

# PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY

*Solanum tuberosum* L.

# ΡΟΤΑΤΟ

UPOV Code: SOLAN\_TUB

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# 1. SUBJECT OF THE PROTOCOL AND REPORTING

#### 1.1 Scope of the technical protocol

This Technical Protocol applies to all varieties of *Solanum tuberosum* L.

The protocol describes the technical procedures to be followed in order to meet the requirements of Council Regulation 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on documents agreed by the International Union for the Protection of New Varieties of Plants (UPOV), such as the General Introduction to DUS (UPOV Document TG/1/3 http://www.upov.int/export/sites/upov/resource/en/tg 1 3.pdf), its associated TGP documents (http://www.upov.int/tqp/en/) and the relevant UPOV Test Guideline TG/23/7 dated 25/10/2022 (https://www.upov.int/edocs/tgdocs/en/tg023.pdf) for the conduct of tests for Distinctness, Uniformity and Stability.

# 1.2 Entry into Force

The present protocol enters into force on **01.12.2023**. Any ongoing DUS examination of candidate varieties started before the aforesaid date will not be affected by the approval of the Technical Protocol. Technical examinations of candidate varieties are carried out according to the TP in force when the DUS test starts. The starting date of a DUS examination is considered to be the due date for submitting of plant material for the first growing cycle.

In cases where the Office requests to take-over a DUS report for which the technical examination has either been finalized or which is in the process to be carried out at the moment of this request, such report can only be accepted if the technical examination has been carried out according to the CPVO TP which was in force at the moment when the technical examination started.

#### 1.3 Reporting between Examination Office and CPVO and Liaison with Applicant

#### 1.3.1 <u>Reporting between Examination Office and CPVO</u>

The Examination Office shall deliver to the CPVO a preliminary report ("the preliminary report") no later than four weeks after the date of the request for technical examination by the CPVO and in any case preferably before the submission period of the plant material.

The Examination Office shall also deliver to the CPVO a report relating to each growing period ("the interim report") and, when the Examination Office considers the results of the technical examination to be adequate to evaluate the variety or the CPVO so requests, a report relating to the examination ("the final report").

The final report shall state the opinion of the Examination Office on the distinctness, uniformity and stability of the variety. Where it considers those criteria to be satisfied, or where the CPVO so requests, a description of the variety shall be added to the report.

If a report is negative the Examination Office shall set out the detailed reasons for its findings.

The interim and the final reports shall be delivered to the CPVO as soon as possible and no later than on the deadlines as laid down in the designation agreement.

#### 1.3.2 Informing on problems in the DUS test

In cases where the Examination Office identifies issues during the course of the technical examination that may lead to a negative report, the Examination Office shall inform the CPVO and in urgent cases the applicant/holder as soon as such issues become obvious.

#### 1.3.3 <u>Sample keeping in case of problems</u>

As far as feasible the Examination Office shall keep a representative sample of any relevant testing material of the candidate variety and reference variety(ies) if the technical examination has resulted in a negative report. As soon as possible, the CPVO shall inform the Examination Office when the material can be destroyed.

# 2. MATERIAL REQUIRED

#### 2.1 Plant material requirements

Information with respect to the agreed closing dates and submission requirements of plant material for the technical examination of varieties can be found on <a href="https://public.plantvarieties.eu/publication">https://public.plantvarieties.eu/publication</a> in the special issue S2/S3 of the Official Gazette of the Office. General requirements on submission of samples are also to be found following the same link.

#### 2.2 Informing the applicant of plant material requirements

The CPVO informs the applicant that

- he is responsible for ensuring compliance with any customs and plant health requirements.
- the plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.
- the plant material should not have undergone any treatment which would affect the expression of the characteristics
  of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details
  of the treatment must be given.

#### 2.3 Informing about problems on the submission of material

The Examination Office shall report to the CPVO immediately in cases where the test material of the candidate variety has not arrived in time or in cases where the material submitted does not fulfil the conditions laid down in the request for submission of plant material issued by the CPVO.

In cases where the examination office encounters difficulties to obtain plant material of reference varieties the CPVO should be informed in writing.

# 3. METHOD OF EXAMINATION

#### 3.1 Number of growing cycles

The minimum duration of tests should normally be two independent growing cycles.

The testing of a variety may be concluded when the entrusted examination office can determine with certainty the outcome of the test.

## 3.2 Testing Place

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 "Examining Distinctness" <u>http://www.upov.int/edocs/tgpdocs/en/tgp\_9.pdf.</u>

#### 3.3 Conditions for Conducting the Examination

The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

The optimum stage of development for the assessment of each characteristic is indicated by a number in the third column of the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.3

#### 3.4 Test design

3.4.1 Each test should be designed to result in a total of at least 60 plants, which should be divided between at least 2 replicates.

In case of vegetatively propagated varieties the assessment of lightsprout characteristics should be carried out on at least 5 tubers and in case of seed propagated varieties on at least 15 tubers.

3.4.2 The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle.

#### 3.5 Special tests for additional characteristics

In accordance with Article 23 of Implementing Rules N° 874/2009 an applicant may claim either in the Technical Questionnaire or during the test that a candidate has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, a special test may be undertaken providing that a technically acceptable test procedure can be devised.

Special tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characteristics listed in the protocol.

# 3.6 Constitution and maintenance of a variety collection

The process for the constitution and the maintenance of a variety collection can be summarized as follows:

Step 1: Making an inventory of the varieties of common knowledge

Step 2: Establishing a collection ("variety collection") of varieties of common knowledge which are relevant for the examination of distinctness of candidate varieties

Step 3: Selecting the varieties from the variety collection which need to be included in the growing trial or other tests for the examination of distinctness of a particular candidate variety.

#### 3.6.1 Forms of variety collection

For vegetatively propagated varieties, the variety collection shall comprise variety descriptions; no living reference collection is required. The variety description shall be produced by the EO unless special cooperation exists between EOs and the CPVO.

For seed propagated varieties, the variety collection shall comprise variety descriptions and living plant material, thus a living reference collection. The variety description shall be produced by the EO unless special cooperation exists between EOs and the CPVO.

The descriptive and pictorial information produced by the EO shall be held and maintained in a form of a database.

#### 3.6.2 Living Plant Material

For vegetatively propagated varieties, the EO may only obtain living plant material of reference varieties as and when those varieties need to be included in growing trials or other tests. Living plant material of reference varieties identified to be included in the growing trial may be taken from the EO's collection in case there is one or shall be obtained specifically for the growing trial or other tests.

#### 3.6.3 Range of the variety collection

The variety collection shall cover at least those common knowledge varieties that are suitable to grow in the climatic conditions of a respective EO.

#### 3.6.4 <u>Making an inventory of varieties of common knowledge for inclusion in the variety collection</u> The inventory shall include varieties protected under National and Community PBR, varieties registered in the Common Catalogue, the OECD list and the Conservation variety list.

The inventory shall take into account the list of varieties which are the subject of an on-going application for protection or official registration (candidate varieties).

#### 3.6.5 <u>Maintenance and renewal/update of a living variety collection</u>

For seed propagated varieties, the EO shall maintain seeds in conditions which will ensure germination and viability, periodical checks, and renewal as required.

Living material in variety collections representing varieties for which a DUS test was carried out at that EO shall be renewed after verification in a side-by-side comparison. In case where no living material is available anymore in the collection, such verification could be done with any other test that has proven to give similar results between the material in the collection and the new material.

#### 4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY

The prescribed procedure is to assess distinctness, uniformity and stability in a growing trial.

#### 4.1 Distinctness

4.1.1 General recommendations

It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 9 'Examining Distinctness' (<u>http://www.upov.int/edocs/tgpdocs/en/tgp 9.pdf</u>) prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in this Technical Protocol.

Further guidance is provided in documents TGP/9 "Examining Distinctness" and TGP/8 "Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability".

# 4.1.2 Consistent differences

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

# 4.1.3 Clear differences

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Technical Protocols are familiar with the recommendations contained in the UPOV-General Introduction to DUS prior to making decisions regarding distinctness.

#### 4.1.4 Number of plants/parts of plants to be examined

Unless otherwise indicated, for the purposes of distinctness, all observations should be made on all plants in the test, disregarding any off-type plants.

#### 4.1.5 Method of observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the third column of the Table of Characteristics (see document TGP/9 "Examining Distinctness", Section 4 "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

# Type of observation: visual (V) or measurement (M)

"Visual" observation (V) is an observation made on the basis of the expert's judgment. For the purposes of this document, "visual" observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, sideby-side comparison) or non-linear charts (e.g. colour charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, "G" provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

# 4.2 Uniformity

- 4.2.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 10 'Examining Uniformity' (<u>http://www.upov.int/edocs/tgpdocs/en/tgp\_10.pdf</u>) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:
- 4.2.2 For the assessment of uniformity of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 60 plants, 2 off-types are allowed. In case of a sample size of five tubers, no off-type is allowed.

The assessment of uniformity for seed propagated varieties depends on the type of variety and should be according to the recommendations in the UPOV-General Introduction to DUS and in TGP/10, "Examining Uniformity".

# 4.3 Stability

4.3.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 11 'Examining Stability' (<u>http://www.upov.int/edocs/tgpdocs/en/tgp 11.pd</u>)

In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

4.3.2 Where appropriate, or in cases of doubt, stability may be further examined by testing a new seed or plant stock to ensure that it exhibits the same characteristics as those shown by the initial material supplied.

#### 5. GROUPING OF VARIETIES AND ORGANISATION OF THE GROWING TRIAL

- **5.1** The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.
- **5.2** Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organise the growing trial so that similar varieties are grouped together.
- **5.3** The following have been agreed as useful grouping characteristics:
  - a) Lightsprout: proportion of blue in anthocyanin coloration of base (characteristic 4)
  - b) Corolla: intensity of anthocyanin coloration of inner side (characteristic 27)
  - c) Corolla: proportion of blue in anthocyanin coloration on inner side (characteristic 28)
  - d) Plant: time of maturity (characteristic 31)
  - e) Tuber: colour of skin (characteristic 34)
- **5.4** If characteristics other than those mentioned in the list of grouping characteristics and/or from the table of characteristics and/or from the Technical Questionnaire sections 5 and 7. are used for the selection of varieties to be included into the growing trial, the EO shall inform the CPVO and seek the prior consent of the CPVO before using these characteristics.
- **5.5** Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the UPOV-General Introduction to DUS and document TGP/9 "Examining Distinctness".

# 6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS

#### 6.1 Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in the table of characteristics. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted or by specific legislation on plant health. In the latter case, the CPVO should be informed.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation N°874/2009, to insert additional characteristics and their expressions in respect of a variety.

#### 6.2. States of expression and corresponding notes

States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description. All relevant states of expression are presented in the characteristic.

Further explanation of the presentation of states of expression and notes is provided in UPOV document TGP/7 "Development of Test Guidelines".

# 6.3 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

# 6.4 Legend

For column	<u>'CPVO N°</u> ':	
G	Grouping characteristic	-see Chapter 5
QL	Qualitative characteristic	
QN	Quantitative characteristic	
PQ	Pseudo-qualitative characteristic	
(+)	Explanations for individual characteristics	-see Chapter 8.2
For column	<u>'UPOV Nº'</u> :	
The numbe	ring of the characteristics is provided as a reference to th	ne UPOV guideline.

 (\*) UPOV Asterisked characteristic
 - Characteristics that are important for the international harmonization of variety descriptions.

MG, MS, V	G, VS	-see Chapter 4.1.5
(a)-(e)	Explanations covering several Characteristics	-see Chapter 8.1
00-99	Explanations on growth stages	-see Chapter 8.3

# 7. TABLE OF CHARACTERISTICS

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
1.	1.		Lightsprout: size		
QN		VG	very small		1
		(a)	very small to small		2
			small	Laura	3
			small to medium		4
			medium	Diamant, Victoria	5
			medium to large		6
			large	Solist	7
			large to very large		8
			very large		9
2. (+)	2. (*)		Lightsprout: shape of base		
PQ		VG	globose	Albatros	1
		(a)	ovoid	Laura	2
			conic	Bintje, Solist	3
			broad cylindrical	Diamant, Innovator	4
			narrow cylindrical	Cecile	5
3.	3. (*)		Lightsprout: anthocyanin coloration of base		
QN		VG	absent or very weak	Estima	1
		(a), (b)	very weak to weak		2
			weak	Solist	3
			weak to medium		4
			medium	Arielle	5
			medium to strong		6
			strong	Abbot, Victoria	7
			strong to very strong		8
			very strong	Agria, Red Emmalie	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
4. (+)	4. (*)		Lightsprout: proportion of blue in anthocyanin coloration of base		
QN		VG	absent or low	Arielle, Solist, Victoria	1
		(a)	medium	Abbot	2
G			high	Agria, Purple Majesty	3
5. (+)	5. (*)		Lightsprout: hairiness of base		
QN		VG	absent or very sparse	Slaney	1
		(a)	very sparse to sparse		2
			sparse	Goldmarie	3
			sparse to medium		4
			medium	Albatros, Laura	5
			medium to dense		6
			dense	Abbot	7
			dense to very dense		8
			very dense	Oxania	9
6. (+)	6.		Lightsprout: size of apex in relation to base		
QN		VG	very small		1
		(a)	very small to small		2
			small	Laura	3
			small to medium		4
			medium	Albatros, King Edward	5
			medium to large		6
			large	Abbot	7
			large to very large		8
			very large		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
7. (+)	7.		Lightsprout: habit of apex		
QN		VG	closed	Laura	1
		(a)	closed to intermediate		2
			intermediate	Arielle	3
			intermediate to open		4
			open	Diamant, Solist	5
8.	8.		Lightsprout: anthocyanin coloration of apex		
QN		VG	absent or very weak	Estima, Innovator	1
		(a), (b)	very weak to weak		2
			weak	Solist	3
			weak to medium		4
			medium	Laura, Spunta	5
			medium to strong		6
			strong	Agria	7
			strong to very strong		8
			very strong	Blaue St. Galler	9
9. (+)	9.		Lightsprout: hairiness of apex		
QN		VG	absent or very sparse	Goldmarie	1
		(a)	very sparse to sparse		2
			sparse	Laura	3
			sparse to medium		4
			medium	Albatros	5
			medium to dense		6
			dense	Abbot	7
			dense to very dense		8
			very dense	Camilla	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
10.	10. (*)		Lightsprout: number of root tips		
QN		VG	very few		1
		(a)	very few to few		2
			few	Estima, Solist	3
			few to medium		4
			medium	Arielle, Bintje	5
			medium to many		6
			many	Innovator	7
			many to very many		8
			very many		9
11. (+)	11.		Lightsprout: length of lateral shoots		
QN		VG	very short		1
		(a)	very short to short		2
			short	Laura, Producent	3
			short to medium		4
			medium	Estima, Princess	5
			medium to long		6
			long	Spunta	7
			long to very long		8
			very long		9
12. (+)	12.	51-69	Plant: foliage structure		
QN		VG	stem type	Agria, Estima	1
			intermediate type	Premiere	2
			leaf type	Kennebec	3

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
13. (+)	13. (*)	51-69	Plant: growth habit		
QN		VG	upright	Victoria	1
			upright to semi-upright		2
			semi-upright	Desiree, Secura	3
			semi-upright to spreading		4
			spreading	Solist	5
14. (+)	14. (*)	51-69	Stem: anthocyanin coloration		
QN		VG	absent or very weak	Estima	1
		(b)	very weak to weak		2
			weak	Victoria	3
			weak to medium		4
			medium	Laura, Saturna	5
			medium to strong		6
			strong	Desiree	7
			strong to very strong		8
			very strong	Blaue St. Galler, Vitelotte Noir	9
15.	15.	51-69	Leaf: size		
QN		VG	very small		1
		(c)	very small to small		2
			small	King Edward	3
			small to medium		4
			medium	Laura	5
			medium to large		6
			large	Kennebec	7
			large to very large		8
			very large		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
16. (+)	16.	51-69	Leaf: arrangement of leaflets		
QN		VG	overlapping	Albatros	1
		(c)	overlapping to touching		2
			touching	Premiere, Solist	3
			touching to free		4
			free	Goldmarie	5
17. (+)	17.	51-69	Leaf: number of secondary leaflets		
QN		VG	very few		1
		(c)	very few to few		2
			few	Goldmarie	3
			few to medium		4
			medium	Solist	5
			medium to many		6
			many	Victoria	7
			many to very many		8
			very many		9
18. (+)	18.	51-69	Leaf: intensity of green colour		
QN		VG	very light		1
			very light to light		2
			light	Solist	3
			light to medium		4
			medium	Kuras, Victoria	5
			medium to dark		6
			dark	Spunta	7
			dark to very dark		8
			very dark		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
19. (+)	19.	51-69	Leaf: anthocyanin coloration of midrib		
QN		VG	absent or very weak	Solist	1
		(b), (c)	very weak to weak		2
			weak	Russet Burbank	3
			weak to medium		4
			medium	Laura	5
			medium to strong		6
			strong	Romanze	7
			strong to very strong		8
			very strong	Bildtstar, Roseval	9
20. (+)	20.	51-69	Second pair of lateral leaflets: width in relation to length		
QN		VG	very narrow		
		(c)	very narrow to narrow		
			narrow	Innovator, Russet Burbank	3
			narrow to medium		
			medium	Desiree	5
			medium to broad		
			broad	Cayenne	7
			broad to very broad		8
			very broad		9
21. (+)	21.	51-69	Terminal and lateral leaflets: frequency of coalescence		
QN		VG	absent or very few	Courage	1
			few		2
			medium	Goldmarie	3
			many		4
			very many	Cardinia	5

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
22. (+)	22.	55	Flower bud: anthocyanin coloration		
QN		VG	absent or very weak	Solist	1
		(b)	very weak to weak		2
			weak	Pompadour	3
			weak to medium		4
			medium	Victoria	5
			medium to strong		6
			strong	Osprey	7
			strong to very strong		8
			very strong	Blaue St. Galler, Cayenne	9
23. (+)	23. (*)	60-69	Plant: number of inflorescences		
QN		VG	absent or very few	King Edward	1
			very few to few		2
			few	Arielle	3
			few to medium		4
			medium	Laura	5
			medium to many		6
			many	Agria, Innovator	7
			many to very many		8
			very many	Euroresa	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
24. (+)	24.	60-69	Inflorescence: size		
QN		VG	very small		1
		(d)	very small to small		2
			small	Estima, Solist	3
			small to medium		4
			medium	Goldmarie	5
			medium to large		6
			large	Innovator, Victoria	7
			large to very large		8
			very large		9
25.	25.	60-69	Peduncle: anthocyanin coloration		
QN		VG	absent or very weak	Estima, Solist	1
		(b), (d)	very weak to weak		2
			weak	Victoria	3
			weak to medium		4
			medium	Saturna	5
			medium to strong		6
			strong	Desiree	7
			strong to very strong		8
			very strong	Blaue St. Galler	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
26.	26.	60-69	Corolla: diameter		
QN		VG	very small		1
		(d)	very small to small		2
			small	Sommergold	3
			small to medium		4
			medium	Laura	5
			medium to large		6
			large	Innovator	7
			large to very large		8
			very large	Roseval	9
27.	27. (*)	60-69	Corolla: <u>intensity</u> of anthocyanin coloration on inner side		
QN		VG	absent or very weak	Solist	1
		(b), (d)	very weak to weak		2
			weak	Laura, Pirol, Secura	3
			weak to medium		4
			medium	Osprey, Quadriga	5
			medium to strong		6
			strong	Courage	7
			strong to very strong		8
G			very strong	Ramona	9
28. (+)	28. (*)	60-69	Corolla: proportion of blue in anthocyanin coloration on inner side		
QN		VG	absent or low	Laura, Osprey	1
		(d)	medium	Courage, Secura	2
G			high	Pirol, Quadriga	3

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
29.	29. (*)	60-69	Corolla: <u>extent</u> of anthocyanin coloration on inner side		
QN		VG	absent or very small	Vitelotte Noir	1
		(d)	very small to small		2
			small	Laura	3
			small to medium		4
			medium	Pirol	5
			medium to large		6
			large	Bildtstar	7
			large to very large		8
			very large	Courage	9
30.	30.	65-69	Plant: height		
QN		VG	very short	Mimi	1
			short		2
			medium	Arielle, Leyla	3
			tall		4
			very tall	Agria, Pirol	5
31. (+)	31. (*)	97	Plant: time of maturity		
QN		MG	very early	Leyla, Solist	1
			very early to early		2
			early	Princess	3
			early to medium		4
			medium	Laura	5
			medium to late		6
			late	Euroresa	7
			late to very late		8
G			very late	Kuras, Producent	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
32. (+)	32. (*)	99	Tuber: form		
QN		MS/VG	round		1
		(e)	short-oval	Courage	2
			oval	Diamant, Ramona	3
			long-oval	Innovator	4
			long	Spunta	5
			very long	Pompadour	6
33.	33.	99	Tuber: depth of eyes		
QN		VG	very shallow	Nadine	1
		(e)	very shallow to shallow		2
			shallow	Agria, Innovator	3
			shallow to medium		4
			medium	Courage	5
			medium to deep		6
			deep	Kuras, Sommergold	7
			deep to very deep		8
			very deep	Vitelotte Noir	9
34.	34. (*)	99	Tuber: colour of skin		
PQ		VG	light yellow brown	Nadine	1
		(e)	yellow	Agria, Solist	2
			orange brown	Velur	3
			light red	Bildtstar	4
			medium red	Laura	5
			dark red	Romanze	6
			mottled red	Cara	7
			blue violet	Blaue St. Galler, Vitelotte Noir	8
G			mottled blue violet	Catriona, Kestrel	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
35.	35.	99	Tuber: texture of skin		
QN		VG	smooth	Laura	1
		(e)	medium	Solist	2
			rough	Ivory Russet, Russet Burbank	3
36. (+)	36. (*)	99	Tuber: colour of base of eye		
QN		VG	white	Nadine	1
		(e)	yellow	Agria, Solist	2
			red	Quarta, Romanze	3
			blue	Double Fun, Vitelotte Noir	4
37. (+)	37. (*)	99	Tuber: colour of flesh		
PQ		VG	white	Kuras, Russet Burbank	1
		(e)	yellowish white	Desiree, Estima	2
			light yellow	Diamant, Solist	3
			medium yellow	Bildtstar, Quarta	4
			dark yellow	Laura, Princess	5
			red	Red Emmalie	6
			red parti-coloured	Early Rose	7
			blue violet	Purple Majesty	8
			blue violet parti-coloured	Double Fun	9

# 8. EXPLANATIONS ON THE TABLE OF CHARACTERISTICS

#### 8.1 Explanations covering several characteristics

Characteristics containing the following key in the third column of the Table of Characteristics should be examined as indicated below:

a) Observations should be made on submitted tubers. In case of submitted seeds, observations should be made on harvested tubers.

Observations should be made on lightsprouts grown according to the following method:

The spectrum and the intensity of the light source are the most important factors for the expression of lightsprouts characteristics. This spectrum is defined by the type of lamps and the voltage used. When extremes of temperature are avoided, the influence of the temperature on the speed of development is small. A good expression of the characteristics is obtained when the lightsprouts are grown in a light-sealed cabinet at room temperature under continuous light provided by small incandescent bulbs (6V AC/0.05 A) giving an intensity of 7 to 11 lux (approximately 8 bulbs per square meter, 20-30 cm above the tubers). The temperature should be around 20C° and relative humidity should be 50 to 70%.

Observations should be made in a room with indirect daylight when the characteristics 7 (habit of apex) and 11 (length of lateral shoots) have reached their maximum differentiation. Example varieties should be used to determine the optimal stage for observations.

The development of lightsprouts depends on the time of test after harvest. Development increases with age of tubers. If the test is started already about 100 days after harvest, the appropriate stage for observations might be reached only after about 14 weeks due to dormancy and/or slow development. If the test is started later, the appropriate stage for observations might be reached after a shorter period.



b) The intensity of the anthocyanin coloration should be observed. The extent and the distribution should not be considered.

c) Observations should be made on fully developed leaves from the center of the plant. One leaf from each of 10 plants should be picked from a main stem halfway between the top and the bottom of the plant.



- d) Observations of flower color should be made on the inner side of freshly opened flowers, the best moment is early in the morning.
- e) Observations should be made within four weeks after harvest. Tubers should be shielded from sunlight as this may have an effect on the colour.

# 8.2 Explanations for individual characteristics

Ad. 2: Lightsprout: shape of base











lrical narrow cylindrical

broad cylindrical

# Ad. 4: Lightsprout: proportion of blue in anthocyanin coloration of base

The color of anthocyanin results from a red and a 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.

#### Ad. 5: Lightsprout: hairiness of base

It is recommended to use a magnifier.

Hairiness is not always evenly distributed over the lightsprout. The total amount of hairiness of the base should be averaged over the total area of the lightsprout base.

#### Ad. 6: Lightsprout: size of apex in relation to base

The size of the apex should be examined in relation to the size of the base. The following table gives an indication between notes and ratio between size of tip and base:

note	ratio size tip: size base
1	10:90
2	20:80
3	30:70
4	40:60
5	50:50
6	60:40
7	70:30
8	80:20
9	90:10

# Ad. 7: Lightsprout: habit of apex



#### Ad. 9: Lightsprout: hairiness of apex

It is recommended to use a magnifier.

Hairiness is not always evenly distributed over the lightsprout. The total amount of hairiness of the apex should be averaged over the total area of the lightsprout apex.

# Ad. 11: Lightsprout: length of lateral shoots



# Ad. 12: Plant: foliage structure





1 upright

Seedlings have only one main stem. For varieties grown from seed, the attitude of the lower branches should be taken into account.

semi-upright

# Ad. 14: Stem: anthocyanin coloration

Observations should be made on the lower three-quarters of the stems.

spreading

# Ad. 16: Leaf: arrangement of leaflets



# Ad. 18: Leaf: intensity of green colour

Observations should be made on fully developed leaves in the center of the plant, preferably not in direct sunlight.

# Ad. 19: Leaf: anthocyanin coloration of midrib

Observations should be made on the upper side of the leaf.

Ad. 20: Second pair of lateral leaflets: width in relation to length



Ad. 21: Terminal and lateral leaflets: frequency of coalescence

Observations should be made on fully developed leaves throughout the whole plant.



# Ad. 22: Flower bud: anthocyanin coloration

Observations should be made on fully developed buds before the corolla is visible.

# Ad. 23: Plant: number of inflorescence

During the flowering period, the plots are observed several times and the number is scored. The highest score reached is noted as the final state of expression.

# Ad. 24: Inflorescence: size

The general impression of the whole plot is observed.

# Ad. 28: Corolla: proportion of blue in anthocyanin coloration on inner side

The colour of anthocyanin results from a red and a 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.

# Ad. 31: Plant: time of maturity

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

#### Ad. 32: Tuber: form

The form is defined by length to width ratio. The predominant form should be observed. In case of MS, observations should be made on at least 20 plants.



# Ad. 36: Tuber: colour of base of eye

Not applicable for varieties with particolored skin (note 7 and 9 in characteristic 34: Tuber: colour of skin).

#### Ad. 37: Tuber: colour of flesh

Observations should be made on freshly cut tubers. A few minutes after cutting the tuber, the flesh may start to discolour.

# 8.3 Phenological growth stages and BBCH-identification keys of potato

Codes	Description
Principal gr	owth stage 0: Sprouting/Germination
Principal ar	rowth stage 1: Leaf development
Principal gr stem)	rowth stage 2: Formation of basal side shoots below and above soil surface (main
Principal gr	owth stage 3: Main stem elongation (crop cover)
Principal or	rowth stage 4: Tuber formation
Dringing or	which stage EL Inflorescence (sume) emergence
51	First individual huds (1–2 mm) of first inflorescence visible (main stem)
55	Ruds of first inflorescence extended to 5 mm
59	First flower netals of first inflorescence visible
Principal or	rowth stage 6: Flowering
60	First open flowers
61	Beginning of flowering about 10% of flowers in the first inflorescence oper (main stem)
 65	Full flowering: 50% of flowers in the first inflorescence open
 68	80% of flowers in the first inflorescence open
69	End of flowering in the first inflorescence
Principal gr	rowth stage 7: Development of fruit
Principal gr	owth stage 8: Ripening of fruit and seed
Principal ar	rowth stage 9: Senescence
91	Beginning of leaf yellowing
93	Most of the leaves yellowish
95	50% of the leaves brownish
97	Leaves and stem dead, stems bleached and dry
99	Harvested product

# 9. LITERATURE

Meier, U. (ed.), 1997: Growth stages of mono- and dicotyledonous plants / Entwicklungsstadien mono- und dikotyler Pflanzen / Estadios de las plantas mono- y dicotiledóneas / Stades phénologiques des mono- et dicotylédones cultivées: BBCH-Monograph. Blackwell Wissenschaftsverlag, Berlin, Wien.

# 10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the <u>CPVO website</u> under the following reference: CPVO/TQ-023/4 – *Solanum tuberosum* L. - potato

Link to e-TQ:

https://online.plantvarieties.eu/backOfficeFormQuestions?viewFormId=15013&viewFormType=TQ&viewFormLang=E N&speciesIds=SOL04&status=1,2&order=formName