

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

WATERCRESS

Nasturtium officinale W.T.Aiton, *Nasturtium microphyllum* Boenn. ex Rchb. and *Nasturtium xsterile*
(Airy Shaw) Oefelein and *Nasturtium* R. Br. hybrids..

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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 and maintenance of reference stocks of varieties of Watercress entered for Plant Breeders' Rights (PBR) tests.

2 SCOPE

- 2.1 These procedures apply to all varieties of Watercress (*Nasturtium officinale* W.T.Aiton, *Nasturtium microphyllum* Boenn. ex Rchb. and *Nasturtium xsterile* (Airy Shaw) Oefelein) and *Nasturtium* R. Br. hybrids. Special procedures and responsibilities for Genetically Modified (GM) varieties are set out in Sections A5 and A6.
- 2.2 Except where specified in this protocol or authorised by the APHA, Plant Varieties and Seeds, only Plant Breeders' Rights candidates, candidates for Foreign Authorities and the reference varieties may be incorporated in the DUS tests.

3 RESPONSIBILITIES

- 3.1 The growing tests and assessments in this protocol are carried out under the responsibility of the Secretary of State for Environment, Food and Rural Affairs, Scottish Ministers, Welsh Ministers and the Secretary of State for Northern Ireland (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 Rural Directorate (SGARD), the Department of Agriculture and Rural Development for Northern Ireland (DARDNI) and the Welsh Government (WG).
- 3.3 This protocol is authorised by the Animal and Plant Health Agency (APHA). It cannot be amended without their approval. Requests and suggestions for amendment of the protocol should be put in writing to the APHA, Plant Varieties and Seeds, either directly or via the Test Centre.
- 3.4 The procedures are administered by:

Plant Varieties and Seeds
 Animal and Plant Health Agency (APHA)
 Eastbrook
 Shaftesbury Road
 Cambridge
 CB2 8DR

Tel No	03000 600497
Fax No	03000 602115

3.5 TEST CENTRE

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

Vegetable DUS Test Centre
 Science and Advice for Scottish Agriculture (SASA)
 Roddinglaw Road
 Edinburgh Tel No 0131-244 8853
 EH12 9FJ Fax No 0131-244 8940

3.6 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, Plant Varieties and Seeds. 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, Plant Varieties and Seeds.

6 PROCEDURES FOR GM VARIETIES

6.1 Applicants intending to enter GM candidates must consult APHA, Plant Varieties and Seeds, 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, Plant Varieties and Seeds has given the specific clearances.

7 ASSOCIATED DOCUMENTS

7.1 The following documents are associated with this protocol:

Reference	Title
UPOV TG/1/3	General Introduction to the Examination of Distinctness, Uniformity and Stability and the Development of Harmonised Descriptions of New Varieties of Plants 19.04.2002.
UPOV TGP/8/1	Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability. 21.10.2010.
UPOV TGP/9/1	Examining Distinctness 11.04.2008.
UPOV TGP/10/1	Examining Uniformity 30.10.2008.
Council Regulation (EC) No. 2100/94	Council Regulation (EC) No. 2100/94/EC of 27 July 1994 on Community Plant Variety Rights.

SECTION B - APPLICATION REQUIREMENTS**1 PURPOSE**

- 1.1 The purpose of this section is to identify the specific requirements for 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 for Plant Breeders' Rights is 28th February which is set administratively by APHA, Plant Varieties and Seeds. Applications received after this date may be considered for inclusion in the current year's tests and trials on a case by case basis.

- 4.2 The procedures for the submission of Plant Breeders' Rights applications, technical questionnaires (TQ) and for payment of administrative fees are set out on the GOV website at <https://www.gov.uk/national-lists-of-agricultural-and-vegetable-crops>.

- 4.3 Applicants should notify APHA, Plant Varieties and Seeds 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 OR PLANT MATERIAL

- 5.1 The latest date for receipt of seed (seed-propagated varieties) or plant material (vegetatively-propagated varieties) is 31st March and is set administratively by APHA, Plant Varieties and Seeds. Seed or plant material submissions received after these dates will normally be refused. Instructions for the delivery of seed or plant material will be made available to applicants by APHA, Plant Varieties and Seeds.

6 SEED QUALITY REQUIREMENTS

- 6.1 Germination and Purity
- | | |
|--|-----|
| Minimum germination | 75% |
| Minimum purity | 95% |
| Maximum of other crop species
(% by weight) | 1.0 |

Health

Free from serious pests and diseases

Condition

Unpelleted and free from any chemical treatment

- 6.2 The seed must not be chemically treated. Seed treatment, where appropriate, will be undertaken by the Test Centre. The chemicals applied and rates of application will be determined by the Test Centre.

7 SEED QUANTITY

- 7.1 1st Test cycle 3g or 10 g
- 7.2 2nd Test cycle
7g if 3g was provided in the first test cycle
No seed if 10g was provided in the first test cycle

Where a second sample has been provided, it will be authenticated against the original submission. An additional charge will be applied.

8 PLANT MATERIAL REQUIREMENTS

- 8.1 Quantity
70 rooted plants at 4 – 7 node stage of development
- 8.2 Health and Condition
Free of pests, disease and without fertiliser or chemical treatment

9 LABELLING REQUIREMENTS, INCLUDING PROVISIONS FOR GM VARIETIES

- 9.1 Applicants **must** clearly label their seed or plant material with the following information:
- Applicant
 - Breeder's Reference number or name
 - Quantity of seed or rooted plants
- 9.2 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 Watercress.

3 RESPONSIBILITIES

- 3.1 The Test Centre is responsible for conducting these procedures.
- 3.2 The Test Centre will be responsible for ensuring that no material supplied to them is used for any other purpose than the conduct of these procedures or the release of reference samples for authorised purposes. (See Section E7).

4 REFERENCE VARIETIES

- 4.1 The principles governing the selection of reference varieties are set out in Appendix 1.
- 4.2 Seed-propagated reference varieties will be supplied by the DUS Test Centre. Vegetatively-propagated reference varieties will be requested from the maintainer.

5 DESIGN OF TESTS

- 5.1 The DUS Test Centre is responsible for selecting a suitable site which should be on ground that has normally not had a Cruciferous crop in the previous five years but may be less where the risk is negligible.
- 5.2 Field husbandry should follow best local practice for all operations and particularly as regards cultivation, drilling, transplanting, fertiliser and spray application, use of irrigation, and control of pests and diseases.
- 5.3 From information given in the TQ the candidate variety may be grown in plots and compared with varieties which are in the same classification for the following characters:

Grouping characters:

- Foliage: attitude and length of uppermost petioles (characteristic 9)
- Leaf: colour in spring and autumn (characteristic 12)
- Leaf: colour in autumn and winter (characteristic 14)
- Inflorescence date: tendency to flower in summer (characteristic 21)
 - Siliqua: length (characteristic 24)
 - Siliqua: arrangement of seed rows (characteristic 27)
 - Siliqua: tendency to set seed (Characteristic 28)

- 5.4 Varieties known to be clearly different from the candidate on any other discontinuous or continuous characteristic may be excluded from the trial. If this exclusion is based on a characteristic which is not listed in Section D 5.1, approval by the NLSC must be sought. See Section F for further information on additional characteristics.

- 5.5 The tests are carried out using a grouped design, with a plot of each candidate variety present in each replicate as follows:

Number of replications	2
Number of rows per plot	5
Spacing between rows	0.30 m
Plot length	1.5 m
Number of plants per replicate	30
Hence, number of plants per variety	60
Plant spacing	0.30 m

Groups are randomised and varieties are randomised within groups.

- 5.6 Seed is sown or alternatively plant material is transplanted in the glasshouse between early and mid-April. Plants are transplanted between mid-April and mid-May according to a plan produced by the Test Centre. Varieties are coded by the Test Centre.
- 5.7 Any candidate with distinctness problems in the first test cycle may be grown side by side with their close controls in the second or third test cycles.
- 5.8 Recordings are taken on each trial approximately 3 - 4 weeks after sowing or vegetative cuttings are taken until harvest maturity stage. Characters recorded are listed in Section D.

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 noted, but excluded from the sample.
- 6.3 In the first test cycle, characters, as indicated in Section D5.1, are recorded on all candidates and their close controls. The data for measured characters are analysed and used to determine the most similar reference varieties and assess uniformity of the candidate. (For details see Section G).
- 6.4 In the second test cycle, characters, as indicated in Section D5.1, are recorded on all candidates and their close controls. The data for measured characters are analysed and, together with those from the first test cycle, used to determine the most similar reference varieties and assess uniformity of the candidate. (For details see Section G).
- 6.5 If a third test cycle is necessary, characters, as indicated in Section D5.1, are recorded on all candidates and their close controls. The data for measured characters are analysed and, together with those from the first and second test cycles, are used to determine the most similar reference varieties and assess the uniformity of the candidate. (For details see Section G).
- 6.6 If the Test Centre notices unusual or novel characters in a candidate, a note may be made of these at any time and a photographic record made.

7 COMMUNICATION WITH THE APPLICANT

- 7.1 The Test Centre will notify the applicant or his agent of any DUS problems at the earliest practical opportunity. All such notifications must be copied to APHA, Plant Varieties and Seeds. In the case of tests for CPVO and foreign DUS authorities, notifications must be sent to the CPVO or the test authority and copied to APHA, Plant Varieties and Seeds.
- 7.2 If confidentiality considerations 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 test cycle the results are summarised and reported by the Test Centre to the applicant, APHA Plant Varieties and Seeds, foreign test authorities or the CPVO as appropriate.

SECTION D - SUMMARY OF DUS CHARACTERISTICS TO BE ASSESSED, METHOD OF ASSESSMENT AND STANDARDS APPLIED

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, methods 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 is normally two independent growing cycles. Shorter periods may be applied for assessment of additional characteristics. Additional growing cycles may be approved by the UK National List and Seeds Committee (NLSC).

5 DUS CHARACTERISTICS TO BE ASSESSED

5.1 Routine Characteristics

The following list summarises the DUS characteristics to be routinely examined.

Legend:

Key to abbreviations used with character number

Types of expression of characteristics:

QL Qualitative characteristic
 QN Quantitative characteristic
 PQ Pseudo-qualitative characteristic

Types of observation of characteristics:

MG Single measurement of a group of plants or parts of plants
 MS Measurement of a number of individual plants or parts of plants
 VG Visual assessment by a single observation of a group of plants or parts of plants
 VS Visual assessment by observation of individual plants or parts of plants

G denotes a grouping characteristic.

WATERCRESS CHARACTERISTICS ROUTINELY RECORDED IN DUS TESTS

Character Number			Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
CPVO	UPOV	UK							
		01 QN VG (a)	Plant: height	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = short 5 = medium 7 = tall	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		02 QN VG (b)	Plant: habit	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = erect 3 = semi-erect 5 = prostrate	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		03 QN VG (a)	Stem: internode length	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = short 5 = medium 7 = long	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		04 QN VG (a)	Stem: intensity of anthocyanin	DUS plot	At least 60, plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		05 QN VG (a)	Stem: development of axillary branching	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		06 QN VG (a)	Stem: development of adventitious roots	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5

SECTION D

CPVO	UPOV	UK	Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
		07 QN VG (a)	Stem: hairiness	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = absent or very weak 3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		08 QN VG (a)	Foliage: glossiness	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		09 *G QN VG (a)	Foliage: attitude and length of uppermost petioles	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = erect and short 2 = semi-erect and long	Clear visual difference	Off-type standard and Uniformity score >5
		10 QN VG (a)	Foliage: canopy density	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		11 QN VG (a)	Leaf: profile of upper side of terminal leaflet	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = convex 5 = plane 7 = concave	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		12 *G QL VG (a)	Leaf: colour in spring and autumn	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = green 2 = greyish-purple 3 = variegated (green and creamy white)	Clear visual difference	Off-type standard and Uniformity score >5

SECTION D

CPVO	UPOV	UK	Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
		13 * QN VG (a)	Leaf: intensity of colour in spring and autumn	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		14 *G QL VG	Leaf: colour in autumn and winter	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = green or greyish-purple 2 = purplish-brown	Clear visual difference	Off-type standard and Uniformity score >5
		15 QN MS (d)	Leaf: length	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = short 5 = medium 7 = long	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests
		16 QN MS (d)	Leaf: width	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = narrow 5 = medium 7 = broad	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests
		17 QN MS (d)	Leaf: area	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = small 5 = medium 7 = large	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests
		18 QN MS (d)	Leaf: length of terminal leaflet	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = short 5 = medium 7 = long	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests

SECTION D

CPVO	UPOV	UK	Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
		19 QN MS (d)	Leaf: width of terminal leaflet	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = narrow 5 = medium 7 = broad	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests
		20 QN MS (d)	Petiole: length from axil to first leaflet	Single plants	At least 30 plants in total from 2 replicates	Measurement of a sample of single plants	3 = short 5 = medium 7 = long	COYD @ 5% for both 2 and 3 year tests	Off-type standard and COYU@0.1% for both 2 and 3 year tests
		21 *G QN VG	Plant: tendency to flower in summer	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = absent or very weak 3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		22 * QN MG	Plant: time of beginning of flowering	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = early 5 = medium 7 = late	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		23 QN VG	Plant: frequency of flowering	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = absent or very low 3 = low 5 = medium 7 = high 9 = very high	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		24 *G QN VG/M S (c)	Siliqua: length	DUS plot or Single plants	At least 60, or 30, plants in total from 2 replicates	Visual observation or visual score or Measurement of a sample of single plants	3 = short 5 = medium 7 = long	Clear visual difference or 2 states or COYD @ 5% for both 2 and 3 year tests	Off-type standard and Uniformity score >5 or COYU@0.1% for both 2 and 3 year tests

SECTION D

CPVO	UPOV	UK	Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
		25 * QN VG/M S (c)	Siliqua: width	DUS plot or Single plants	At least 60, or 30, plants in total from 2 replicates	Visual observation or visual score or Measurement of a sample of single plants	3 = narrow 5 = medium 7 = broad	Clear visual difference or 2 states or COYD @ 5% for both 2 and 3 year tests	Off-type standard and Uniformity score >5 or COYU@0.1% for both 2 and 3 year tests
		26 * QN VG/M S (c)	Peduncle: length	DUS plot or Single plants	At least 60, or 30, plants in total from 2 replicates	Visual observation or visual score or Measurement of a sample of single plants	3 = short 5 = medium 7 = long	Clear visual difference or 2 states or COYD @ 5% for both 2 and 3 year tests	Off-type standard and Uniformity score >5 or COYU@0.1% for both 2 and 3 year tests
		27 *G QL VG (c)	Siliqua: arrangement of seed in rows	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = uniseriate 2 = biseriate	Clear visual difference	Off-type standard and Uniformity score >5
		28 *G QN MG (c)	Siliqua: tendency to set seed	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	1 = absent or very weak 3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5
		29 QN VG	Dry harvest seed: surface reticulation	DUS plot	At least 60 plants in total from 2 replicates	Visual observation or visual score	3 = weak 5 = medium 7 = strong	Clear visual difference or 2 states	Off-type standard and Uniformity score >5

Growth stages for recording characteristics indicated with character numbers in the table above

- (a) Observations should be made before flowering when leaves are fully developed.
- (b) Observations should be made on fully developed, fresh flowers.
- (c) Observations should be made on fully developed pods at early stages of senescence.
- (d) Observations should be made before flowering when leaves are fully developed, on plants with excised axillary branches.

5.2 Previously Approved Characteristics not Routinely Recorded in DUS Tests

The following table summarises the additional characteristics which have been approved by the NLSC and can be examined at the request of the applicant where necessary to establish Distinctness. A fee may be charged for examination of these characteristics as advised by APHA, Plant Varieties and Seeds.

Character Number			Character	Material examined	Number of plants or sample size for assessment	Method of assessment and recording	States of expression	D Method and Minimum distance required	U Method and Standard applied
CPVO	UPOV	UK							

5.3 New Additional DUS Characteristics

Applicants can suggest new additional characters on the TQ for testing DUS or after notification by the DUS Test Centre of distinctness problems. (For procedures see Section F).

SECTION E - REFERENCE STOCK MAINTENANCE**1 PURPOSE**

- 1.1. This section sets out the procedures for the authentication of replacement reference seed.

2 SCOPE

- 2.1 These procedures apply to all reference collection varieties.

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 with the successful or pending application is considered to be the definitive stock of the variety. Subject to meeting the required quality standards a small portion of the seed is sown for observation and measurement. The remainder is stored under controlled and monitored storage conditions as part of the official reference collection.
- 4.2 If during the normal tests there is any evidence that a seed stock is deteriorating in storage, or that stocks have low quantity, a request will be made to the maintainer asking for a replacement stock of the variety. This replacement stock must be authenticated, by comparing plots established from the replacement seed with that of the definitive seed, over a maximum of two test cycles.
- 4.3 If the replacement seed sample cannot be visually distinguished from the definitive reference stock, it will be accepted as representing the variety. If there are visual differences, the new sample will be recorded, and will be accepted as representing the variety if there are no significant ($P=0.05$) differences in the first test cycle, or no significant ($P=0.05$) differences over two test cycles in a COYD analysis (see associated document UPOV TGP/8/1 for details). It may then be accepted as definitive and substituted for the existing definitive stock in the reference collection. These procedures may be modified, where, in the opinion of the technical officer, differences are the result of environmental or cultural factors.
- 4.4 A replacement sample or an additional replacement sample will be considered sufficiently uniform after one test cycle, if the level of off-types is the same or less than the number at 1% population standard and 95% acceptance probability, and the standard deviations of the measured characters are not significantly greater at the 0.1% ($P=0.001$) significance level than that of the mean standard deviations of the control varieties. Over 2 years the additional replacement sample will be considered sufficiently uniform if the Combined Over Years Uniformity (COYU) is not significantly greater at the 0.1% ($P=0.001$) significance level than that of the reference varieties. These procedures may be modified, where, in the opinion of the technical officer, differences are the result of environmental or cultural factors.
- 4.5 In the event of the replacement sample not meeting the required acceptance standards, an additional replacement sample is requested. Plots will be established from any additional replacement seed sample and compared over a maximum of two test cycles. If the additional replacement sample does not meet the acceptance criteria set out in 4.3, the variety will be deleted from the reference collection.

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

- 5.1 When a new variety enters into common knowledge, it must be included in the reference collection if seed is available. A request will be sent by the Test Centre to the maintainer of the variety and an official description will be requested from the Testing Authority which registered the variety. If an official description is provided, seed received will be assumed to be definitive if the seed conforms to the official description. Small differences in the expression of quantitative characteristics are likely to be the result of recording in a different environment and will be considered as conforming to the description. If no official description is available, seed will be assumed to be definitive.
- 5.2 If the seed does not conform to the official description, a request for definitive seed will be sent to the Testing Authority that added the variety to its National List or granted Plant Breeders' Rights. This seed will then be used to validate the sample of seed from the maintainer. The standards for this validation will be as for authentication of replacement (see E4).

6 RELEASE OF REFERENCE SAMPLES FOR AUTHORISED PURPOSES

- 6.1 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 OECD 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.
- 6.2 Provision of reference samples, other than in 6.1, to any other parties must be authorised by the NLSC.

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 Watercress entered for Plant Breeders Rights tests.

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 in DUS testing.

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 NLSC.

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, Plant Varieties and Seeds 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.
- 5.3 Where the test for a character is approved by the NLSC it should be subsequently listed in Section D5.1 or 5.2 as appropriate.

SECTION G - PROCEDURES FOR DUS DECISIONS**1 PURPOSE**

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

2 SCOPE

- 2.1 These procedures apply to all varieties of Watercress entered for UK Plant Breeders' Rights tests and those being tested for the CPVO or for other 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 CPVO Protocols.

4 REFERENCE VARIETIES

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

5 DISTINCTNESS

- 5.1 Distinctness is normally assessed in two independent test cycles, but a candidate variety could be considered to be distinct after one test cycle if there are no similar varieties. A third independent test cycle may be undertaken if distinctness is not established after two test cycles.
- 5.2 In accordance with associated document UPOV TG/1/3 varieties can be considered distinct where they have a different expression in a grouping character.
- 5.3 The distinctness standard applied for qualitative characters is a difference of one state, unless otherwise indicated in Section D. For pseudo-qualitative characters the distinctive standard is a difference of 1, 2 or 3 states depending on the characteristic.
- 5.4 If a candidate is clearly different in a visually assessed quantitative character it is considered to be distinct without the need for a repeated observation.
- 5.5 Where varieties are grown in close proximity under the same conditions, and a direct comparison can be made, a candidate is considered to be distinct if a clear visual difference is observed in a quantitative character.
- 5.6 Where varieties are not grown in close proximity, a candidate is considered to be distinct if a difference of at least two states (see table in section D 5.1 and 5.2) is recorded in a visually observed quantitative character.
- 5.7 The standard for measured or counted quantitative characters, is, at least, a 5% ($P=0.05$) significant difference in one character over two or three test cycles in a Combined Over Years Distinctness (COYD) analysis. Please see associated document UPOV TGP/8/1 for details.
- 5.8 Where COYD cannot be applied, alternative methods should be considered.
- 5.8.1 When the number of varieties grown does not provide sufficient degrees of freedom for use of the standard COYD analysis, alternative methods should be adopted. If there is sufficient historical data (at least 5 years and sufficient degrees of freedom) then the long

term LSD is applied. This LSD is calculated using up to 10 years of the most recent data. If there is insufficient historical data, the 2 x 1% method should be used.

- 5.8.2 Where the candidate has a full complement of data for two test cycles, but there is only data for control varieties for one test cycle, the use of FITC (Fitted Constant program in DUST) may be applied. This situation may arise due to the loss of plant material within plots in any one year or where suitable control varieties were not grown in both test cycles. The standard applied for Distinctness in such cases is $P=0.01$.

6 UNIFORMITY

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

Uniformity based on the assessment of 'Off-types'

- 6.2 The assessment of Off-types is undertaken in the first test cycle.
- 6.3 Off-type plants in the glasshouse or field are identified and marked for exclusion from recording.
- 6.4 For cross-pollinated varieties and hybrid varieties (excluding single cross hybrids) relative uniformity standards are applied.
- 6.5 In vegetatively propagated varieties and single cross hybrids, a population standard of 1% with an acceptance probability of at least 95% should be applied. In a population of 60 plants, 2 off-types are allowed.
- 6.6 After the variants have been excluded, the characteristics listed in Section D5 are used to assess the uniformity of the remaining plants, according to the methods described.

Uniformity based on the assessment of general variation where no measurements are recorded:

- 6.7 Uniformity of continuous variation is assessed visually according to the following scale:

Score 1-5	unacceptable (1 is worst)
Score 6-9	acceptable (9 is best)

A candidate with a visual uniformity score of 6 or more is satisfactory.

Uniformity based on the assessment of general variation where measurements are recorded:

- 6.8 Provided a variety meets the off-type standard, it can be considered sufficiently uniform after two, or three, test cycles if, for all measured characters necessary for distinctness, the Combined Over Years Uniformity (COYU) is not significantly greater than that of the reference varieties at the 0.1% ($P=0.001$) significance level. In all cases an examination of data from individual test cycles is carried out to investigate the uniformity problem indicated by the COYU result. Decisions on whether any outlier plants (off-types) identified by data analysis should be excluded from the calculation of variety means and standard deviations, should be taken by the Test Centre.

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, Plant Varieties and Seeds by the specified date. This report will specify all non-routine characteristics used for establishing distinctness.
- 8.2 The final DUS report, including the full variety description, will be submitted to APHA, Plant Varieties and Seeds by the specified date. The characteristics to be used in the description are identified in Section D.

APPENDIX 1.**REFERENCE COLLECTION VARIETIES****1. PLANT BREEDERS RIGHTS**

1.1 The DUS reference collection, for Plant Breeders' Rights purposes, for any given category of plant variety, comprises the following at the time when the application for the candidate is made.

A.1.1.1. 1.2 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).

B.1.1.1. 1.3 Varieties protected in the UK, EC or in a UPOV Member State, which are known to be similar to the candidate variety.

C.1.1.1. 1.4 Other available comparable varieties in common knowledge.