UNITED KINGDOM NATIONAL LIST/ PLANT BREEDERS RIGHTS TECHNICAL PROTOCOL FOR
THE OFFICIAL EXAMINATION OF DISTINCTNESS, UNIFORMITY AND STABILITY (DUS)

POTATO
(Solanum tuberosum L.)

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SECTION A - GENERAL INFORMATION

1. PURPOSE

1.1 This Protocol sets out the procedures for conducting tests and assessments in relation to official examinations of DUS, maintenance of reference stocks and verification of VCU submissions of varieties of potato entered for National List (NL) Trials and Plant Breeders’ Rights (PBR).

2. SCOPE

2.1 These procedures apply to all varieties of potato. Special procedures and responsibilities for Genetically Modified (GM) varieties are set out in Sections A5 and A6.

2.2 Only National List candidates, Plant Breeders’ Rights candidates, candidates for other EU Authorities and the reference varieties may be incorporated in the DUS tests, except where specified in this protocol or authorised by APHA Varieties and Seeds.

3. RESPONSIBILITIES

3.1 The growing tests and assessments in this protocol are conducted under the responsibility of the Secretary of State for Environment, Food and Rural Affairs, Scottish Ministers, Welsh Ministers and the Northern Ireland Assembly (the National Authorities).

3.2 They are supervised, on behalf of the National Authorities, by officials of the Testing Authorities, that is the Animal and Plant Health Agency (APHA), the Scottish Government Directorate for Agriculture and the Rural Economy (SGDARE), the Department of Agriculture, Environment and Rural Affairs (DAERA) and the Welsh Government (WG).

3.3 This protocol is authorised by the Plant Variety and Seeds Committee (PVSC). It cannot be amended without their approval. Requests and suggestions for amendment of the protocol should be put in writing to APHA Varieties and Seeds, either directly or via the Test Centre.

3.4 The procedures are administered by:

Varieties and Seeds
The Animal and Plant Health Agency
Eastbrook
Shaftesbury Road
Cambridge Tel No 02080 265993
CB2 8DR Fax No 02084 152504

3.5 Test Centre

The DUS growing tests and assessments in this protocol are co-ordinated and carried out by the:

Variety Testing Unit
SASA
Roddingley Road
EDINBURGH Tel. No 0131 244 8961
EH12 9FJ Fax. No 0131 244 8940

The Test Centre is responsible for providing the appropriate facilities.
4. NON COMPLIANCE WITH THE PROTOCOL

4.1 Where the protocol uses the word “must” for any action, then failure to carry out this action will result in non-compliance. Where non-compliance occurs or there are concerns regarding the validity of any data or tests, this must be reported to APHA. Where this protocol uses the word “should” for any action this is the method to be followed, unless there are clear reasons not to do so which can be justified by the Test Centre as technically sound.

5. RESPONSIBILITY FOR GM RELEASES

5.1 GM Release Consent Holders are responsible for GM releases. All parties involved in DUS work operating under a GM Release Consent must adhere to the instructions of the Release Consent Holder where necessary, to comply with the relevant consent conditions. Where DUS protocol non-compliance occurs, this must be reported to the consent holder and the Test Centre who will notify APHA.

6. PROCEDURES FOR GM VARIETIES

6.1 Applicants intending to enter GM candidates must consult APHA, well in advance of their application, about specific requirements under GM regulations.

6.2 The Test Centre must ensure that no test or trial sites are planted with GM candidates and/or varieties until APHA has given the specific clearances.

7. ASSOCIATED DOCUMENTS

7.1 The following documents are associated with this protocol

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potatoes VCU Protocol</td>
<td>United Kingdom National List Trials: Protocol and Procedures for Examining the Value for Cultivation and Use (VCU) of Potatoes</td>
</tr>
<tr>
<td>UPOV TG/1/3</td>
<td>General Introduction to the Examination of Distinctness, Uniformity and Stability and the development of Harmonised Descriptions of New Varieties of Plants. 9.4.2002</td>
</tr>
<tr>
<td>CPVO TP/23/3</td>
<td>CPVO Technical Protocol for Distinctness, Uniformity and Stability Tests – Potato (Solanum tuberosum L.) 15.3.2017</td>
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<tr>
<td>UPOV TG/23/6</td>
<td>Guidelines for the Conduct of Tests for Distinctness, Uniformity and Stability, Potato. 31.3.2004</td>
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<tr>
<td>UPOV TGP/8/2</td>
<td>Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability. 16.10.2014</td>
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<tr>
<td>UPOV TGP/9/2</td>
<td>Examining Distinctness. 11.4.2008</td>
</tr>
<tr>
<td>UPOV TGP/10/1</td>
<td>Examining Uniformity. 30.10.2008</td>
</tr>
</tbody>
</table>
SECTION B - APPLICATION REQUIREMENTS

1. PURPOSE

1.1 The purpose of this section is to identify the specific requirements for National List and Plant Breeders’ Rights applications.

2. SCOPE

2.1 These procedures apply to all applications.

3. RESPONSIBILITIES

3.1 The applicants are responsible for ensuring that these procedures are complied with.

4. RECEIPT OF APPLICATIONS

4.1 The latest date for receipt of applications for acceptance of a variety onto the National List or for Plant Breeders’ Rights, which is set administratively by APHA, is 15 December. Applications received after this date may be considered for inclusion in the current year’s tests and trials on a case by case basis.


4.3 Applicants should notify APHA of special DUS characteristics which may require additional examinations. These claims should, in addition, be noted in the TQ accompanying the application.

5. RECEIPT OF SEED

5.1 The latest date for receipt of seed is 15 January and is set administratively by APHA. Acceptance of seed after this date will be determined by APHA in consultation with the Test Centre. Instructions for the delivery of seed will be made available to applicants by APHA.

6. SEED QUALITY REQUIREMENTS

6.1 The seed must satisfy the quality requirements for basic category seed potatoes as laid down in The Seed Potatoes (Scotland) Regulations 2000 and The Seed Potatoes (Scotland) Amendment Regulations 2005.

6.2 Seed tubers must be derived, in the UK, from seed crops which satisfy the conditions for Approved Stock as set out by SASA (Potato Branch, SASA, Roddinglaw Road, Edinburgh EH12 9FJ), Defra and NAW (Plant Health Division, Foss House, Kings Pool, 1-2 Peasholme Green, York YO1 7PX), and DAERA (Plant Health and Crop Certification, Room 1019, Dundonald House, Belfast BT4 3SP). Seed tubers from elsewhere in the European Community (EC) must have satisfied equivalent conditions.

6.3 Seed tubers must be size graded 30mm x 50mm, be in sound condition, be substantially free from soil and not be visibly unfit for planting by reason of mechanical damage, attack by pest, disease or any other condition which would impair subsequent growth.

6.4 Seed tubers must not have been chemically treated and must be delivered in new sacks or other new containers.
7. **SEED QUANTITY**

7.1 The number of tubers required for DUS testing each year is a minimum of 120 tubers. If a variety is submitted for PBR and NL testing, the number of tubers required is 600 each year. In the event of deterioration of seed prior to planting, replacement tubers may be acceptable provided that they are from the same stock, and will, in the opinion of the Test Centre, not affect the assessments.

8. **LABELLING REQUIREMENTS, INCLUDING PROVISIONS FOR GM VARIETIES**

8.1 Seed tubers submitted for trials should be from seed stocks grown in the European Community and should be accompanied by an EC passport. Each package or container holding the seed tubers submitted for trials should be sealed by part of the plant passport/label.

8.2 Applicants wishing to submit varieties which have been propagated within the EC and which do not meet the requirements for the issue of a plant passport may apply for an import licence under Article 30 of the Plant Health (Great Britain) Order 1993. Any import licence granted will be subject to conditions and a copy must accompany the seed tubers.

8.3 Applicants wishing to submit varieties which have been bred outside the EC must initially apply for a licence under the Plant Health (Great Britain) Order 1993 to bring a restricted number of tubers through quarantine. Only the produce of these tubers further multiplied in the EC will be eligible for tests and trials.

8.4 All packages of GM material must be clearly labelled as “GMO” or “Genetically Modified Organism”.
SECTION C – GROWING TEST PROCEDURES

1. PURPOSE

1.1 The purpose of this section is to provide details of the procedures used in the growing tests for DUS analysis.

2. SCOPE

2.1 These procedures apply to all varieties of potato.

3. RESPONSIBILITIES

3.1 The Test Centre is responsible for conducting these procedures.

3.2 The Test Centre will be responsible for ensuring that material supplied to them is not used for any purpose other than the conduct of these procedures, the release of reference samples for authorised purposes. (See Section E7) or the production of seed potato nuclear stock, if authorised by the breeder or agent.

4. REFERENCE VARIETIES

4.1 The principles governing the selection of reference varieties are set out in Appendix 1.

4.2 Seed of reference varieties will be supplied by the Test Centre.

5. DESIGN OF TESTS

5.1 Tests are normally conducted over 2 years but a third year test may be conducted if further evidence is required.

5.2 Sprout Test

Sprout characteristics are assessed following a procedure similar to that described by A Howing, R. Suk & B. Ros (1986. *Acta Horticulturae* 182: 359-363). In February or early March, tubers are mounted, rose end uppermost, on pins under a very low light intensity (small incandescent light bulbs, approx 6 volt, 0.05 amp). There are a minimum of 5 replications for each variety. After c.12 weeks incubation at 20°C, the characteristics 1 to 11 listed in Section D 5.1 and as described in Appendix 2 are recorded in comparison with the example varieties.

5.3 Growing Test

5.3.1 The Test Centre is responsible for selecting a suitable site which should be on ground that has normally not had a potato crop in the previous five years but the interval may be less where the risk is negligible.

5.3.2 Field husbandry should follow best local practice for all operations and particularly as regards cultivation, drilling, fertiliser and spray application, use of irrigation, and control of pests and diseases.

5.3.3 Test varieties will be planted in plots, each containing a minimum of 40 plants. There will be 2 replications of which one may also be used for VCU purposes. In this latter replication, the varieties will be planted according to VCU maturity group i.e. first early or second early and maincrop. In the other replication, varieties will be planted according to 5 DUS maturity groups: very early, early, medium, late and very late. Varieties will be randomised within each maturity replication.

5.3.4 Seed tubers should be spaced 25 to 35 cm apart for very early varieties and 30 to 40 cm apart for all other maturity groups.
5.3.5 The candidate varieties may be grown in a single row plots for comparison with very similar varieties, particularly if these are identified.

6. RECORDS AND RECORDING

6.1 All records and plot data should be in a form determined and validated by the Test Centre.

6.2 Characters, recording details and instructions are given in Section D. Any variant and abnormal plants or plants resulting from an adverse reaction to husbandry practice are recorded but excluded from the sample. Diseased plants will also be excluded.

6.3 In the first recording year, characters, as indicated in Section D 5.1, are assessed on all candidate varieties and the data analysed to determine the most similar reference varieties. (For details see Section G).

6.4 In the second recording year, characters, as indicated in Section D 5.1, are assessed on all candidate varieties and the data analysed and, together with those from the first year, used to determine the distinctness of a candidate variety. (For details see Section G). Uniformity and stability are determined visually over 2 years.

6.5 If the Test Centre notices unusual or novel characters in a candidate variety, a note and a photographic record may be made at any time.

7. COMMUNICATIONS WITH THE APPLICANT

7.1 The Test Centre will notify the applicant or his agent of any DUS problems at the earliest practical opportunity through interim (1 year) reports. All such notifications must be copied to APHA.

7.2 If considerations of confidentiality allow, the applicant should be informed which variety is similar to his own and be invited to submit any information which may help to distinguish them.

7.3 If DUS problems arise, applicants will be invited to visit the DUS tests by arrangement so that the material can be examined and discussions held with the Test Centre.

7.4 After each recording season, the results may, if necessary, be summarised and reported to the applicant and APHA by the Test Centre.
1. PURPOSE
1.1 The purpose of this section is to summarise the characteristics to be assessed.

2. SCOPE
2.1 This section summarises characteristics, states of expression, method of observation and standards required for DUS assessment.

3. RESPONSIBILITIES
3.1 The Test Centre is responsible for co-ordinating the procedures in this summary.

4. ORGANISATION
4.1 The minimum duration of tests to assess characteristics should normally be two growing periods. Shorter periods may be applied for assessment of additional characteristics. Additional growing periods may be approved by the UK National List and Seeds Committee.

5. DUS CHARACTERISTICS TO BE ASSESSED
5.1 Routine Characteristics

The following table summarises the DUS characteristics to be routinely examined. Notes and instructions on recording the characteristics are provided at Appendix 2 and referenced in Tables as follows: a) = Sprout, b) = Plant Foliage, c) Buds, Inflorescences, Flowers and d) = Tuber.

All characteristics, other than 34 Plant: time of maturity, are recorded by visual assessment by a single observation of a group of plants or parts of plants (VG). Character 34 is recorded by measurement of a group of plants or plant parts (MG).

For each characteristic, a state of expression other than those listed can be recorded where it is clear that the characteristic is on a continuous scale. For example, character 1 gives 3 example states but states between these examples and at either end are possible and should be recorded.

Note: * denotes a characteristic which must be examined according to Commission Directive 2003/90/EC, the CPVO protocol and/or UPOV Guidelines.

G denotes a UPOV grouping characteristic.

All UK characteristics may be used in the variety description.

QN indicates a qualitative character i.e. the range of variation is continuously expressed in one dimension. States of expression are primarily for descriptive purposes and not for distinctness.

PQ indicates a pseudo-qualitative character i.e. the range of variation is at least partly continuous, but is expressed in more than one dimension.
### A. SPROUTS

<table>
<thead>
<tr>
<th>CPVO TP/23/3</th>
<th>UPOV TG/23/6</th>
<th>UK</th>
<th>Character Description</th>
<th>Optimal Stage for Assessment</th>
<th>State of Expression</th>
<th>Example Varieties (UK options in italics)</th>
<th>Available number of states</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>Lightsprout: size</td>
<td>After 12 weeks incubation</td>
<td>3=Small</td>
<td>Grata, Laura, <em>Golden Wonder</em> Diamant, Victoria Gloria, <em>Solist</em></td>
<td>9 states</td>
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<tr>
<td></td>
<td></td>
<td>a)</td>
<td></td>
<td></td>
<td>5=Medium</td>
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<td></td>
<td>7=Large</td>
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<td></td>
<td>a)</td>
<td></td>
<td></td>
<td>2=Ovoid</td>
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<td></td>
<td>3=Conical</td>
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<td>4=Broad cylindrical, 5=Narrow cylindrical.</td>
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<td>a)</td>
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<td>3=Weak</td>
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<td></td>
<td>9=Very strong</td>
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<tr>
<td>4*</td>
<td>G</td>
<td>4</td>
<td>Lightsprout: proportion of blue in anthocyanin colouration of base</td>
<td>After 12 weeks incubation</td>
<td>1=Absent or low</td>
<td><em>Arielle, Desiree, Solist, Victoria Abbot, Pamina</em> <em>Agria, Avano, Record</em></td>
<td>9 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a)</td>
<td></td>
<td></td>
<td>2=Medium</td>
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<td></td>
<td>3=High</td>
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<td>5*</td>
<td>5</td>
<td>5</td>
<td>Lightsprout: pubescence of base</td>
<td>After 12 weeks incubation</td>
<td>1=Absent or very weak</td>
<td><em>Valfi, Croft Goldmarie, Pentland Dell</em> <em>Albatros, Laura, Maris Piper</em> <em>Abbot</em> <em>Oxania, Dunluce</em></td>
<td>9 states</td>
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<td></td>
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<td>a)</td>
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<td>3=Weak</td>
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<td>9=Very strong</td>
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<td>6*</td>
<td>6</td>
<td>6</td>
<td>Lightsprout: size of tip in relation to base</td>
<td>After 12 weeks incubation</td>
<td>3= Small</td>
<td><em>Laura, Estima Albatros, King Edward, Ukama Abbot, Erntestolz, Dunbar Standard</em></td>
<td>9 states</td>
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<td>a)</td>
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<td>5=Medium</td>
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<td>7=Large</td>
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<td>7*</td>
<td>7</td>
<td>7</td>
<td>Lightsprout: habit of tip</td>
<td>After 10 weeks incubation</td>
<td>1=Closed</td>
<td><em>Laura, Estima Arielle, Rita, Catriona Diamant, Solist, Arran Pilot</em></td>
<td>5 states</td>
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<tr>
<td></td>
<td></td>
<td>a)</td>
<td></td>
<td></td>
<td>3=Intermediate</td>
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<td>5=Open</td>
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<td>8*</td>
<td>8</td>
<td>8</td>
<td>Lightsprout: anthocyanin colouration of tip</td>
<td>After 12 weeks incubation</td>
<td>1=Absent or very weak</td>
<td>*Estima, Innovator Solist Laura, <em>Spunta Agria, Montana Valfi</em></td>
<td>9 states</td>
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<td>9=Very strong</td>
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<td>9*</td>
<td>9</td>
<td>9</td>
<td>Lightsprout: pubescence of tip</td>
<td>After 12 weeks incubation</td>
<td>1=Absent or very weak</td>
<td><em>Goldmarie, Maris Piper Laura, Valfi Albatros Abbot</em> Camilla</td>
<td>9 states</td>
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<td></td>
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<td>a)</td>
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<td>3=Weak</td>
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<td>CPVO TP/23/3</td>
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<td>UK</td>
<td>Character</td>
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<tr>
<td>10* 10*</td>
<td>10 a) QN</td>
<td></td>
<td>Lightsprout: number of root tips</td>
<td>After 12 weeks incubation</td>
<td>3=Few 5=Medium 7=Many</td>
<td>Estima, Solist, Craig’s Royal Arielle, Bintje, Catriona Innovator, Maris Piper</td>
<td>9 states</td>
</tr>
<tr>
<td>11* 11</td>
<td>11 a) QN</td>
<td></td>
<td>Lightsprout: length of lateral shoots</td>
<td>After 12 weeks incubation</td>
<td>3=Short 5=Medium 7=Long</td>
<td>Laura, Producent, King Edward Estima, Princess, Kerr’s Pink Spunta</td>
<td>9 states</td>
</tr>
</tbody>
</table>

**B. PLANT AT FLOWER BUD STAGE**

<table>
<thead>
<tr>
<th>CPVO TP/23/3</th>
<th>UPOV TG/23/6</th>
<th>UK</th>
<th>Character</th>
<th>Optimal Stage for Assessment</th>
<th>State of Expression</th>
<th>Example varieties (UK options in italics)</th>
<th>Available number of states</th>
</tr>
</thead>
<tbody>
<tr>
<td>12* 12</td>
<td>12 b) QN</td>
<td></td>
<td>Plant: foliage structure</td>
<td>Flower Bud</td>
<td>1=Stem Type 2=Intermediate 3=Leaf Type</td>
<td>Agria, Estima, Pentland Dell Premiere, Desiree Kennebec, Shannon</td>
<td>3 states</td>
</tr>
<tr>
<td>13* 13</td>
<td>13 b) QN</td>
<td></td>
<td>Plant: growth habit</td>
<td>Flower Bud</td>
<td>3=Upright 5=Semi-upright 7=Spreading</td>
<td>Victoria, Dunbar Standard Desiree, Secura, King Edward Solist, Arran Banner</td>
<td>9 states</td>
</tr>
<tr>
<td>14* 14</td>
<td>14 b) QN</td>
<td></td>
<td>Stem: anthocyanin colouration</td>
<td>Flower Bud</td>
<td>1=Absent or very weak 3=Weak 5=Medium 7=Strong 9=Very strong</td>
<td>Estima Atlantic, Victoria, Pentland Crown Laura, Saturna, Bintje Desiree, Pentland Dell Valfi, Arran Victory</td>
<td>9 states</td>
</tr>
<tr>
<td>15* 15</td>
<td>15 b) QN</td>
<td></td>
<td>Leaf: outline size</td>
<td>Flower Bud</td>
<td>3=Small 5=Medium 7=Large</td>
<td>Kingston, Natalie Laura, Majestic Kennebec, Merlin</td>
<td>9 states</td>
</tr>
<tr>
<td>16* 16</td>
<td>16 b) QN</td>
<td></td>
<td>Leaf: openness</td>
<td>Flower Bud</td>
<td>1=Closed 3=Intermediate 5=Open</td>
<td>Albatros, Likaria, Record Premiere, Solist, Majestic Goldmarie, Arran Consul</td>
<td>5 states</td>
</tr>
<tr>
<td>17* 17</td>
<td>17 b) QN</td>
<td></td>
<td>Leaf: presence of secondary leaflets</td>
<td>Flower Bud</td>
<td>3=Weak 5=Medium 7=Strong</td>
<td>Solara, Goldmarie, Desiree Solist, Majestic Hercules, Victoria, Cara</td>
<td>9 states</td>
</tr>
<tr>
<td>18* 18</td>
<td>18 b) QN</td>
<td></td>
<td>Leaf: green colour</td>
<td>Flower Bud</td>
<td>3=Light-5=Medium 7=Dark</td>
<td>Solist, Estima Ulme, Victoria, Maris Piper Spunta, Sierra</td>
<td>9 states</td>
</tr>
<tr>
<td>19* 19</td>
<td>19 b) QN</td>
<td></td>
<td>Leaf: anthocyanin colouration on midrib of upper side</td>
<td>Flower Bud</td>
<td>1=Absent or very weak 3=Weak 5=Medium 7=Strong 9=Very strong</td>
<td>Solist, Estima Avano, Russet Burbank, Majestic Laura, Kerr’s Pink Romanze, Desiree Bildstar, Roseval, Arran Victory</td>
<td>9 states</td>
</tr>
</tbody>
</table>
### SECTION D

#### C. BUDS/INFLORESCENCES/FLOWERS

<table>
<thead>
<tr>
<th>CPVO TP/23/3</th>
<th>UPOV TG/23/6</th>
<th>UK</th>
<th>Character</th>
<th>Optimal Stage for Assessment</th>
<th>State of Expression</th>
<th>Example Varieties (UK options in italics)</th>
<th>Available number of states</th>
</tr>
</thead>
<tbody>
<tr>
<td>23* 29*</td>
<td>26 c) QN</td>
<td>Plant: frequency of inflorescences</td>
<td>Flowering</td>
<td>1=Absent or very low 3=Low 5=Medium 7=High 9=Very high</td>
<td>King Edward, Rosalind (&lt;1) Arielle, Estima (1-5) Laura, Rita, Home Guard (5-15) Agria, Innovator, Kerr's Pink (15-30) Sibu, Maris Piper (&gt;30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a  % Plants in Flower) b Infls./Plant) c Flowers/Infl.  No/Plant = a x b x c 100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24* 30*</td>
<td>27 c) QN</td>
<td>Inflorescence: size</td>
<td>Flowering</td>
<td>3=Small 5=Medium 7=Large</td>
<td>Accent, Estima, Solist, Rubesse, Desiree Innovator, Pentland Ivory</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25* 31</td>
<td>28 c) QN</td>
<td>Inflorescence: anthocyanin colouration on peduncle</td>
<td>Flowering</td>
<td>1=Absent or very weak 3=Weak 5=Medium 7=Strong 9=Very strong</td>
<td>Estima, Solist, Victoria, Pentland Ivory Saturna, Dunbar Standard Desiree, Maris Piper Blau St Geller</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20* 21 20 b) QN
Second pair of lateral leaflets: width in relation to length
Flower Bud 3=Narrow 5=Medium 7=Broad
Innovator, Russet Burbank, Arran Consul Desiree, Majestic Romano 9 states

21* 22 21 b) QN
Terminal and lateral leaflets: frequency of coalescence
Flower Bud 1=Absent or very low 3=Medium 5=Very high
Courage Goldmarie, Ulster Prince Cardinia, Alex 5 states

23 22 QN
Leaflet: waviness of margin
Flower Bud 1=Absent or very weak 3=Weak 5=Medium 7=Strong 9=Very strong
Umatilla Russet Grata Marabel, Home Guard Aiko Sava, Riveria, Waregem 9 states

24 23 QN
Leaflet: depth of veins
Flower Bud 3=Shallow 5=Medium 7=Deep
Pirol, Home, Guard Premiere Bernadette, Red Pontiac 9 states

22* 27* 24 c) QN
Flower bud: anthocyanin colouration
Flower Bud 1=Absent or very weak 3=Weak 5=Medium 7=Strong 9=Very strong
Solist, Estima Panda, Isle of Jura Victoria, Maris Piper Osprey Valli, British Queen, Argos 9 states
|   | 26* | 32  | 29 c) QN | Flower corolla: size | Flowering | 1=Very Small  
3=Small  
5=Medium  
7=Large  
9=Very Large | Rhona  
Avano, Sommergold, Pentland Javelin  
Laura, Arran Comet  
Innovator  
Rioja, Roseval | 9 states |
|---|-----|------|----------|---------------------|-----------|---------------------------------|-------------------------------------------------|--------|
|   | 27* G | 33* G | 30 c) G QN | Flower corolla: intensity of colouration on inner side | Flowering | 1=Absent or very weak  
3=Weak  
5=Medium  
7=Strong  
9=Very Strong | Solist, Pentland Dell  
Laura, Pirol, Secura, Desiree  
Osprey, Quadriga, Up to Date  
Courage, Valfi  
Ramona, Mayan Gold, Trixie | 9 states |
|   | 28* G | 34* G | 31 G QN | Flower corolla: proportion of blue in anthocyanin colouration on inner side | Flowering | 1=Absent or low  
2=Medium  
3=High | Laura, Osprey, Maris Piper  
Courage, Secura, Pirol, Quadriga, Valfi | 3 states |
|   | 29* | 35* | 32 QN | Flower corolla: extent of anthocyanin colouration on inner side | Flowering | 1=Absent or very small  
3=Small  
5=Medium  
7=Large  
9=Very large | Vitelotte Noir  
Laura, Ulster Concord  
Pirol, Maris Piper  
Panda, Arran Comet  
Courage | 9 states |
|   | 30* | 28 | 25 QN | Plant: height | Flowering | 1=Very short  
2=Short  
3=Medium  
4=Tall  
5=Very tall | Mimi  
Duke of York  
Arielle, Leyla, Desiree  
Maris Piper  
Panda, Pomeroy | 5 states |
|   |     |     | 33 QN | Flower corolla: pigment on rear (White Flowers) | Flowering | 1=Absent  
9=Present | Estima  
Majestic | 2 states |

### D. PLANT AT HAULM SENESCENCE

|   | 31 G | 36 G | 34 G QN | Plant: time of maturity | Foliage ripening | 1=Very early  
3=Early  
5=Medium  
7=Late  
9=Very late | Christa, Solist, Duke of York  
Cilena, Courage, Estima  
Laura, Nicola, Desiree  
Avano, Pentland Crown  
Producent, Kuras, Cara | 9 states |

*NB. Refer to Additional Characters No 41, 42, 43, 44.*
## E. TUBER AFTER HARVEST

<table>
<thead>
<tr>
<th>CPVO TP/23/3</th>
<th>UPOV TG/23/6</th>
<th>UK</th>
<th>Character</th>
<th>Optimal Stage for Assessment</th>
<th>State of Expression</th>
<th>Example Varieties (UK options in italics)</th>
<th>Available number of states</th>
</tr>
</thead>
<tbody>
<tr>
<td>32* 37*</td>
<td>35 d) QN</td>
<td></td>
<td>Tuber: shape</td>
<td>After harvest</td>
<td>1=Round</td>
<td>Kuras, Kerr’s Pink Courage, Record</td>
<td>6 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Short-oval</td>
<td>Diamant, Rubesse, Estima</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Oval</td>
<td>Linda, Innovator, Pentland Dell</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Long-oval</td>
<td>Spunta, Golden Wonder, Ratte</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5=Long</td>
<td>Pompadour, Pink Fir Apple</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6=Very long</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33* 38*</td>
<td>36 QN</td>
<td></td>
<td>Tuber: depth of eye</td>
<td>After harvest</td>
<td>1=Very shallow</td>
<td>Nadine, Agria, Innovator, Pentland Crown</td>
<td>9 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Shallow</td>
<td>Courage, Erntestolz, Kerr’s Pink</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Medium</td>
<td>Elles, Kuras, Epicure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Deep</td>
<td>Joshua, Lumpers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5=Very deep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34* G</td>
<td>39* G d) PQ</td>
<td></td>
<td>Tuber: colour of skin</td>
<td>After harvest</td>
<td>1=Light beige</td>
<td>Nadine, Solist, SF Balu, Ivory Russet</td>
<td>9 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Yellow</td>
<td>Rosalind, Kerr’s Pink</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Reddish brown</td>
<td>Laura, Romanze, Darkred Chieftain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Light red</td>
<td>Cara, King Edward</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5=Medium red</td>
<td>Valfi, Edzell Blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6=Dark red</td>
<td>Caterina, Kestrel</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7=Red parti-coloured</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8=Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9=Blue parti-coloured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>38</td>
<td></td>
<td>Tuber: smoothness of skin</td>
<td>After harvest</td>
<td>1=Smooth</td>
<td>SF Balu, Pentland Ivory, Solist, Record</td>
<td>3 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Medium</td>
<td>Ivory Russet, Golden Wonder</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Rough</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36* 40*</td>
<td>39 d) PQ</td>
<td></td>
<td>Tuber: colour of base of eye</td>
<td>After harvest</td>
<td>1=White</td>
<td>Nadine, Agria, Solist, Quarta, Romanze, Cara</td>
<td>4 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Yellow</td>
<td>Purple Majesty, Caterina</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36* 41*</td>
<td>40 d) PQ</td>
<td></td>
<td>Tuber: colour of flesh</td>
<td>After harvest</td>
<td>1=White</td>
<td>Kuras, Russet Burbank, Desiree, Estima</td>
<td>9 states</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Cream</td>
<td>Diamant, Solist, Bildstar, Quarta</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Light Yellow</td>
<td>Prince, Laura, Saturna, Red Emmaile</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Medium yellow</td>
<td>Early Rose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5=Deep yellow</td>
<td>Purple Majesty, Herd Laddie</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6=Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7=Red parti-coloured</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8=Blue</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9=Blue parti-coloured</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NB.** Refer to Additional Characters No 45 and 46.
### ADDITIONAL CHARACTERISTICS

The following table summarises the additional characteristics which have been approved by NLSC and can be examined at the request of the applicant where necessary to establish Distinctness.

<table>
<thead>
<tr>
<th>CPVO TP/23/3</th>
<th>UPOV TG/23/6</th>
<th>UK</th>
<th>Character</th>
<th>Optimal Stage for Assessment</th>
<th>State of Expression</th>
<th>UK Example varieties</th>
<th>Available number of states</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 PQ</td>
<td></td>
<td></td>
<td>Flower: colour of anthers</td>
<td>Flowering</td>
<td>1=Pale yellow 2=Yellow 3=Orange</td>
<td>Duke of York King George Maris Piper</td>
<td>3 states</td>
</tr>
<tr>
<td>42 PQ</td>
<td></td>
<td></td>
<td>Flower: anther column</td>
<td>Flowering</td>
<td>1=Malformed 2=Open (cage) 3=Normal</td>
<td>Duke of York Craigs Royal Maris Piper</td>
<td>3 states</td>
</tr>
<tr>
<td>43 PQ</td>
<td></td>
<td></td>
<td>Flower: shape of style</td>
<td>Flowering</td>
<td>1=Straight 2=Intermediate 3=Kinked</td>
<td>Maris Piper Dunbar Standard</td>
<td>3 states</td>
</tr>
<tr>
<td>44 PQ</td>
<td></td>
<td></td>
<td>Flower: colour of ovary interior</td>
<td>Flowering</td>
<td>1=Green 2=F.Pigt at Base 3=Pigmented</td>
<td>Maris Piper Foxton Kerr's Pink</td>
<td>3 states</td>
</tr>
<tr>
<td>45 PQ</td>
<td></td>
<td></td>
<td>Tuber: pigment in flesh of ungreened tubers</td>
<td>After harvest</td>
<td>1=Absent 2=Vascular Ring 3=Medulla</td>
<td>Desiree Herd Laddie Congo</td>
<td>3 states</td>
</tr>
<tr>
<td>46 QN</td>
<td></td>
<td></td>
<td>Tuber: number of tubers per plant</td>
<td>After harvest</td>
<td>3=Few (&lt;10) 5=Moderate (11-14) 7=Many (&gt;15)</td>
<td>Ulster Prince Pentland Crown Golden Wonder</td>
<td>9 states</td>
</tr>
</tbody>
</table>

6.1 New Additional DUS Characteristics

Applicants can suggest new additional characters on the Technical Questionnaire for testing DUS or after notification by the DUS Test Centre of distinctness problems. For procedures see Section F.
SECTION E - REFERENCE SEED STOCK MAINTENANCE AND VCU SEED STOCK AUTHENTICATION PROCEDURES

1. PURPOSE

1.1. This section sets out the procedures for reference seed stock maintenance and VCU seed stock authentication.

2. SCOPE

2.1. These procedures apply to all reference collection varieties and VCU seed submissions where the VCU seed has not been taken from the same bulk as the seed used for the DUS test.

3. RESPONSIBILITIES

3.1. The Test Centre is responsible for conducting these procedures.

4. PROCEDURES FOR REFERENCE SEED STOCK MAINTENANCE

4.1. The seed sample submitted by the applicant for testing is considered to be the definitive stock of the variety. Subject to meeting the required health quality standards (see B 6), a few tubers will be transferred to the SASA reference potato variety collections and maintained annually as part of a living collection, except if the candidate variety is not accepted for National Listing.

4.2. Tubers may also be produced from microplants derived from the submitted seed sample which have been tested to comply with the requirements of Plant Health Directive 2000/29/EC. This material will then incorporated into SASA's Reserve Virus Tested Potato Collection and will be used to renew varieties in the main reference collection, as appropriate.

5. PROCEDURES FOR VCU SEED STOCK AUTHENTICATION

5.1. Evidence will be requested from the breeder of the relationship between the VCU seed sample and the definitive DUS seed sample. Sprouts, plants and tubers will be compared visually with the definitive stock over the recording season, if necessary.

5.2. If the new seed sample cannot be visually distinguished from the reference stock, it will be accepted as representing the variety.

5.3. If the VCU seed sample can be distinguished visually from the definitive stock in the authentication plots, then it will not be accepted as representing the candidate variety.

6. PROCEDURES FOR THE INCLUSION OF NEW COMMON KNOWLEDGE VARIETIES INTO THE REFERENCE COLLECTION

6.1. When a new variety enters into common knowledge such that it must be included in the reference collection for comparative purposes, a request will be sent by the Test Centre to the Testing Authority which has added this variety to its National List for the supply of at least 4 tubers. A UPOV description may also be requested from the Testing Authority.

7. RELEASE OF REFERENCE SAMPLES FOR AUTHORISED PURPOSES

7.1. A maximum of 5 tubers of seed of reference samples can be supplied by the Test Centre, on request, to UK, EU and UPOV DUS Testing Authorities and UK, EU and UNECE Seed Certification Agencies, provided the recipient is notified in writing that this material, or any material derived from it, must not be supplied to a Third party or used for any other purpose than as a reference for official DUS testing or seed certification. Varieties which are in the public domain can be supplied subject to a germplasm acquisition agreement.

7.2. Provision of reference samples, other than in 7.1, to any other parties must be authorised by APHA.
SECTION F - PROCEDURES FOR ASSESSMENT OF NEW ADDITIONAL DUS CHARACTERS

1. PURPOSE

1.1 This Section sets out the procedures for assessment of new additional DUS characters for varieties of potato entered for National List trials and PBR.

2. SCOPE

2.1 These procedures apply to applications where new additional DUS characteristics which have not been approved by the NLSC are requested for use for determinations of DUS.

3. RESPONSIBILITIES

3.1 The Test Centre is responsible for liaising with the applicant to produce a proposed procedure for the conduct of new tests. This procedure must ensure that Distinctness, Uniformity and Stability will be assessed.

3.2 All new additional characteristics must be authorised by the National List and Seeds Committee.

4. REFERENCE VARIETIES

4.1 The reference varieties will include only those varieties from which the candidate variety is not distinct, as well as other appropriate varieties for control purposes.

4.2 Seed of reference varieties will be supplied by the Test Centre.

5. PROCEDURES

5.1 Details of the proposed special test or assessments will be submitted to the NLSC to consider the feasibility of setting up a test acceptable to the UK Authorities. The applicant will be advised by APHA of arrangements and costs.

5.2 The NLSC will consider the results of the commissioned test or trial when reaching its recommendation on the granting of Plant Breeders’ Rights and/or National Listing.

5.3 Where the test for a character is approved by the NLSC it should be subsequently listed in Section D5.1.
SECTION G - PROCEDURES FOR DUS DECISIONS

1. PURPOSE

1.1 This section sets out the procedures for assessing DUS decisions on varieties of potato.

2. SCOPE

2.1 These procedures apply to all varieties of potato entered for National List and Plant Breeders’ Rights tests and those being tested for Foreign Authorities.

3. RESPONSIBILITIES

3.1 The Test Centre is responsible for applying the criteria for DUS, set out in this procedure.

3.2 The Test Centre is responsible for producing the DUS reports in accordance with these procedures and for ensuring that they are in accordance with the UPOV Guidelines.

4. REFERENCE VARIETIES

4.1 Appendix 1 sets out which varieties are considered as reference varieties for these procedures.

5. DISTINCTNESS

5.1 In accordance with associated document UPOV TG1/3, varieties can be considered distinct where they have a different expression in a grouping character from varieties in the reference collection identified as being similar. For PQ characters, the difference must be clear i.e. at least 1 state and, for QN characters, the difference must be visually clear or consistent.

5.2 Where varieties are grown in close proximity under the same conditions, and a direct comparison can be made, distinctness may be determined on the basis of visual observation. In these circumstances, the basis for distinctness will be clearly recorded.

6. UNIFORMITY

6.1 Uniformity is assessed visually for all characteristics used to establish Distinctness.

6.2 Any variants identified by visual assessment are marked and counted, and their proportions calculated. Variants are defined as plants which are clearly not of the variety. Care is taken to ensure that the plants which are counted are not the result of any non-genetic factors such as environment, pest or disease or husbandry.

6.3 After the variants and abnormal plants have been excluded, the characters listed in Section D are used to assess the uniformity of the remaining plants.

6.4 Uniformity is assessed in both years of the two year test period and in further years for those characteristics being assessed for distinctness.

6.5 For characters which are not measured, the uniformity standard is tabulated in UPOV TC/34/5. The total number of variants in the two test years is calculated to give the value “k” and the total number of plants in the two test years gives the value “n”. Where a third year of uniformity data is required, the same principle, i.e. that of adding the numbers of variants and the total numbers of plants examined, is applied.

7. STABILITY

7.1 A variety is considered sufficiently stable when there is no evidence to indicate that it lacks uniformity or fails to conform to the essential characteristics of its description in different submissions or in different tests.
8. DUS REPORT AND VARIETY DESCRIPTION

8.1 Upon completion of the DUS examination, the DUS Summary report will be submitted to APHA by the specified date. This report will specify all non-routine characteristics for establishing distinctness.

8.2 The final DUS report, including the full variety description, will be submitted to APHA by the specified date. The characteristics to be used in the description are identified in Section D.
REFERENCE COLLECTION VARIETIES

1. NATIONAL LISTING

1.1 The DUS reference collection, for NL purposes, for any given category of plant variety comprises the following at the time when the application for the candidate is made:

1.1.1 All other candidate varieties already in DUS test in the UK, or entering testing at the same time as the candidate, including those being tested for other Member States.

1.1.2 All varieties on the UK National List and varieties on the EC Common Catalogue whose seed is known to be certified or marketed in the UK.

1.1.3 Varieties nominated by the authorities concerned where tests are done for other Member States.

1.1.4 Any varieties nominated by the applicant as being comparable i.e. known to be similar.

1.1.5 Any other varieties considered to be comparable i.e. known to be similar by the appropriate Test Centre or DUS Centre Group.

2. PLANT BREEDERS RIGHTS

2.1 The DUS reference collection, for PBR purposes, for any given category of plant variety comprises the following at the time when the application for the candidate is made:

2.1.1 All other candidate varieties already in DUS tests in the UK, or entering DUS testing at the same time as the candidate, including those being tested for other Member States or the Community Plant Variety office (CPVO).

2.1.2 Varieties protected in the UK, EC or in a UPOV Member State, which are known to be similar to the candidate variety.

2.1.3 Other available comparable varieties in common knowledge.
NOTES AND INSTRUCTIONS

a) SPROUTS

Characters 1-11 – Light sprout

Sprout characters should be noted on at least 5 tubers sprouted for 12 weeks at 20°C under diffuse artificial lighting in a light sprout cabinet (see Houwing A, Suk R and Ros B (1986), Acta Horticulturae 182).

The spectrum of the light source is the most determining factor for the expression of characteristics of lightsprouts. A good expression of characteristics is obtained with lightsprouts growing in a cabinet at room temperature under exclusion of day light and under continuous light of small incandescent bulbs (6V AC/0.05 A, 8 pro square meter, 25-40cm above the tubers).

Character 2: Shape
**Character 3**: intensity of anthocyanin colouration of base.

If lightsprout appears green, then record as “absent”

**Character 4**: proportion of blue in anthocyanin colouration of base

The colour results from a red and blue component. If the proportion of blue is low, the anthocyanin appears red violet. If the proportion of blue is high, the anthocyanin appears blue violet.

**Character 7**: habit of tip

![Diagrams of habit of tip]

3 closed
5 medium
7 open

This characteristic should be observed after about 10 weeks to obtain a good differentiation in the collection.

**Character 11**: length of lateral shoots

![Diagrams of length of lateral shoots]

3 Short
5 Medium
7 long
b) PLANT FOLIAGE

Characters 12 – 24

These records on foliage should be made when flower buds are clearly fully developed on the plants and just before the first flowers are fully opened throughout the plot.

Anthocyanin colouration (characters 14, 19):

The extent of colouration should be observed in relation to the total area. Distribution and intensity should not be considered in relation to record but may be noted if distinct.

Comparisons should be made with example varieties in the reference collection of potato varieties in the field.

Character 12: foliage structure

Stem-type: foliage open, stems clearly visible
Intermediate: foliage half open, stems partly visible
Leaf-type: foliage closed, stems not or hardly visible

Character 13: Growth habit

Characters 15-23: Leaf

Leaves and leaflets selected for detailed description should be fully formed and expanded and are those normally inserted about half way up the stem.
Character 16: Openness

3  Closed
5  medium
7  open

Character 17: presence of secondary leaflets

3  weak
5  medium
7  strong
Character 20: Second pair of lateral leaflets: width in relation to length

3 narrow

5 medium

7 broad

Character 21: Terminal and lateral leaflets: frequency of coalescence

Absent/ not coalescent

Coalescent

Character 34: Plant: time of maturity

The time of maturity is reached when 80% of the leaves are dead.

c) BUDS/INFLORESCENCE/FLOWERS

Characters 24 - 33, 41 - 44
Anthocyanin colouration (characters 22, 26 and 30):

The extent of colouration should be observed in relation to the total area. Distribution and intensity should not be considered. Observations on flower buds should be made on fully developed buds before the corolla is visible. If flower corolla appears white, then the record for intensity of colouration is “Absent”.

Character 26: Flower frequency may be determined by dividing the product of the percentage plants in flower, the number of inflorescences per plant and the number of flowers per inflorescence by one hundred.

Character 42: Anther columns are normal when they are (a) regular and tube-like, (b) oblique. When they are “open” the column is cage-like with the anthers touching top and bottom, but separated in the middle. Malformed anthers are usually badly twisted, not completely developed, and often greenish. Petaloid.structures should be separately recorded

At least one or 2 later observations should be made to confirm flower descriptions.

d) TUBERS

Characters 35 – 40, 45-46

Character 35: shape

1 round
2 round-oval
3 oval
4 oval-long
5 long-oval
6 very long

Character 37: on tubers described as parti-coloured (i.e. the skin is incompletely pigmented), the distribution and intensity of pigmentation will be recorded. It is, however, recognised that expression of this characteristic may be variable and such a description will acknowledge that a proportion of the tubers may not be parti-coloured.

Character 39: Flesh colour should be determined by cutting at least 10 freshly lifted, ungreened ware tubers and comparing the flesh colour with those of the example varieties.

Character 50 (light beige and yellow skinned varieties only): Tuber: anthocyanin coloration of skin in reaction to light.

The anthocyanin development in the skin of these varieties should be assessed after 10 days of exposure to full daylight or after 150 hours of exposure to artificial light.