



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

***Citrus* L. – Group 1**

**MANDARINS**

UPOV Code: CITRU, CITRU\_RET, CITRU\_UN

**Adopted on 19/04/2016**

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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 **Citrus L. – Group 1**.

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/en/publications/intro\\_dus.htm](http://www.upov.int/en/publications/intro_dus.htm)), its associated TGP documents (<http://www.upov.int/en/publications/tgp/>) and the relevant UPOV Test Guideline TG/201/1 Rev. dated 25/03/2015 (<http://www.upov.int/edocs/tgdocs/en/tg201.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

#### GROUP 1 – ALTERNATIVE NAMES AND CORRESPONDING SUBGROUPS\*

<i>Botanical taxon</i>	<i>Subgroup</i>	<i>Common name</i>
<i>Citrus amblycarpa</i> (Hassk.) Ochse	HMA	
<i>Citrus benikoji</i> hort. ex Tanaka	PMN	
<i>Citrus chuana</i> hort. ex Tseng	PMN	
<i>Citrus clementina</i> hort. ex Tan.	CLE	Clementine
<i>Citrus crenatifolia</i> Lush.	PMN	
<i>Citrus deliciosa</i> Ten.	MMM	Mediterranean Mandarin
<i>Citrus depressa</i> Hayata	HMA	
<i>Citrus genshokan</i> (Hayata) hort. ex Tanaka	PMN	
<i>Citrus hainanensis</i> Tanaka	HMA	
<i>Citrus haniana</i> hort. ex Tseng	PMN	
<i>Citrus ichangensis</i> Swing. x <i>C. reticulata</i> Blanco	HMR	Ichandarin
<i>Citrus ichangensis</i> Swing. x <i>C. unshiu</i> (Mak.) Marc.	HMR	Ichandarin
<i>Citrus inflata</i> hort. ex Tanaka	HMA	
<i>Citrus inflatorugosa</i> hort. ex Tanaka	HMA	
<i>Citrus keraji</i> hort. ex Tanaka	HMA	
<i>Citrus leiocarpa</i> hort. ex Tanaka	HMA	
<i>Citrus lycopersicaeformis</i> (Lush.) hort. ex Tanaka	HMA	
<i>Citrus madurensis</i> Lour.	HMA	Calamondin
<i>Citrus maxima</i> (Burm.) Merr. x <i>C. ichangensis</i> Swing.	HMR	Ichangelo
<i>Citrus nippokoreana</i> Tanaka	HMA	
<i>Citrus nobilis</i> Lour.	HMA	
<i>Citrus oto</i> hort. ex Yu. Tanaka	HMA	
<i>Citrus paratangerina</i> hort. ex Tanaka	PMN	
<i>Citrus platymamma</i> hort. ex Tanaka	PMN	
<i>Citrus pseudo-aurantium</i> hort. ex Yu. Tanaka	HMA	
<i>Citrus pseudosunki</i> hort. ex Tanaka	HMA	
<i>Citrus reshni</i> hort. ex Tanaka	HMA	
<i>Citrus reticulata</i> Blanco	PMN	Tangerine
<i>Citrus reticulata</i> Blanco x <i>C. paradisi</i> Macfad	TNL	Tangelo

\* These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV Code, which can be found on the UPOV Web Site ([www.upov.int](http://www.upov.int)), for the latest information.]

<i>Botanical taxon</i>	<i>Subgroup</i>	<i>Common name</i>
<i>Citrus reticulata</i> Blanco x <i>C. sinensis</i> (L.) Osb.	TNR	Tangor
<i>Citrus reticulata</i> Blanco x <i>Fortunella</i> sp.	HMR	Kumandarin
<i>Citrus suavissima</i> hort. ex Tanaka	PMN	
<i>Citrus succosa</i> hort. ex Tanaka	PMN	
<i>Citrus suhuiensis</i> hort. ex Tanaka	PMN	
<i>Citrus sunki</i> (Hayata) hort. ex Tanaka	HMA	
<i>Citrus tangerina</i> hort. ex Tanaka	PMN	
<i>Citrus tardiferax</i> hort. ex Tanaka	PMN	
<i>Citrus tardiva</i> hort. ex Shirai	HMA	
<i>Citrus tarogayo</i> hort. ex Yu. Tanaka	HMA	
<i>Citrus temple</i> hort. ex Y. Tan. x <i>C. paradisi</i> Macfad	HMA	Siamelo
<i>Citrus temple</i> hort. ex Yu. Tanaka	TNR	
<i>Citrus tumida</i> hort. ex Tanaka	HMA	
<i>Citrus unshiu</i> Marcow.	SAT	Satsuma
<i>Citrus yatsushiro</i> hort. ex Tanaka	HMA	
<i>Citrus yuko</i> hort. ex Tanaka	HMA	
Tangelo x <i>C. paradisi</i> Macfad	HMA	Tangelolo
Tangor x <i>C. temple</i> hort. ex Y. Tan.	HMA	Tangorgelo

## 1.2 Entry into Force

The present protocol enters into force on **19.04.2016**. 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 test period.

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 two weeks after the date of the request for technical examination by the CPVO.

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

If problems arise during the course of the test the CPVO should be informed immediately so that the information can be passed on to the applicant. Subject to prior permanent agreement, the applicant may be directly informed at the same time as the CPVO particularly if a visit to the trial is advisable.

### 1.3.3 Sample keeping in case of problems

If the technical examination has resulted in a negative report, the CPVO shall inform the Examination Office as soon as possible in case that a representative sample of any relevant testing material shall be kept.

## **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 <http://www.cpvo.europa.eu/main/en/home/documents-and-publications/s2-gazette> in the special issue S2 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 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 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.

## **3. METHOD OF EXAMINATION**

### **3.1 Number of growing cycles**

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

In particular, it is essential that the trees produce a satisfactory crop of fruit in each of the two growing cycles.

3.1.2 The growing cycle is considered to be the duration of a single growing season, beginning with bud burst (flowering and/or vegetative), flowering and fruit harvest and concluding when the following dormant period ends with the swelling of new season buds.

### **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/export/sites/upov/en/publications/tgp/documents/tgp\\_9\\_1.pdf](http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_9_1.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.

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 8.1.

### **3.4 Test design**

- 3.4.1 Each test should be designed to result in a total of at least 5 plants.
- 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 Additional tests**

In accordance with Article 83(3) of Council Regulation No. 2100/94 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, an additional test may be undertaken providing that a technically acceptable test procedure can be devised.

Additional tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters 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 varieties that are suitable to 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 take into account the list of protected varieties and the official, or other, registers of varieties, in particular:

The inventory shall include varieties protected under National and Community PBR, varieties of National Catalogues for fruit species) and varieties in trade or in commercial registers. In addition to the above, the inventory shall be extended to the appropriate to

- any commercial document in which varieties are marketed as propagating or harvested material, especially when there is no official registration system;
- any list including varieties which are publicly available within plant collections (varieties included in genetic resource collections, collection of old varieties, etc.);
- information provided by relevant plant experts;
- relevant example varieties referred to in the technical protocols for the examination of distinctness.

#### **3.6.5 Maintenance and renewal/update of a living variety collection**

The EO shall maintain the variety collection under appropriate growing conditions (e.g. glasshouse, orchard, in vitro), where it shall be ensured that the plants are adequately irrigated, fertilised, pruned and protected from harmful pests and diseases. For the renewal of existing living material the identity of replacement living plant material shall be verified by conducting side-by-side plot comparisons between the material in the collection and the new material or by checking the identity of the new material against the variety description.

## 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/export/sites/upov/en/publications/tgp/documents/tgp\\_9\\_1.pdf](http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_9_1.pdf)) prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in this Technical Protocol.

#### 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 5 plants or parts taken from each of 5 plants and any other observations made on all plants in the test, disregarding any off-type plants. In the case of observations of parts taken from single plants, the number of parts to be taken from each of the plants should be 2.

#### 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. color 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

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/export/sites/upov/en/publications/tgp/documents/tgp\\_10\\_1.pdf](http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_10_1.pdf)) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:

### Uniformity assessment by off-types

For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 5 plants, no off-types are allowed.

## 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' ([http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp\\_11\\_1.pdf](http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_11_1.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.

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

## 5. GROUPING OF VARIETIES AND ORGANIZATION 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 organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics.

- a) Fruit: length (characteristic 20)
- b) Fruit: diameter (characteristic 21)
- c) Fruit: presence of neck (characteristic 26)
- d) Fruit surface: predominant colour(s) (characteristic 39)
- e) Time of maturity of fruit for consumption (characteristic 76)
- f) Parthenocarpy (characteristic 77)
- g) Self-incompatibility (characteristic 78)

5.4 If other characteristics than those from the TP 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.

## 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.



### States of expression and corresponding notes

In the case of qualitative and pseudo-qualitative characteristics, all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	Note
small	3
medium	5
large	7

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

State	Note
very small	1
very small to small	2
small	3
small to medium	4
medium	5
medium to large	6
large	7
large to very large	8
very large	9

## 6.2 Example Varieties

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

## 6.3 Legend

For the CPVO N° column:

G	Grouping characteristic	– see Chapter 5
MG, MS, VG, VS	– see Chapter 4.1.5	
QL	Qualitative characteristic	
QN	Quantitative characteristic	
PQ	Pseudo-qualitative characteristic	

For the UPOV N° column:

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

- (\*) Asterisked characteristic – Characteristics that are important for the international harmonisation of variety descriptions
- (a)-(f) See Explanations on the Table of Characteristics in Chapter 8.1
- (+) See Explanations on the Table of Characteristics in Chapter 8.

## 7. TABLE OF CHARACTERISTICS

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
1. QL	1.		<b>Ploidy</b>		
			diploid	Clemenules (CLE)	2
			triploid	Winola (HMA)	3
			tetraploid		4
2. (+) PQ	2.		<b>Tree: growth habit</b>		
			upright	Marisol (CLE)	1
			spreading	Clemenules (CLE)	2
			drooping	Owari (SAT)	3
3. QN	3.		<b>Tree: density of spines</b>		
			absent	Owari (SAT)	1
			sparse	Okitsu (SAT)	2
			intermediate	Marisol (CLE)	3
			dense		4
4. QN	4.		<b>Tree: length of spines</b>		
			short	Marisol (CLE)	3
			medium		5
			long		7
5. QN	5.	(a)	<b>Leaf blade: length (apical leaflet in case of compound leaf)</b>		
			short	Común (MMN)	3
			medium	Nova (HMA)	5
			long	Kara (HMA)	7
6. QN	6.	(a)	<b>Leaf blade: width (apical leaflet in case of compound leaf)</b>		
			narrow	Común (MMN)	3
			medium	Clemenules (CLE)	5
			broad	Page (HMA)	7

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>7.</b>	<b>7.</b>		<b>Leaf blade: ratio length/width (apical leaflet in case of compound leaf)</b>		
<b>QN</b>		<b>(a)</b>	small	Orlando (TNL)	3
			medium	Fino (CLE)	5
			large	Clemenules (CLE)	7
<b>8.</b>	<b>8.</b>		<b>Leaf blade: shape in cross section</b>		
<b>QN</b>		<b>(a)</b>	straight or weakly concave	Owari (SAT)	1
			intermediate	Mineola (TNL)	2
			strongly concave	Primosole (HMA)	3
<b>9.</b>	<b>13.</b>		<b>Leaf blade: incision of margin</b>		
<b>PQ</b>		<b>(a)</b>	absent	Owari (SAT)	1
			crenate	Mandarino Cleopatra (MCL)	2
			dentate		3
<b>10.</b>	<b>14.</b>		<b>Leaf blade: shape of apex</b>		
<b>(+)</b>		<b>(a)</b>	acuminate		1
<b>PQ</b>			acute	Clemenules (CLE)	2
			obtuse	Mineola (TNL)	3
			rounded		4
<b>11.</b>	<b>16.</b>		<b>Petiole: length</b>		
<b>QN</b>		<b>(a)</b>	short	Clemenules (CLE)	3
			medium	Fortune (HMA)	5
			long	Minneola (TNL)	7
<b>12.</b>	<b>17.</b>		<b>Petiole: presence of wings</b>		
<b>QL</b>		<b>(a)</b>	absent	Clemenules (CLE)	1
			present	Minneola (TNL)	9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>13.</b>	<b>20.</b>		<b>Flower: length of petal</b>		
<b>QN</b>		<b>(b)</b>	short	Clementina Fina (CLE)	3
			medium	Ellendale(TNR)	5
			long	Owari (SAT)	7
<b>14.</b>	<b>21.</b>		<b>Flower: width of petal</b>		
<b>QN</b>		<b>(b)</b>	narrow	Clemenules (CLE)	3
			medium	Ellendale (TNR)	5
			broad	Owari (SAT)	7
<b>15.</b>	<b>22.</b>		<b>Flower: ratio length/width of petal</b>		
<b>QN</b>		<b>(b)</b>	short	Wilking (HMA)	3
			medium	Clementina Fina (CLE)	5
			large	Page (HMA)	7
<b>16.</b>	<b>23.</b>		<b>Flower: length of stamens</b>		
<b>QN</b>		<b>(b)</b>	short	Encore (HMA)	3
			medium	Clemenules (CLE)	5
			long	Owari (SAT)	7
<b>17.</b>	<b>24.</b>		<b>Anther: colour</b>		
<b>PQ</b>		<b>(b)</b>	white		1
			light yellow	Owari (SAT)	2
			medium yellow	Clementina Fina (CLE)	3
<b>18.</b>	<b>25.</b>		<b>Anther: viable pollen</b>		
<b>(+)</b>		<b>(b)</b>	absent or very few	Owari (SAT)	1
<b>QN</b>			low		3
			medium	Marisol (CLE)	5
			high	Murcott (HMA)	7
			very high	Fortune (HMA)	9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>19.</b>	<b>26.</b>		<b>Style: length</b>		
<b>QN</b>		<b>(b)</b>	short	Pixie (HMA)	3
			medium	Clementina Fina (CLE)	5
			long	Owari (SAT)	7
<b>20.</b>	<b>28.</b>		<b>Fruit: length</b>		
<b>QN</b>		<b>(c)</b>	short	Wilking (HMA)	3
			medium	Clemenules (CLE)	5
<b>G</b>			long	Minneola (TNL)	7
<b>21.</b>	<b>29.</b>		<b>Fruit: diameter</b>		
<b>QN</b>		<b>(c)</b>	small	Clementina Fina (CLE)	3
			medium	Clemenules (CLE)	5
<b>G</b>			large	Ortanique (TNR)	7
<b>22.</b>	<b>30.</b>		<b>Fruit: ratio length/diameter</b>		
<b>QN</b>		<b>(c)</b>	small	Encore (HMA)	3
			medium	Clemenules (CLE)	5
			large	Minneola (TNL)	7
<b>23.</b>	<b>31.</b>		<b>Fruit: position of broadest part</b>		
<b>QN</b>		<b>(c)</b>	towards stalk end		1
			at middle	Clemenules (CLE)	2
			towards distal end		3
<b>24.</b>	<b>32.</b>		<b>Fruit: shape in transverse section</b>		
<b>(+)</b>		<b>(c)</b>	circular	Ortanique (TNR)	1
<b>PQ</b>			somewhat angular	Clemenules (CLE)	2
			scalloped		3

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>25.</b>			<b>Fruit: general shape of proximal part (excluding neck, collar and depression at stalk end)</b>		
(+)		(c)	flattened	Clemenules (CLE)	1
<b>PQ</b>			slightly rounded	Ortanique (TNR)	2
			strongly rounded		3
			tapered		4
<b>26.</b>	<b>34.</b>		<b>Fruit: presence of neck</b>		
(+)		(c)	absent	Clemenules (CLE)	1
<b>QL</b>	<b>G</b>		present		9
<b>27.</b>	<b>37.</b>		<b><u>Only varieties without fruit neck:</u> Fruit: presence of depression at stalk end</b>		
(+)		(c)	absent	Ortanique (TNR)	1
<b>QL</b>			present	Marisol (CLE)	9
<b>28.</b>	<b>41.</b>		<b>Fruit: number of radial grooves at stalk end</b>		
<b>QN</b>		(c)	absent or very few	Nova (HMA)	1
			intermediate	Clemenules (CLE)	2
			many		3
<b>29.</b>	<b>44.</b>		<b>Fruit: presence of collar</b>		
(+)		(c)	absent	Clemenules (CLE)	1
<b>QL</b>			present		9
<b>30.</b>	<b>48.</b>		<b>Fruit: general shape of distal part (excluding nipple, bulging or navel and depression at distal end)</b>		
(+)		(c)	flattened	Clemenules (CLE)	1
<b>QN</b>			slightly rounded		2
			strongly rounded		3
<b>31.</b>	<b>49.</b>		<b>Fruit: presence of depression at distal end</b>		
(+)		(c)	absent	Ortanique (TNR)	1
<b>QL</b>			present	Arrufatina (CLE)	9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>32.</b>	<b>52.</b>		<b>Fruit: presence of areola</b>		
<b>QL</b>		<b>(c)</b>	absent	Nova (HMA)	1
			incomplete	Hernandina (CLE)	2
			complete	Ortanique (TNR)	3
<b>33.</b>	<b>53.</b>		<b>Fruit: type of areola</b>		
<b>(+)</b>		<b>(c)</b>	smooth	Owari (SAT)	1
<b>QL</b>			grooved		2
			ridged		3
<b>34.</b>	<b>54.</b>		<b>Fruit: diameter of areola</b>		
<b>QN</b>		<b>(c)</b>	small	Arrufatina (CLE)	3
			medium	Owari (SAT)	5
			large	Ortanique (TNR)	7
<b>35.</b>	<b>55.</b>		<b>Fruit: diameter of stylar scar</b>		
<b>QN</b>		<b>(c)</b>	small	Clemenules (CLE)	3
			medium	Owari (SAT)	5
			large		7
<b>36.</b>	<b>56.</b>		<b>Fruit: persistence of style</b>		
<b>PQ</b>		<b>(c)</b>	none	Clemenules (CLE)	1
			partial		2
			total		3
<b>37.</b>	<b>57.</b>		<b>Fruit: presence of navel opening</b>		
<b>PQ</b>		<b>(c)</b>	absent	Clemenules (CLE)	1
			occasionally present	Fortune (HMA)	2
			always present		3
<b>38.</b>	<b>59.</b>		<b>Fruit: presence of radial grooves at distal end</b>		
<b>QL</b>		<b>(c)</b>	absent	Clemenules (CLE)	1
			present		9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>39.</b>	<b>61.</b>		<b>Fruit surface: predominant colour(s)</b>		
<b>PQ</b>		<b>(d)</b>	green		1
			yellow green		2
			light yellow		3
			medium yellow	Mapo (TNL)	4
			yellow orange		5
			medium orange	Clemenules (CLE)	6
			dark orange		7
			orange red	Nova (HMA)	8
<b>G</b>			red		9
<b>40.</b>	<b>62.</b>		<b>Fruit surface: glossiness</b>		
<b>QN</b>		<b>(d)</b>	absent or very weak	Owari (SAT)	1
			weak	Clemenules (CLE)	3
			medium	Okitsu (SAT)	5
			strong	Nadorcott (TNR)	7
<b>G</b>			very strong		9
<b>41.</b>	<b>63.</b>		<b>Fruit surface: roughness</b>		
<b>QN</b>		<b>(d)</b>	smooth	Murcott (TNR)	3
			medium	Clemenules (CLE)	5
			rough	Temple (HMA)	7
<b>42.</b>	<b>64.</b>		<b>Fruit surface: size of glands</b>		
<b>PQ</b>		<b>(d)</b>	all more or less the same size		1
			larger ones interspersed by smaller ones		2



CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
43.  PQ	67.	(d)	<b>Fruit surface: presence of pitting and pebbling on oil glands</b>		
			pitting and pebbling absent	Nova (HMA)	1
			pitting absent, pebbling present	Loretina (CLE)	2
			pitting present, pebbling absent	Owari (SAT)	3
			pitting and pebbling present		4
44.  QN	71.	(d)	<b>Fruit rind: thickness</b>		
			thin	Murcott (TNR)	3
			medium	Clemenules (CLE)	5
			thick	Minneola (TNL)	7
45.  QN	72.	(d)	<b>Fruit rind: adherence of flesh</b>		
			weak	Clemenules (CLE)	3
			medium	Fortune (HMA)	5
			strong	Ortanique (TNR)	7
46.  QN	73.	(d)	<b>Fruit rind: strength</b>		
			weak		3
			medium	Clemenules (CLE)	5
			strong		7
47.  QN	74.	(d)	<b>Fruit rind: oiliness</b>		
			dry		3
			medium	Clemenules (CLE)	5
			oily	Ortanique (TNR)	7
48.  PQ	76.	(c)	<b>Fruit: colour of albedo</b>		
			greenish		1
			white	Clemenules (CLE)	2
			light yellow	Murcott (TNR)	3
			light orange	Nadorcott (TNR)	4
			pink		5
			reddish		6

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>49.</b>	<b>77.</b>		<b>Fruit: density of albedo</b>		
<b>QN</b>		<b>(c)</b>	loose	Clemenules (CLE)	3
			medium	Fortune (HMA)	5
			dense	Ortanique (TNR)	7
<b>50.</b>	<b>78.</b>		<b>Fruit: amount of albedo adhering to flesh (strands excluded)</b>		
<b>QN</b>		<b>(c)</b>	absent or very small	Clemenules (CLE)	1
			small		3
			medium		5
			large		7
			very large		9
<b>51.</b>	<b>79.</b>		<b>Fruit: presence of albedo strands</b>		
<b>QL</b>		<b>(c)</b>	absent		1
			present	Clemenules (CLE)	9
<b>52.</b>	<b>80.</b>		<b>Fruit: amount of albedo strands</b>		
<b>QN</b>		<b>(c)</b>	small		3
			medium		5
			large		7
<b>53.</b>	<b>81.</b>		<b>Fruit: main colour of flesh</b>		
<b>PQ</b>		<b>(e)</b>	whitish		1
			light green		2
			light yellow		3
			medium yellow	Mapo (HMA)	4
			light orange		5
			medium orange	Clemenules (CLE)	6
			dark orange		7
			red		8
			purple		9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>54.</b> <b>QN</b>	<b>82.</b>	<b>(e)</b>	<b>Fruit: filling of core</b>		
			absent or very sparse	Fortune (HMA)	1
			sparse		3
			medium	Clemenules (CLE)	5
			dense	Murcott (TNR)	7
			very dense		9
<b>55.</b> <b>QN</b>	<b>83.</b>	<b>(e)</b>	<b>Fruit: diameter of core</b>		
			small	Murcott (TNR)	3
			medium	Clemenules (CLE)	5
			large	Hermandina (CLE)	7
<b>56.</b> <b>QN</b>	<b>84.</b>	<b>(e)</b>	<b>Fruit: presence of rudimentary segments</b>		
			absent or weak	Clemenules (CLE)	1
			intermediate		2
			strong		3
<b>57.</b> <b>QN</b>	<b>85.</b>	<b>(e)</b>	<b>Fruit: number of well developed segments</b>		
			few	Oroval (CLE)	3
			medium	Ortanique (TNR)	5
			many	Temple (HMA)	7
<b>58.</b> <b>QN</b>	<b>86.</b>	<b>(e)</b>	<b>Fruit: coherence of adjacent segment walls</b>		
			weak	Clemenules (CLE)	3
			medium	Fortune (HMA)	5
			strong		7
<b>59.</b> <b>QN</b>	<b>87.</b>	<b>(e)</b>	<b>Fruit: strength of segment walls</b>		
			weak	Mapo (TNL)	3
			medium	Clementina Fina (CLE)	5
			strong	Oronules (CLE)	7

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>60.</b> <b>QN</b>	<b>88.</b>	<b>(e)</b>	<b>Fruit: length of juice vesicles</b>		
			short	Wilking (HMA)	3
			medium		5
			long	Clemenules (CLE)	7
<b>61.</b> <b>QN</b>	<b>89.</b>	<b>(e)</b>	<b>Fruit: thickness of juice vesicles</b>		
			thin	Clemenules (CLE)	3
			medium		5
			thick	Mapo (TNL)	7
<b>62.</b> <b>PQ</b>	<b>92.</b>	<b>(c)</b>	<b>Fruit: presence of navel (viewed internally)</b>		
			absent or very rare	Clemenules (CLE)	1
			occasionally present	Nova (HMA)	2
			always present		3
<b>63.</b> <b>QN</b>	<b>94.</b>	<b>(c)</b>	<b>Fruit: juiciness</b>		
			low		3
			medium	Campeona (HMA)	5
			high	Marisol (CLE)	7
<b>64.</b> <b>QN</b>	<b>95.</b>	<b>(c)</b>	<b>Fruit juice: total soluble solids</b>		
			low	Okitsu (SAT)	3
			medium	Temple (HMA)	5
			high	Honey (HMA)	7
<b>65.</b> <b>QN</b>	<b>96.</b>	<b>(c)</b>	<b>Fruit juice: acidity</b>		
			low	Hermandina (CLE)	3
			medium	Clemenules (CLE)	5
			high	Fortune (HMA)	7
<b>66.</b> <b>QN</b>	<b>97.</b>	<b>(c)</b>	<b>Fruit: strength of fibre</b>		
			weak	Mapo (HMA)	3
			medium	Clemenules (CLE)	5
			strong		7

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>67.</b>	<b>98.</b>		<b>Fruit: number of seeds (controlled manual self-pollination)</b>		
(+)		(f)	absent or very few	Clemenules (CLE)	1
QN			few		3
			medium	Kara (HMA)	5
			many		7
			very many	Común (MMN)	9
<b>68</b>			<b>Fruit: number of seeds (controlled manual cross-pollination)</b>		
(+)		(f)	absent or very few	Nulesin (CLE)	1
QN			few		3
			medium	Marisol (CLE)	5
			many		7
			very many	Clemenules (CLE)	9
<b>69.</b>	<b>100.</b>		<b>Seed: polyembryony</b>		
QL		(f)	absent	Wilking (HMA)	1
			present	Común (MMN)	9
<b>70.</b>	<b>101.</b>		<b>Seed: length</b>		
QN		(f)	short	Temple (HMA)	3
			medium		5
			long	Campeona (HMA)	7
<b>71.</b>	<b>102.</b>		<b>Seed: width</b>		
QN		(f)	narrow	Temple (HMA)	3
			medium		5
			broad	Campeona (HMA)	7
<b>72.</b>	<b>103.</b>		<b>Seed: surface</b>		
QL		(f)	smooth	Común (MMN)	1
			wrinkled		2

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>73.</b>	<b>105.</b>		<b>Seed: external colour</b>		
<b>PQ</b>		<b>(f)</b>	greenish	Kara (HMA)	1
			whitish		2
			yellowish		3
			pinkish		4
			brownish		5
<b>74.</b>	<b>106.</b>		<b>Seed: colour of inner seed coat</b>		
<b>PQ</b>		<b>(f)</b>	white		1
			light yellow		2
			light brown	Murcott (TNR)	3
			medium brown		4
			dark brown		5
			red		
			purple		
<b>75.</b>	<b>107.</b>		<b><u>Only varieties with seed:</u> <u>polyembryony present:</u> Seed: colour of cotyledons</b>		
<b>PQ</b>		<b>(f)</b>	white	Murcott (TNR)	1
			cream	Kara (HMA)	2
			light	Común (MMN)	3
			dark green		4
<b>76.</b>	<b>108.</b>		<b>Time of maturity of fruit for consumption</b>		
<b>QN</b>		<b>(c)</b>	early	Okitsu (SAT)	3
			medium	Clemenules (CLE)	5
<b>G</b>			late	Murcott (TNR)	7
<b>77.</b>	<b>109.</b>		<b>Parthenocarpy</b>		
<b>QL</b>			absent	Wilking (HMA)	1
<b>G</b>			present	Clemenules (CLE)	9

CPVO N°	UPOV N°	Stage, method	Characteristics	Examples	Note
<b>78.</b>	<b>110.</b>		<b>Self-incompatibility</b>		
<b>(+)</b>			absent	Común (MMN)	1
<b>QL</b>	<b>G</b>		present	Clemenules (CLE)	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:

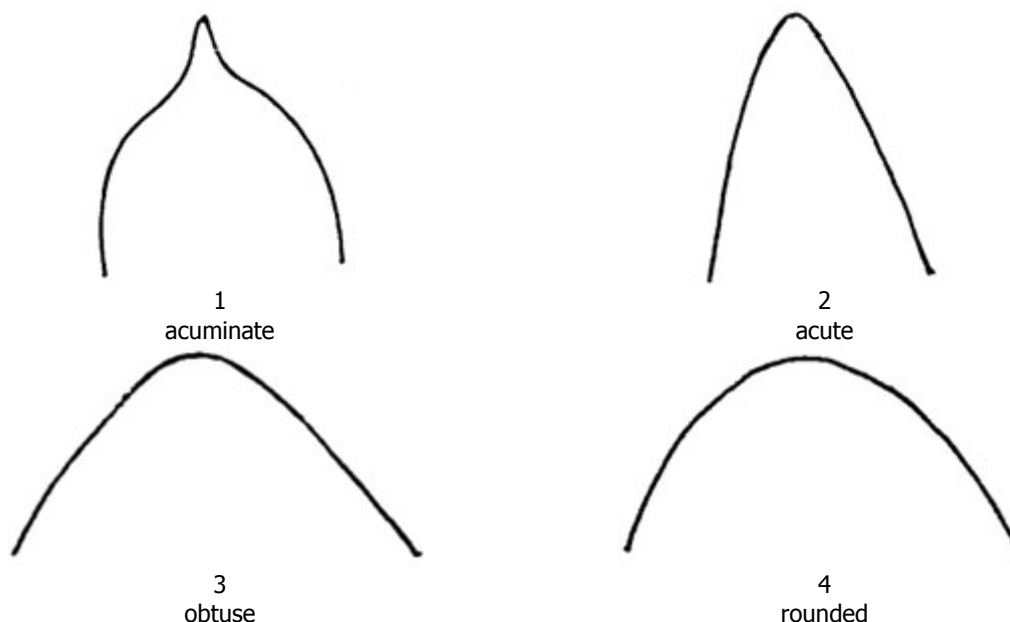
- (a) Leaf: Observations on the leaf should be made on fully developed leaves on the middle third of the youngest spring flush branch sections not showing signs of active growth.
- (b) Flower: Unless otherwise indicated, observations on the flower bud and the flower should be made on the terminal flower bud and flower, at the time of full flowering of the variety. Observations on the open flower should be made on the first day of opening.
- (c) Fruit: Observations on the fruit should be made at the stage of optimum ripeness. The fruit should be tested weekly and harvested as soon as this stage has been reached. All fruits for observations should be taken from the periphery of the tree and fruit misformed as a result of clustering should not be sampled.
- (d) Fruit surface and fruit rind: Observations on the fruit surface and on the fruit rind should be made at the middle, between the base and apex of the fruit. The observation on the oiliness of the fruit rind should be made, by peeling the fruit, within three to seven days after harvesting.
- (e) Fruit flesh: Observations on the flesh of the fruit should be made on a cross section through the middle of the fruit.
- (f) Seed: Observations on the seed should be made on the fresh seed.

### 8.2 Explanations for individual characteristics

#### Ad. 2: Tree: growth habit

The observation on the growth habit of the tree should be made immediately after harvest.

#### Ad. 10: Leaf blade: shape of apex





Ad. 18: Anther: viable pollen

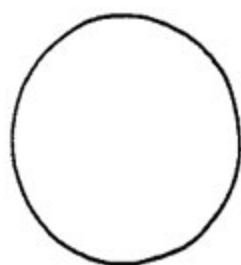
Method: The pollen should be collected when the petals begin to open (but with the anthers closed). The anthers should be introduced into a Petri dish and placed inside a silica gel dryer at room temperature, for 20-48 hours of darkness. When the anthers are open they should be moved to an 8 °C chamber with a 70-80 % Relative Humidity for one hour. Afterwards, the pollen should be brushed onto a microscope slide with 2 ml of Brewbacker medium (Brewbaker and Kwack. 1963). Finally, the microscope slide should be placed in a 24 °C chamber with a 75 % RH for 20 hours.

The percentage of pollen fertilization is calculated as the average of germinated pollen grains observed with a binocular in 15 visual fields from 2 different microscope slides.

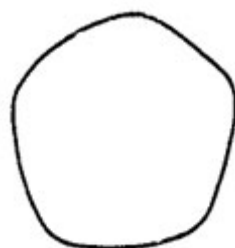
Percentage range indication for the states of expression:

Example varieties	Note	Range
Owari (SAT)	1	≤ 7%
	2	> 7 ≤ 14%
	3	> 14 ≤ 21%
	4	> 21 ≤ 28%
Marisol (CLE)	5	> 28 ≤ 35%
	6	> 35 ≤ 45%
Murcott (HMA)	7	> 45 < 55%
	8	> 55 < 65%
Fortune (HMA)	9	≥ 65%

Ad. 24: Fruit: shape in transverse section



1  
circular

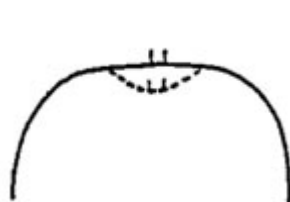


2  
somewhat angular

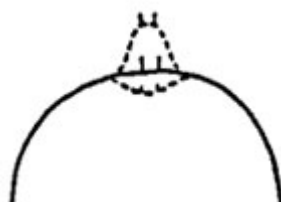


3  
scalloped

Ad. 25: Fruit: general shape of proximal part (excluding neck, collar and depression at stalk end)



1  
flattened



2  
slightly rounded



3  
strongly rounded

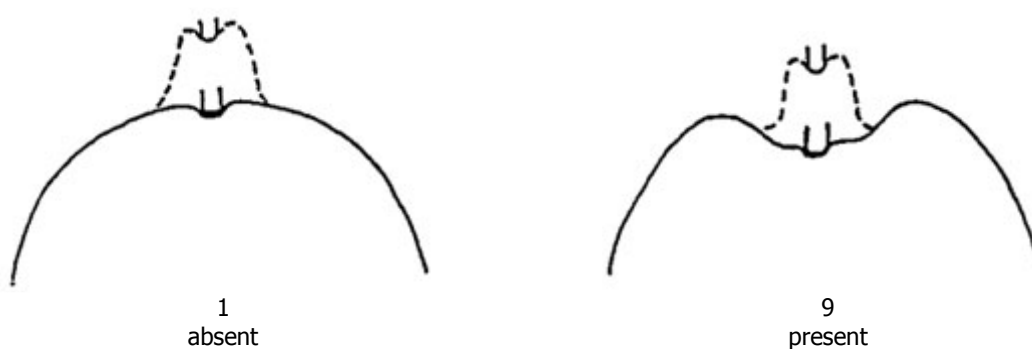


4  
tapered

Ad. 26: Fruit: presence of neck



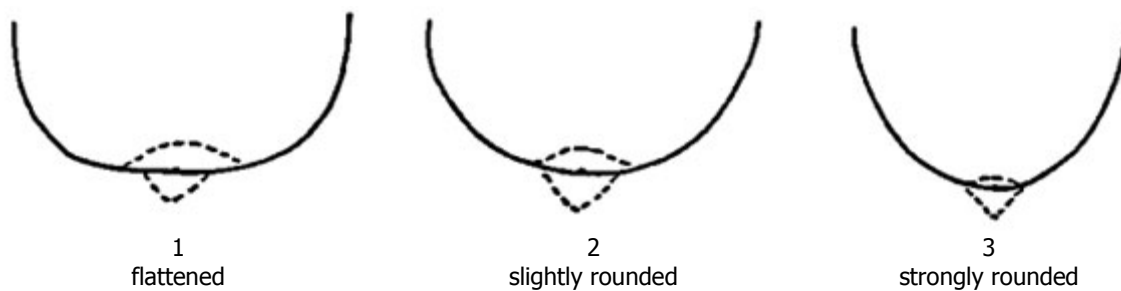
Ad. 27: Only varieties without neck: Fruit: presence of depression at stalk end



Ad. 29: Fruit: presence of collar



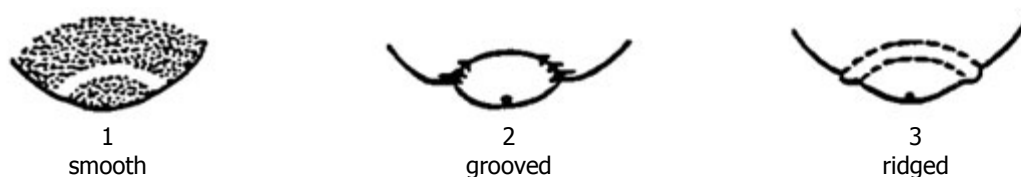
Ad. 30: Fruit: general shape of distal part (excluding nipple, bulging and depression at distal end)



Ad. 31: Fruit: presence of depression at distal end



Ad. 33: Fruit: type of areola



Ad. 67: Fruit: number of seeds (controlled manual self-pollination)

Manual self-pollination is necessary to ensure a consistent production of seed.

Ad. 68: Fruit: number of seeds (controlled manual cross-pollination)

50 terminal flowers from the candidate variety shall be used: if possible, 10 flowers from 5 trees. If less than 5 trees, the number of trees to be pollinated should be specified. Flowers shall be fully developed but not yet opened: one day before anthesis (stage 59 on the Citrus BBCH phenological scale), flowers will be emasculated and bagged to avoid self and free pollination. Stigma of candidate varieties shall be at its optimum stage of receptivity. Alternatively, 50 flowers a day will be cross-pollinated by hand respectively 1 and 6 days after anthesis. The trees will be at the phenologic state of full bloom.

Pollination is made each time with pollen of a single pollinator with a high fertilization capacity. Pollination should take place at the moment of maximum development of the flower. Quantity of pollen: to reach the saturation of the stigma, at least 100 grains of pollen. Pollen will be applied by a brush. After pollination, the pollinated flowers should be isolated from the environment with an individual mesh in order to avoid further pollination.

The characteristic is observed by counting the number of seeds in each of the resulting fruits.

Ad. 78: Self-incompatibility

A variety is self-incompatible when the fertile pollen of its own flower or of other flowers of the same variety is not able to fertilize the ovary.

The test on self-incompatibility has to be carried out on at least 10 flowers.

Choose flowers with petals which are just before opening and open the flower manually. Then separate and cut the anthers. Take viable pollen from other flowers of the same variety and put it on the stigma. Cover the flowers with muslin in order to avoid accidental pollination by other pollen. If the mature fruit bears no seeds, the variety is self-incompatible. If the mature fruit bears seeds, the variety is self-compatible.

**Synonym(s) of Example Varieties**

<b>Example varieties</b>	<b>Subgroup</b>	<b>Observations</b>	<b>Synonym(s)</b>
Clemenules	CLE		Clementina de Nules
Comun	MMN		Avana, Mediterranea, Willowleaf
Clementina Fina	CLE		Fino
Minneola	<b>TNL</b>	<i>Citrus paradisi</i> Macfad. x <i>C. tangerina</i> hort. ex Tan. Grapefruit Duncan x Mandarin Dancy	Honeybell
Nadorcott	TNR		Afourer, Murcott Afourer
Nova	HMA	<i>Citrus clementina</i> hort. ex Tan. x Tangelo Orlando	Clemenvilla
Orlando	TNL	<i>Citrus paradisi</i> Macfad. x <i>C. tangerina</i> hort. ex Tan. Grapefruit Duncan x Mandarin Dancy	Lake Tangelo

## 9. LITERATURE

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**10. TECHNICAL QUESTIONNAIRE**

The Technical Questionnaire is available on the CPVO website under the following reference: CPVO-TQ/201/2 Rev.