed for dry matter determination as described in Section 15.

Any factors which may have affected the yield of the trial or individual plots should be noted and accompany the yield data. If, within the harvested plot area, any drill rows or part of drill rows are missing, the following information should be supplied.

- i) the plot number(s) containing the missing row(s)
- ii) the length of the missing row(s)
- iii) whether the missing row is internal, or one of the two outer ones
- iv) the number of rows normally drilled
- v) the distance between the rows

13.10 **HARVEST DATE** (*HARV*)

The date on which each plot is harvested must be recorded. The date should be given numerically as day, month, year.

13.11 **SHEDDING (1-9)** (*SHED*)

- 1 = severe shedding
- 9 = no shedding

Loss of lupins due to pod shattering.

13.12 **COMBINE LOSSES %** (*COM LOSS*)

It may be necessary to assess overall losses at harvest by collecting all lost lupins in 2 x 0.5m areas across the whole plot width, selected at random. The lost produce should be weighed and the moisture content checked, if possible. This exercise is only likely to be necessary for an individual plot or plots where the losses are thought sufficient to exclude the yield data from results.

14. **DISEASE ASSESSMENT AND RECORDING**

- 14.1. The following diseases may be recorded at the discretion of the Trials Officer when differences between varieties are evident.

Anthracnose (*Colletotrichum gloeosporioides*)

Brown spot (*Pleiochetiae setosa*)

Phomopsis stem blight

Root rots

Bean yellow mosaic virus

- 14.3. Timing of assessments - the precise timing for assessment is best judged in relation to the development of disease in the trials, 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.

14.4. Assessment keys and general procedures

Trials officers should assess the % plant area affected, or the % of plants showing symptoms. Further advice may be sought from the Co-ordinators. As a general rule, foliar and pod diseases should be assessed as the % area infected, while stem or root diseases which show foliar symptoms should be assessed as the % of plants infected. Virus diseases should also be assessed in this way.

Only disease which reaches a minimum of 5% infection in any one plot should be recorded.

All replicates in the trial should be recorded.

Assessments should be made on a “whole plot” basis, i.e. make an overall assessment of the average % infection on all plants in a small (approx. 1m²) area of the plot and repeat at a *minimum* of 3 points in each plot.

Where primary foci of high infection occur, these should be averaged over the whole plot; e.g. A primary focus of 50% infection occupying 5% of the plot should be recorded as $50\% \times 5\% = 2.5\%$.

14.5. Dates for despatch of disease assessments

Disease records should be sent out the appropriate Testing Authority (as listed on page 2) ***as soon as assessments have been made***. All data must be received no later than the deadline given in Appendix VI. Data arriving after that date cannot be included in the calculation of resistance ratings.

15. TRIAL SAMPLES AND QUALITY TESTING

Samples for the assessment of quality and moisture content will be required according to the schedule distributed prior to harvest. Full instructions with the appropriate labels and bags will be sent by the Co-ordinators prior to harvest.

It is essential that all samples are truly representative of the bulk from which they are taken. Moisture samples must always be taken at the time of plot weighing.

All samples should be clearly marked outside and inside with the tear-off portions of the special labels provided.

If the samples are incomplete for any reason, the missing ones should be noted when forwarding the remainder to the appropriate testing authority.

15.1. Moisture content

This must be determined from every plot in a trial. Oven drying and moisture meter methods are both acceptable, according to the guidelines given in Appendix V.

Where not dried on site, samples (in polythene bags) should be sent to NIAB Park Farm (see address on Page 2).

15.2. Quality samples

1 kg of oven dried seed must be despatched to Seed Handling Unit at the address on page 2 for the assessment of thousand seed weight, protein content and oil content.

This 1 kg sample should be a representative sample of the bulk of the seed used for the determination of moisture content in each plot.

All samples should be despatched by the deadline specified in Appendix VI

15.3 Protein content determination.

15.3.1 Hammer milling of grain prior to analysis

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.

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 as described at 3.1.3., and blending each stage within the jar. The sample jar must be filled and then sealed with a close fitting lid.

15.3.2 Determination of Crude Protein or Total Nitrogen Content

Determination of Crude Protein or Total Nitrogen Content must be by a chemical method, recognised by competent authorities (IOB, AOAC, ISO, etc) and which makes direct measurement of nitrogen content. Acceptable methods 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. 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. Instrument drift in Dumas nitrogen should be controlled by standardisation against a suitable analytical standard (EDTA, Glycine), for which the nitrogen content is known. 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.

15.4 Determination of oil content

Total oil analysis is performed using continuous emission NMR following ISO 5511:1992. The instrument is calibrated against an appropriate lupin oil standard, results are expressed as apparent oil as a percentage at 0% 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.

APPENDIX I

Descriptive List Trials - Site Data (part 1) Including confirmation of sowing

Please e-mail this completed form to: niabstats@niab.com within two weeks of sowing.

Trial sketch: either 1) draw electronically in the separate worksheet or 2) print out the form, sketch freehand and post to the Co-ordinator.

Trial Code:

The trial code is the unique identifier used to store all data from the trial and is given on the trial plan supplied. Please quote this code in all correspondence.

Trial code (e.g. WW3CA17T) Please use the unique code given on the trial plan

Confirmation of Sowing:

Sowing date (e.g. 01.01.2003) Date Format: dd.mm.yyyy
Any amendment to the plan supplied? If yes - please return by fax a hard copy of the plan, showing amendments.

Trial Location:

County (in which the trial is situated)
Site name (town/village nearest to trial)

Trial Operator's Details:

Trials organisation (e.g. NIAB)	<input type="text"/>
Trial manager's name	<input type="text"/>
Office address 1	<input type="text"/>
Office address 2	<input type="text"/>
Office address 3	<input type="text"/>
Office address 4	<input type="text"/>
Office postcode	<input type="text"/>
Telephone number	<input type="text"/>
Mobile phone number	<input type="text"/>
FAX no.	<input type="text"/>
e-mail address	<input type="text"/>

Host Farm Details:

Farmer's name	<input type="text"/>
Farm Name / Farm company name	<input type="text"/>
Address 2	<input type="text"/>
Address 3	<input type="text"/>
Postcode	<input type="text"/>
Telephone number	<input type="text"/>
Mobile phone number	<input type="text"/>
FAX no.	<input type="text"/>
e-mail address	<input type="text"/>

Trial Site and Plot Details:

OS map ref (Letters)	<input type="text"/>	It is recommended that you use Multimap http://www.multimap.co.uk to find or check the grid reference. See notes in appendix 2.
East (3 figs)	<input type="text"/>	
North (3 figs)	<input type="text"/>	
Altitude (metres)	<input type="text"/>	
Plot length sown (metres)	<input type="text"/>	Plot centre to plot centre
Plot width (metres)	<input type="text"/>	
Inter-row measurement (metres)	<input type="text"/>	
Number of rows	<input type="text"/>	

Cropping History:

Previous crop ▼

2 years ago ▼

3 years ago ▼ Optional for cereals

4 years ago ▼ Optional for cereals

5 years ago ▼ Optional for cereals

How long since a grass ley was grown on the site? _____ ▼

Approx. how many applications of animal manure have been applied in the last 5 years? ▼

Soil Classification:

Soil type ▼ (See Appendix 1 for descriptions)

Soil series name (e.g. Andover series)

Trial Sketch: see separate worksheet

This form is designed for use in MS Excel Versions 97, 2000, 2002. If you have a different version and encounter difficulties, please contact the Trial Co-ordinator.

Note 1:

Classification of soils

Definitions comply as closely as possible with those in DEFRA Reference Book 209.

Light sand soils: Soils which are sand, loamy sand or sandy loam to 40 cm depth and are sand or loamy sand between 40 and 80 cm, or over sandstone rock.

Shallow soils: Soils over chalk, limestone or other rock where the parent material is within 40 cm of the soil surface. Sandy soils developed over sandstone rock should be regarded as light sand soils.

Medium soils: Medium textured mineral soils that do not fall into any other soil category.

Deep clay soils: Soils with predominantly sandy clay loam, silty clay loam, clay loam, sandy clay, silty clay or clay topsoil overlying clay subsoil. Deep clay soils normally need artificial field drainage.

Deep fertile silty soils: Soils of sandy silt loam, silt loam to silty clay loam textures to 100 cm depth or more. Silt soils formed on marine alluvium, warp soils (formed on river alluvium) and brickearth soils (formed on wind blown material) will be in this category.

Organic soils: Soils that are predominantly mineral with between 6 and 20% organic matter. These can be distinguished by darker colouring that stains the fingers black or grey and gives the soil a silty feel.

Note 2:

Using 'Multimap' to find or check your OS grid reference

<http://www.multimap.co.uk>

At the home page, within the 'Quicksearch' facility for Great Britain, type into the 'GB postcode or place' box your two-letter and six-figure OS reference and press return. The Multimap facility should show that area in which the trial is located. Use the pick list box beneath to select an appropriate scale. If your OS reference is accurate, the map downloaded should show a detailed map of the locality with a red circle showing the location of the trial. If the circle is not in the correct place, use the cursor to point to the trial and left-click on it. Multimap should then relocate the circle. The correct OS reference will then be showed in the map information box underneath the map. You may save the map as a .GIF file by right-clicking on the map and select 'Save picture as' This file can then be printed out and faxed or (preferably) sent electronically with the site data file.

Pesticide applications (e.g. herbicide, fungicide, plant growth regulator, insecticide):

Fungicides:

Have fungicides been applied to the trial?
(Either overall or to T component of split plot / split lattice trials)

Plant Growth Regulators (PGR):

TREATED:

Have PGRs been applied, either overall to a T trial or to the T component of a split plot / split lattice trial?

UNTREATED:

Have PGRs been applied, either overall to a U trial or to the U component of a split plot / split lattice trial?

If fungicides or PGRs are required on this trial but either 1) have not been applied to protocol, or 2) have been applied to protocol but with problems please explain below. Detail any problems with poor disease or lodging control. Also use the area below to record details (product, rate, date applied and growth stage) of all agrochemicals applied.

Please provide any comments below

Rainfall & Irrigation:

Total monthly rainfall total for the *site*.

Sep-02	<input type="text"/>	millimetres
Oct-02	<input type="text"/>	millimetres
Nov-02	<input type="text"/>	millimetres
Dec-02	<input type="text"/>	millimetres
Jan-03	<input type="text"/>	millimetres
Feb-03	<input type="text"/>	millimetres
Mar-03	<input type="text"/>	millimetres
Apr-03	<input type="text"/>	millimetres
May-03	<input type="text"/>	millimetres
Jun-03	<input type="text"/>	millimetres
Jul-03	<input type="text"/>	millimetres
Aug-03	<input type="text"/>	millimetres
Sep-03	<input type="text"/>	millimetres
Oct-03	<input type="text"/>	millimetres

Distance of rain recorder from trial field:

Has irrigation been applied to the trial?

APPENDIX II

GROWTH STAGES OF LUPINS

	<u>Code</u>	<u>Definition</u>
<u>Germination</u>	0.0	Dry seed
<u>and</u>	0.1	Imbibed seed
<u>Emergence</u>	0.3	Radicle apparent
	0.5	Germination (Radicle 5mm long)
	0.7	Hypocotyl protruding through the seed coat
	0.9	Emergence
<u>Leaf</u>	1.0	First pair of leaves protruding beyond upright cotyledons
<u>Emergence</u>	1.1	1 leaf emerged from bud
	1.2	2 leaves emerged from bud
	1.3	3 leaves emerged from bud
	1.n	n leaves emerged from bud
<u>Stem</u>	2.1	Little separation between bases of leaves
<u>Elongation</u>	2.3	Bases of some basal leaves clearly separated
	2.5	Bases of several leaves clearly separated from each other
	2.7	Inflorescence bud clearly visible
	2.9	Inflorescence bud clearly separated from base of highest leaf
<u>Flowering</u>	3.0	Bracts completely hiding corolla
	3.1	Pointed bud stage
	3.4	Open flower stage
	3.5	Coloured corolla stage
	3.7	Senescent corolla stage
	3.9	Pod set
<u>Pod</u>	4.0	Young, green pod. No septa between seeds, seeds abutting.
<u>Ripening</u>	4.1	Young, green pod. No septa between seeds, seeds separating.
	4.2	Green pod, slight bulging of walls, seeds filling 50% of space between septa.
	4.3	Seeds filling 75% of space between septa.
	4.5	Green pod, septa split.
	4.7	Pod turning khaki coloured.
	4.9	Pod pale reddish-brown and wrinkled
<u>Seed</u>	5.0	Seed small, dark green, with watery contents
<u>Ripening</u>	5.3	Seed large, green, little watery contents.
	5.5	Seeds large, light green to pale greyish-blue coat, green cotyledons.
	5.7	Seeds large and soft, pale fawn coat, yellow to golden orange cotyledons.
	5.8	Seed hard but dentable.
	5.9	Seeds hard and ripe for harvest.

Adapted from Lupin Development Guide (Dracup/ Kirby 1996) University of Western Australia Press

APPENDIX III

STANDARD VARIATE NAMES

(File found in /vtab/measures/measures.ce)

*ABBREVIATION	FULL MEASURE NAME
%MOI	%MOISTURE CONTENT
BIRD DAM	BIRD DAMAGE(1-9)
BOT	BOTRYTIS%
BRACK	BRACKLING%
BRUST	BROWN RUST%
BRUSTFL	BROWN RUST%(FLAG)
BRUSTL2	BROWN RUST%(L2)
BRUSTL3	BROWN RUST%(L3)
BRUSTL4	BROWN RUST%(L4)
BYDV	BYDV%
BYMV	BYMV(0-5)
C SPOT	CHOCOLATE SPOT%
COM LOSS	COMBINE LOSSES%
C RUST	CROWN RUST%
DATEGS30	DATE WHEN GS 30 REACHED
DATEGS31	DATE WHEN GS 31 REACHED
DATEGS39	DATE WHEN GS 39 REACHED
DATEGS61	DATE WHEN GS 61 REACHED
D MILD	DOWNY MILDEW%
DRY WT	DRY SAMPLE WT
EARMC1	EAR DRY MATTER% AT GS87
EARMC2	EAR DRY MATTER% AT GS87+7 DAYS
EARMC3	EAR DRY MATTER% AT GS91
EGCOVER	EARLY GROUND COVER(1-9)
E LOSS	EAR LOSS(1-9)
ELOSS SQM	EAR LOSS PER SQM
COM EASE	EASE OF COMBINING(1-9)
EMERG	EMERGENCE DATE
FLOWER	FLOWERING DATE
FLEMERGE	50% FLAG LEAF EMERGENCE DATE
L2EMERGE	50% LEAF 2 EMERGENCE DATE
L3EMERGE	50% LEAF 3 EMERGENCE DATE
L4EMERGE	50% LEAF 4 EMERGENCE DATE
FROT	FOOT ROT%
FRESH WT	FRESH SAMPLE WT
YLD	FRESH YIELD
FUS EAR	FUSARIUM EAR%

GLA	GREEN LEAF AREA%
GLAFL	GREEN LEAF AREA%(FLAG)
GLAL2	GREEN LEAF AREA%(L2)
GLAL3	GREEN LEAF AREA%(L3)
GLAL4	GREEN LEAF AREA%(L4)
HABIT	GROWTH HABIT(1-9)
HARV	HARVEST DATE
POD	HEIGHT TO FIRST POD(CM)
LGCOVER	LATE GROUND COVER(1-9)
LP SPOT	LEAF AND POD SPOT%(ASC)
LEAN	LEANING%
LODG	LODGING%
RLODG	ROOT LODGING%
SLODG	STEM LODGING%
MILD	MILDEW%
MILDFL	MILDEW%(FLAG)
MILDL2	MILDEW%(L2)
MILDL3	MILDEW%(L3)
MILDL4	MILDEW%(L4)
MC%(PROBE)	MOISTURE CONTENT%(PROBE)
MYCO	MYCOSPHAERELLA%
NECK%	NECKING%
N BLOTCH	NET BLOTCH%
N BLOTCHFL	NET BLOTCH%(FLAG)
N BLOTCHL2	NET BLOTCH%(L2)
N BLOTCHL3	NET BLOTCH%(L3)
N BLOTCHL4	NET BLOTCH%(L4)
POP	PLANT POP/RECORDED AREA
P LEN	PLOT LENGTH
P WID	PLOT WIDTH
PWEED	PLOT WEEDINESS(1-9)
RHYNCH	RHYNCHOSPORIUM%
RHYNCH EAR	RHYNCHO.% ON EAR
RHYNCHFL	RHYNCHOSPORIUM%(FLAG)
RHYNCHL2	RHYNCHOSPORIUM%(L2)
RHYNCHL3	RHYNCHOSPORIUM%(L3)
RHYNCHL4	RHYNCHOSPORIUM%(L4)
RIPEN	RIPENING DATE
BEAN RUST	RUST%
SEP EAR	SEPTORIA NODORUM EAR%
SEP NOD	SEPTORIA NODORUM%
SEP NODFL	SEPTORIA NODORUM%(FLAG)
SEP NODL2	SEPTORIA NODORUM%(L2)
SEP NODL3	SEPTORIA NODORUM%(L3)
SEP NODL4	SEPTORIA NODORUM%(L4)
SEP SPP	SEPTORIA SPP%

SEP TRIT	SEPTORIA TRITICI%
SEP TRITFL	SEPTORIA TRITICI%(FLAG)
SEP TRITL2	SEPTORIA TRITICI%(L2)
SEP TRITL3	SEPTORIA TRITICI%(L3)
SEP TRITL4	SEPTORIA TRITICI%(L4)
SHED	SHEDDING(1-9)
SPROUT	SPROUTING%
STAND	STANDING ABILITY(1-9)
STRAW	STRAW LENGTH(CM)
TILL/FERT	MEAN NO.FERTILE EARS/PLANT
TILL/PLT	MEAN NO.TILLERS/PLANT
TRAY WT	TRAY WEIGHT
VIRUS	VIRUS%
WEEDSUPP	WEED SUPPRESSION(1-9)
WILT	WILT%
WHEAD	%WHITEHEADS WHOLE PLOTS
WHHEADS	%WHITEHEADS STEM-BASE SAMPLES
W HARD	WINTER HARDINESS(1-9)
WMV	SBWMV%
YRUST	YELLOW RUST%
YRUSTFL	YELLOW RUST%(FLAG)
YRUSTL2	YELLOW RUST%(L2)
YRUSTL3	YELLOW RUST%(L3)
YRUSTL4	YELLOW RUST%(L4)

The abbreviated measures are for use with the database only.

APPENDIX IV

WINTER HARDINESS ASSESSMENT KEY

Winter lupins only. This is scored on a 1-9 scale. A high figure shows good winter hardiness

1. Total loss of plant
2. Very severe leaf damage, up to 75% loss of plants
3. Very severe leaf damage, up to 50% loss of plants
4. Severe leaf damage, severe leaf loss, up to 25% loss of plants estimated
5. Severe leaf damage, loss of lower leaves and slight loss of plants
6. Severe leaf scorch, loss of lower leaves
7. Moderate leaf scorch
8. Slight to very slight leaf scorch
9. No damage

APPENDIX V

MOISTURE CONTENT DETERMINATION FOR YIELD

Moisture content % of harvested material enables yield at 15% moisture content to be calculated.

This can be determined by either of two methods.

1. The Oven Method. Here the sealed sample taken at harvest is dried in an oven until no more moisture can be removed. The dried weight is then recorded and by comparison with the pre-dried sample weight, moisture content can be calculated.
2. Harvesting and conditioning of each plot and then reweighing and measuring moisture content electronically.

OVEN METHOD

The following procedure must be followed:

1. A fully representative sub-sample of approx 500 grams is weighed to 1 decimal place and then 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 regulator is critical for 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.
2. 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.
3. ***When all samples from a given trial have been recorded, the moisture content % must be immediately sent to the Co-ordinator.*** Send information electronically to niabstats@niab.com.
4. Where not dried on site, samples (in polythene bags) should be sent to NIAB Park Farm (see address on Page 2).

CONDITIONING & ELECTRONIC MOISTURE METER METHOD

Conditioning

1. Each plot must be harvested and the entire produce put into clean sacks or other suitable containers, labelled and sealed. The grain parcels should then be dried using a cold/warm air drier where the drying temperature is not in excess of 60°C .
2. The grain should be dried for such time as is necessary to reach equilibrium with their surroundings. The parcels should then be weighed and the moisture content recorded

using an appropriate electronic moisture meter as set out below. The moisture content after drying must not exceed 17%.

3. The Trials Operator returns the weight and moisture content to the Data Handling Operator.

Moisture Meters

1. Principles

Moisture meters may only be used for the measurement of grain moisture below 17%. There are no restrictions on the make or model of moisture analyser that may be used, provided the conditions described below are met.

The manufacturer's recommendations for use must be followed. On-combine analysis is not approved, as currently no model is sufficiently accurate over the likely range of moisture contents.

2. Equipment

The analysing equipment must:

- Be calibrated at least once annually for each crop according to the manufacturer's instructions using check samples (see reference below) and have a moisture content accuracy of plus/minus 0.5%. The calibration data should be retained for a minimum of 1 year.
- Be serviced regularly, especially just prior to harvest, according to manufacturer recommendations. The action taken should be documented and the information held for a minimum of 1 year.
- Be fit for use in accordance with manufacturer instructions. It should have an adequate power supply throughout operation. Instructions should be held with the machine and all operators adequately trained in its operation.

3. *Measuring moisture in conditioned grain*

- The grain samples to be analysed must be between 12 to 17% moisture content.
- The grain to be analysed must be fully ripe. In other cases, the samples for the oven method should be used.
- The data must be in the form of moisture content %.

References: BS 4317-24:1990, ISO 7700/1-1984 Methods of test for cereals and pulses.

Method of checking the calibration of moisture meters for cereals.

APPENDIX VI

DEADLINES FOR RECEIPT OF DATA BY THE CO-ORDINATORS

Please note that all data should be submitted to the Co-ordinators as soon as records have been made. Failure to submit data by these deadlines may constitute a breach of contract.

Data	Deadline
Returned trial randomisation (as drilled) showing sowing date and any changes to the randomisation as supplied	1 week after sowing date
Sketch of trial layout	As above
Site data part 1	28 June
Site data part 2	Final spray application or within 5 days of the harvest of the trial.
Agronomic and disease data:- (excluding yield)	disease 20 August agronomic 1 October *
Yield	Ideally within 2-3 days of harvest, and no later than 7 days after harvest.
Quality samples:- If called for	Within 7 days of being called for

* The Co-ordinators should be consulted where data cannot be submitted by this date due to the lateness of ripening of the crop.

Send information electronically to niabstats@niab.com.

See Section 15 for details of sample despatch.

APPENDIX VII

RECOMMENDED LIST TRIALS PROTOCOL - SPRING LUPINS 2008

CHECKLIST FOR TRIALS OFFICERS

1. Site selection and drilling

Return plan electronically to Testing Authorities, with sowing date. Return sketch showing layout of trials. Send information electronically to niabstats@niab.com.

2. Site data

Return site data part I after sowing and part II after the last application. Send information electronically to niabstats@niab.com.

3. Plot records

Return all plot records electronically as soon as they are taken. Send information electronically to niabstats@niab.com.

Character

Plant population

Winter hardiness

(Winter lupins only)

Standing ability (1-9)

Straw length (cms)

Bird damage

Ripening date

Harvest date

Shedding

Combine losses

Pests and Diseases

When to record

When emergence complete.

7-10 days after significant cold spell. It may be necessary to repeat this score. If no effects are noted a nil return should be completed at the end of winter.

More than one record may be required if successive increases in lodging observed.

After flowering has finished.

As appropriate.

The date the crop is first fit to combine.

At harvest.

At or after harvest.

At or after harvest.

As necessary.

4. Harvest

Send yields and outstanding records as soon as possible after harvest (see deadlines in Appendix VI). Send information electronically to niabstats@niab.com.

Quality samples should be dispatched to NIAB Park Farm. Notification of sample dispatch should be emailed to the Co-ordinator.

5. NIAB contacts

Co-ordinator:- NIAB Crops and Traits Huntingdon Road Cambridge CB3 0LE Tel. (01223) 342200 Fax (01223) 277602 Contact – Tricia Cullimore email: tricia.cullimore@niab.com Pathology contact – Jane Thomas email: Jane.thomas@niab.com	Seed Handling Unit:- NIAB Seed Handling Unit White House Lane Huntingdon Road Cambridge CB3 0LF Tel: 01223 342325 Contact - Christina Lewis email: Christina.lewis@niab.com	Park Farm:- NIAB Analytical Services Park Farm Villa Road Impington Cambridge CB24 9NZ Tel: 01223 233258 Contact – Peter Fletcher email: peter.fletcher@niab.com
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