



## **PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY**

***Cichorium intybus* L. partim**

**INDUSTRIAL CHICORY**

UPOV Code: CICHO\_INT

**Adopted on 28/01/2025**

**Entry into force on 20/02/2025**

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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 *Cichorium intybus* L. partim of the family *Asteraceae*, excluding witloof (CPVO/TP-173/2) and leaf chicory (CPVO/TP-154/2-Rev).

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](http://www.upov.int/export/sites/upov/resource/en/tg_1_3.pdf)), its associated TGP documents (<http://www.upov.int/tgp/en/>) and the relevant UPOV Test Guideline TG/172/4 Rev. dated 09/08/2024 (<https://www.upov.int/edocs/tgdocs/en/tg172.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

### 1.2 Entry into Force

The present protocol enters into force on **20.02.2025**. 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 Reporting between Examination Office and CPVO

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 Sample keeping in case of problems

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 <https://public.plantvarieties.eu/publication> 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/she is responsible for ensuring compliance with any customs and plant health requirements;
- the plant material supplied should be visibly healthy, not lacking in vigour, 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" [http://www.upov.int/edocs/tqpdocs/en/tqp\\_9.pdf](http://www.upov.int/edocs/tqpdocs/en/tqp_9.pdf).

### **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.

### **3.4 Test design**

3.4.1 Each test should be designed to result in a total of at least 100 plants, which should be divided between at least 2 replicates.

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

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

The EO shall collect and maintain living plant material of varieties of the species concerned in the variety collection.

#### 3.6.3 Range of the variety collection

The living 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 Making an inventory of varieties of common knowledge for inclusion in the variety collection

The inventory shall include varieties protected under National and Community PBR, varieties registered in the Common Catalogue, the OECD list, the Conservation variety list and varieties in trade or in commercial registers for those species not covered by a National or the Common Catalogue.

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 Maintenance and renewal/update of a living variety collection

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' ([http://www.upov.int/edocs/tgpdocs/en/tgp\\_9.pdf](http://www.upov.int/edocs/tgpdocs/en/tgp_9.pdf)) 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 on single plants should be made on 40 plants or parts taken from each of 40 plants and any other observations 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, side-by-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' ([http://www.upov.int/edocs/tgpdocs/en/tgp\\_10.pdf](http://www.upov.int/edocs/tgpdocs/en/tgp_10.pdf)) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:

4.2.2 This Technical Protocol has been developed for the examination of seed propagated varieties. For varieties with other types of propagation the recommendations in the UPOV-General Introduction to DUS and document TGP/13 "Guidance for new types and species", Section 4.5 "Testing Uniformity" should be followed.

4.2.3 The assessment of uniformity for cross-pollinated varieties should be according to the recommendations for cross-pollinated varieties in the UPOV-General Introduction to DUS.

4.2.4 For the assessment of uniformity of open-pollinated varieties, relative uniformity standards should be used.

4.2.5 For the assessment of uniformity of hybrid varieties relative uniformity standards should be applied, excluding clearly recognisable inbred plants. For these clearly recognisable inbred plants a population standard of 3% with an acceptance probability of at least 95% should be applied.

## 4.3 **Stability**

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' ([http://www.upov.int/edocs/tgpdocs/en/tgp\\_11.pdf](http://www.upov.int/edocs/tgpdocs/en/tgp_11.pdf))

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.

Where appropriate, or in cases of doubt, stability may be further examined by testing a new seed 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) Ploidy (characteristic 1)
  - b) Leaf: length (characteristic 4)
  - c) Leaf: intensity of green colour (characteristic 6)
  - d) Root: length (characteristic 14)
  - e) Male sterility (22)
- 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 'CPVO N°':

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 'UPOV N°':

The numbering of the characteristics is provided as a reference to the UPOV guideline.

(*)	UPOV Asterisked characteristic	- Characteristics that are important for the international harmonization of variety descriptions.
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### For column 'Stage, method':

MG, MS, VG, VS		-see Chapter 4.1.5
(a)-(b)	Explanations covering several Characteristics	-see Chapter 8.1

## 7. TABLE OF CHARACTERISTICS

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>1.</b> <b>(*)</b>	<b>1.</b> <b>(*)</b>	<b>MS/MG</b> <b>/VG</b>	<b>Ploidy</b>		
<b>(+)</b>			diploid	Turquoise	2
<b>QL</b>			triploid	Perle	3
<b>G</b>			tetraploid		4
<b>2.</b> <b>(+)</b>	<b>2.</b> <b>(*)</b>	<b>VG</b>	<b>Plant: height (at end of first growing season)</b>		
<b>QN</b>			very short		1
			very short to short		2
			short	Perle	3
			short to medium		4
			medium	Orchies	5
			medium to tall		6
			tall	Katrien, Luxor	7
			tall to very tall		8
			very tall		9
<b>3.</b>	<b>3.</b> <b>(*)</b>	<b>VG</b>	<b>Foliage: attitude</b>		
<b>QN</b>			erect	Luxor, Madona, Rubis	1
			erect to semi-erect		2
			semi-erect	Fruitosa, Orchies	3
			semi-erect to horizontal		4
			horizontal		5

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note		
<b>4. (+)</b>	<b>4. (*)</b>	<b>VG</b>	<b>Leaf: length</b>				
			<b>QN</b>	<b>(a)</b>	very short		1
					very short to short		2
					short	Perle	3
					short to medium		4
					medium	Orchies	5
					medium to long		6
					long	Jade, Luxor	7
					long to very long		8
<b>G</b>		very long		9			
<b>5. (+)</b>	<b>5. (*)</b>	<b>VG</b>	<b>Leaf: width</b>				
			<b>QN</b>	<b>(a)</b>	very narrow		1
					very narrow to narrow		2
					narrow	Eva, Luxor, Vanessa	3
					narrow to medium		4
					medium	Rubis	5
					medium to broad		6
					broad	Jade	7
					broad to very broad		8
		very broad		9			

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>6.</b>	<b>6.</b>	<b>VG</b>	<b>Leaf: intensity of green colour</b>		
<b>QN</b>	<b>(*)</b>	<b>(a)</b>	very light		1
			very light to light		2
			light	Eva	3
			light to medium		4
			medium	Katrien	5
			medium to dark		6
			dark	Madona, Rubis	7
			dark to very dark		8
<b>G</b>			very dark		9
<b>7.</b>	<b>7.</b>	<b>VG</b>	<b>Leaf: glossiness</b>		
<b>QN</b>		<b>(a)</b>	absent or very weak		1
			very weak to weak		2
			weak	Luxor	3
			weak to medium		4
			medium	Rubis	5
			medium to strong		6
			strong		7
			strong to very strong		8
			very strong		9
<b>8.</b>	<b>8.</b>	<b>VG</b>	<b>Leaf: shape in cross section</b>		
<b>QN</b>		<b>(a)</b>	concave		1
			flat	Luxor, Madona	2
			convex		3

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>9.</b> <b>QN</b>	<b>9.</b>	<b>VG</b> <b>(a)</b>	<b>Leaf: blistering</b>		
			absent or very weak		1
			very weak to weak		2
			weak	Luxor	3
			weak to medium		4
			medium	Bergues	5
			medium to strong		6
			strong	Cassel	7
			strong to very strong		8
		very strong		9	
<b>10.</b> <b>QN</b>	<b>10.</b>	<b>VG</b> <b>(a)</b>	<b>Leaf: anthocyanin coloration of midrib</b>		
			absent or very weak	Bergues	1
			very weak to weak		2
			weak	Luxor, Rubis	3
			weak to medium		4
			medium		5
			medium to strong		6
			strong		7
			strong to very strong		8
		very strong		9	

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>11.</b> <b>QN</b>	<b>11.</b>	<b>VG</b> <b>(a)</b>	<b>Leaf: undulation of margin</b>		
			absent or very weak		1
			very weak to weak		2
			weak	Madona, Rubis	3
			weak to medium		4
			medium	Marlene	5
			medium to strong		6
			strong		7
			strong to very strong		8
			very strong		9
<b>12.</b> <b>QN</b>	<b>12.</b>	<b>VG</b> <b>(a)</b>	<b>Leaf: number of incisions of margin</b>		
			absent or very few	Luxor	1
			very few to few		2
			few	Marlene, Rubis	3
			few to medium		4
			medium	Katrien	5
			medium to many		6
			many		7
			many to very many		8
			very many		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>13.</b>	<b>13.</b>	<b>VG</b>	<b>Leaf: depth of incisions of margin</b>		
<b>QN</b>		<b>(a)</b>	very shallow		1
			very shallow to shallow		2
			shallow	Bergues	3
			shallow to medium		4
			medium		5
			medium to deep		6
			deep	Capucijnerbaard	7
			deep to very deep		8
			very deep		9
<b>14.</b>	<b>14. (*)</b>	<b>MS</b>	<b>Root: length</b>		
<b>QN</b>		<b>(b)</b>	very short		1
			very short to short		2
			short		3
			short to medium		4
			medium	Madona, Marlene	5
			medium to long		6
			long	Magdeburger Spitzkopf	7
			long to very long		8
<b>G</b>			very long		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>15.</b>	<b>15.</b>	<b>MS</b>	<b>Root: maximum width</b>		
	<b>(*)</b>				
<b>QN</b>		<b>(b)</b>	very narrow		1
			very narrow to narrow		2
			narrow	Magdeburger Spitzkopf	3
			narrow to medium		4
			medium	Luxor, Rubis	5
			medium to broad		6
			broad	Bergues	7
			broad to very broad		8
			very broad		9
<b>16.</b>	<b>16.</b>	<b>VG</b>	<b>Root: shape of shoulder</b>		
<b>(+)</b>	<b>(*)</b>				
<b>PQ</b>		<b>(b)</b>	flat	Luxor	1
			slightly rounded	Madona, Rubis	2
			moderately rounded		3
			conical	Magdeburger Spitzkopf	4
<b>17.</b>	<b>17.</b>	<b>MG</b>	<b>Root: total sugar content</b>		
<b>(+)</b>					
<b>QN</b>		<b>(b)</b>	very low	Sabau 3	1
			very low to low		2
			low	Luxor, Markise	3
			low to medium		4
			medium	Brinco, Orchies, Vanessa	5
			medium to high		6
			high	Dageraad, Fredonia, Katrien, Marlene	7
			high to very high		8
			very high	Eva	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>18.</b>	<b>18.</b>	<b>VG</b>	<b>Bolting tendency (from an early sowing)</b>		
<b>QN</b>	<b>(*)</b>		absent or very weak	Katrien, Orchies	1
			very weak to weak		2
			weak	Bergues, Marlene	3
			weak to medium		4
			medium	Madona	5
			medium to strong		6
			strong	Vanessa	7
			strong to very strong		8
			very strong	Inula	9
<b>19.</b>	<b>19.</b>	<b>VG</b>	<b>Flowering stem: height</b>		
<b>QN</b>			very short		1
			very short to short		2
			short		3
			short to medium		4
			medium		5
			medium to tall		6
			tall		7
			tall to very tall		8
			very tall		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
<b>20.</b>	<b>20.</b>	<b>VG</b>	<b>Flowering stem: branching</b>		
<b>QN</b>			absent or very weak		1
			very weak to weak		2
			weak		3
			weak to medium		4
			medium		5
			medium to strong		6
			strong		7
			strong to very strong		8
			very strong		9
<b>21.</b>	<b>21.</b>	<b>VG</b>	<b>Flower: colour</b>		
<b>PQ</b>			white		1
			pink		2
			blue	Luxor	3
<b>22. (+)</b>	<b>22.</b>	<b>VS</b>	<b>Male sterility</b>		
<b>QL</b>			absent	Luxor	1
<b>G</b>			present	Turquoise	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) All observations on the leaf should be made on the full-grown leaf before deterioration, this means 2 to 3 weeks before harvesting the roots.
- (b) All observations on the root should be made immediately after harvesting

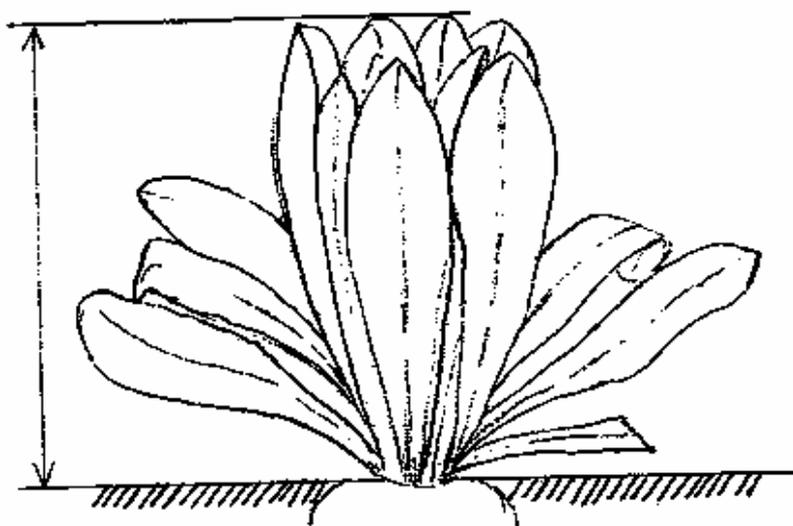
### 8.2 Explanations for individual characteristics

#### Ad. 1: Ploidy

Observations should be made by standard cytological methods such as flow cytometry (DNA quantification method).

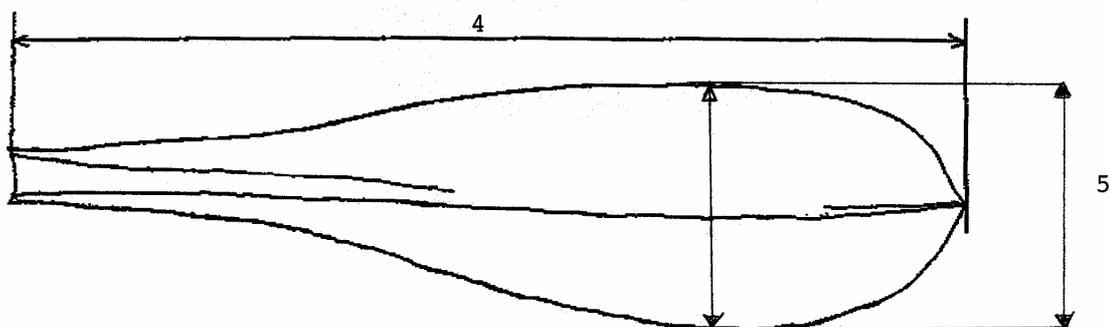
Observations should be made on at least 5 plants.

#### Ad. 2: Plant: height (at end of first growing season)

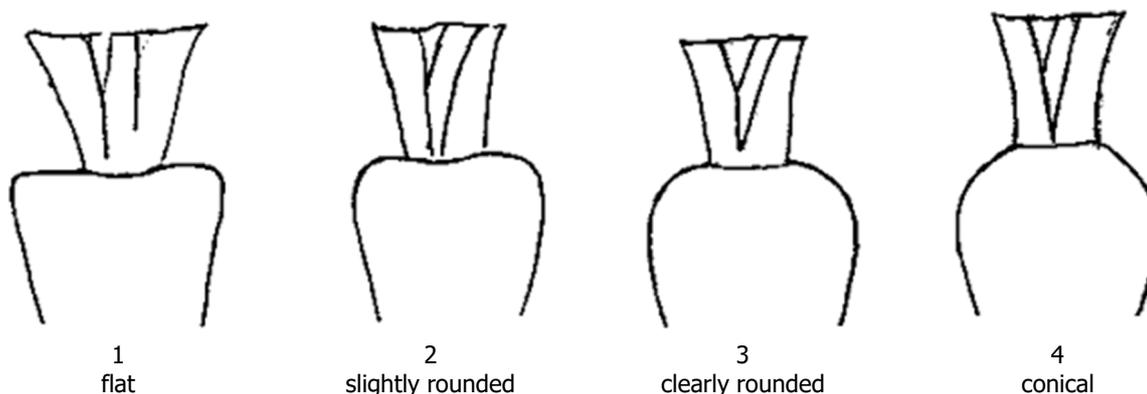


#### Ad. 4: Leaf: length

#### Ad. 5: Leaf: width



Ad. 16: Root: shape of shoulder



Ad. 17: Root: total sugar content

The total sugar content should be measured on the basis of bulk samples, within one week of the roots being harvested.

A sample of 25 roots should be taken randomly from each plot. The roots should be thoroughly washed and all impurities should be removed.

A representative sub-sample of pulp is produced by taking small quantities of material from throughout each of the roots i.e. from the top to the base, at equal distances, and from the outer to the central part of the root. This can be achieved, for example, by making incisions to the centre of the root at 2-3 cm intervals along the length of each root.

The sub-sample of pulp is homogenized and the resultant juice is then filtered under pressure. Readings for the juice are then taken from a refractometer. Three separate readings should be taken to obtain a representative result.

Ad. 22: Male sterility

Check presence of pollen on stamen:

- (a) if pollen on stamen is present than male sterility is absent;
- (b) if pollen on stamen is absent than male sterility is present

## 9. LITERATURE

Frese, L., Dambroth, M. and Bramm, A., 1991: Breeding Potential of Root Chicory (*Cichorium intybus* L. var. *sativum*), *Plant Breeding* 106, 107-113.

## 10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the [CPVO website](#) under the following reference:  
CPVO/TQ-172/2-Rev – *Cichorium intybus* L. partim – industrial chicory