



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

***Malus Mill.***

**APPLE ROOTSTOCKS**

UPOV Code: MALUS

**Adopted on 14/04/2026**

**Entry into force on 14/04/2026**

*CPVO-TP/163/2-Rev. 2 based on the version 5 of the CPVO-TP/template*

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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 *Malus* Mill.

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/163/4 dated 25/03/2015 (<https://www.upov.int/edocs/tgdocs/en/tg163.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

### **1.2 Entry into Force**

The present protocol enters into force on **14.04.2026**. 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 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**

3.1.1 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.

The two independent growing cycles may be observed from a single planting, examined in two separate 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 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/edocs/tgpdocs/en/tgp\\_9.pdf](http://www.upov.int/edocs/tgpdocs/en/tgp_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:

- (a) 5 plants for trees,
- (b) 10 plants for stool beds.

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 of National Catalogues (where such catalogues exist) and varieties in trade or in commercial registers. 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).

In addition to the above, the inventory shall be extended to the appropriate to

- relevant example varieties referred to in the technical protocols.
- 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.

#### **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.

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.

#### 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 5 plants or parts taken from each of 5 plants for trees and 9 plants for stool beds and for seed propagated varieties disregarding off-type plants. In the case of observations of parts of 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., 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 For vegetatively propagated varieties:

In the case of trees, 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.

In the case of stool beds, 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 10 plants, one off-type is allowed.

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

- 4.2.4 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.

### **4.3 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/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.

- 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) Plant: vigour (characteristic 1)
- b) Plant: habit (characteristic 4)
- c) Young shoot: extent of anthocyanin coloration (characteristic 19)
- d) Leaf blade: attitude in relation to shoot (characteristic 20)
- e) Leaf blade: incisions of margin (characteristic 26)

- 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. |
|-----|--------------------------------|--|

For column 'Stage, method':

|                |                    |
|----------------|--------------------|
| MG, MS, VG, VS | -see Chapter 4.1.5 |
|----------------|--------------------|

[A] – applies only for stool beds

[B] – applies only for fully grown trees

|         |   |                  |
|---------|---|------------------|
| (a)-(d) | Explanations covering several Characteristics | -see Chapter 8.1 |
|---------|---|------------------|

## 7. TABLE OF CHARACTERISTICS

| CPVO N°                                  | UPOV N°                 | Stage, Method                             | Characteristics                  | Examples                                 | Note |  |
|--|-------------------------|---|----------------------------------|--|------|--|
| <b>1.</b><br><b>(+)</b><br><br><b>QN</b> | <b>1.</b><br><b>(*)</b> | <b>VG</b><br><br><b>(a)</b>               | <b>Plant: vigour</b>             |  |      |  |
|  |                         |   | very weak                        |  | 1    |  |
|  |                         |   | very weak to weak                |  | 2    |  |
|  |                         |   | weak                             | M 27                                     | 3    |  |
|  |                         |   | weak to medium                   | J-TE-F                                   | 4    |  |
|  |                         |   | medium                           | J-TE-H, Mark                             | 5    |  |
|  |                         |   | medium to strong                 | Lancep                                   | 6    |  |
|  |                         |   | strong                           | Cepiland                                 | 7    |  |
|  |                         |   | strong to very strong            |  | 8    |  |
| <b>G</b>                                 |                         | very strong                               |                                  | 9  |      |  |
| <b>2.</b><br><br><b>QN</b>               | <b>2.</b>               | <b>[B]</b><br><b>VG</b><br><br><b>(a)</b> | <b>Plant: number of branches</b> |  |      |  |
|  |                         |   | very few                         |  | 1    |  |
|  |                         |   | few                              |  | 2    |  |
|  |                         |   | medium                           |  | 3    |  |
|  |                         |   | many                             |  | 4    |  |
|  |                         |   | very many                        |  | 5    |  |
| <b>3.</b><br><br><b>QN</b>               | <b>3.</b>               | <b>[A]</b><br><b>VG</b><br><br><b>(a)</b> | <b>Plant: number of shoots</b>   |  |      |  |
|  |                         |   | very few                         |  | 1    |  |
|  |                         |   | few                              |  | 2    |  |
|  |                         |   | medium                           | Lancep, Last Minute/ P22,<br>Supporter 1 | 3    |  |
|  |                         |   | many                             | Joha                                     | 4    |  |
|  |                         |   | very many                        |  | 5    |  |

| CPVO N°                 | UPOV N°                 | Stage, Method | Characteristics                           | Examples   | Note                 |                                   |
|-------------------------|-------------------------|---------------|---|------------|----------------------|-----------------------------------|
| <b>4.</b><br><b>(+)</b> | <b>4.</b><br><b>(*)</b> | <b>VG</b>     | <b>Plant: habit</b>                       |            |                      |                                   |
|                         |                         |               | <b>PQ</b>                                 | <b>(a)</b> | upright              | 1                                 |
|                         |                         |               |   |            | upright to spreading | 2                                 |
|                         |                         |               |   |            | spreading            | M9<br>3                           |
| <b>G</b>                |                         |               | drooping                                  | 4          |                      |                                   |
| <b>5.</b>               | <b>5.</b>               | <b>VG</b>     | <b>Plant: number of spines</b>            |            |                      |                                   |
|                         |                         |               | <b>QN</b>                                 | <b>(a)</b> | absent or few        | 1                                 |
|                         |                         |               |   |            | medium               | 2                                 |
|                         |                         |               | many                                      | 3          |                      |                                   |
| <b>6.</b><br><b>(+)</b> | <b>6.</b><br><b>(*)</b> | <b>VG</b>     | <b>One-year-old shoot: growth pattern</b> |            |                      |                                   |
|                         |                         |               | <b>QN</b>                                 | <b>(b)</b> | straight             | Joha<br>1                         |
|                         |                         |               |   |            | moderately wavy      | M 26, M 9, Mark, Supporter 1<br>2 |
|                         |                         |               | strongly wavy                             | 3          |                      |                                   |
| <b>7.</b><br><b>(+)</b> | <b>7.</b><br><b>(*)</b> | <b>VG</b>     | <b>One-year-old shoot: pubescence</b>     |            |                      |                                   |
|                         |                         |               | <b>QN</b>                                 | <b>(b)</b> | absent or very weak  | 1                                 |
|                         |                         |               |   |            | weak                 | 2                                 |
|                         |                         |               |   |            | medium               | B 9, M 27<br>3                    |
|                         |                         |               |   |            | strong               | Joha, M 9<br>4                    |
|                         |                         |               | very strong                               | 5          |                      |                                   |
| <b>8.</b>               | <b>8.</b><br><b>(*)</b> | <b>VG</b>     | <b>One-year-old shoot: glossiness</b>     |            |                      |                                   |
|                         |                         |               | <b>QN</b>                                 | <b>(b)</b> | absent or weak       | 1                                 |
|                         |                         |               |   |            | weak to medium       | 2                                 |
|                         |                         |               |   |            | medium               | M 26<br>3                         |
|                         |                         |               |   |            | medium to strong     | 4                                 |
|                         |                         |               | strong                                    | 5          |                      |                                   |

| CPVO N° | UPOV N°    | Stage, Method | Characteristics                                 | Examples    | Note           |                              |   |
|---------|------------|---------------|---|-------------|----------------|------------------------------|---|
| 9.      | 9.<br>(*)  | VG/MS<br>/MG  | <b>One-year-old shoot: thickness</b>            |             |                |                              |   |
|         |            |               | QN  | (b)         | thin           |                              | 1 |
|         |            |               |   |             | medium         | B 9, Mark                    | 2 |
|         |            |               | thick   | Lizzy/ P 16 | 3              |                              |   |
| 10.     | 10.<br>(*) | VG/MG         | <b>One-year-old shoot: length of internodes</b> |             |                |                              |   |
|         |            |               | QN  | (b)         | short          | J-TE-H                       | 1 |
|         |            |               |   |             | medium         | Last Minute/ P22             | 2 |
|         |            |               | long  |             | 3              |                              |   |
| 11.     | 11.<br>(*) | VG            | <b>One-year-old shoot: number of lenticels</b>  |             |                |                              |   |
|         |            |               | QN  | (b)         | very few       |                              | 1 |
|         |            |               |   |             | few            | J-TE-F, Lancep               | 2 |
|         |            |               |   |             | medium         | M 26, M 5, Mark, Supporter 1 | 3 |
|         |            |               |   |             | many           | CG 10, M 2                   | 4 |
|         |            |               | very many                                       |             | 5              |                              |   |
| 12.     | 12.        | VG            | <b>One-year-old shoot: size of lenticels</b>    |             |                |                              |   |
|         |            |               | QN  | (b)         | small          | J-TE-F                       | 1 |
|         |            |               |   |             | medium         | B 9, Joha, Lizzy/ P 16       | 2 |
|         |            |               | large   |             | 3              |                              |   |
| 13.     | 13.<br>(*) | VG            | <b>One-year-old shoot: colour of sunny side</b> |             |                |                              |   |
|         |            |               | PQ  | (b)         | greenish brown | M 4                          | 1 |
|         |            |               |   |             | reddish brown  | Lizzy/ P 16, Mark            | 2 |
|         |            |               |   |             | medium brown   | J-TE-H, M 27, M 26           | 3 |
|         |            |               | dark brown                                      | B 9, M 2    | 4              |                              |   |

| CPVO N°            | UPOV N°            | Stage, Method | Characteristics  | Examples   | Note              |                                     |   |
|--------------------|--------------------|---------------|--|------------|-------------------|-------------------------------------|---|
| <b>14.</b>         | <b>14.</b><br>(* ) | <b>VG</b>     | <b>One-year-old shoot: size of vegetative bud</b>                          |            |                   |                                     |   |
|                    |                    |               | <b>QN</b>  | <b>(b)</b> | small             | J-TE-H                              | 1 |
|                    |                    |               |  |            | medium            | M 26                                | 2 |
|                    |                    |               |  |            | large             | M 9                                 | 3 |
| <b>15.</b><br>(+ ) | <b>15.</b>         | <b>VG</b>     | <b>One-year-old shoot: shape of apex of vegetative bud</b>                 |            |                   |                                     |   |
|                    |                    |               | <b>PQ</b>  | <b>(b)</b> | acute             | CG 10, J-TE-H                       | 1 |
|                    |                    |               |  |            | obtuse            | Last Minute/ P22, Mark, Supporter 1 | 2 |
|                    |                    |               |  |            | rounded           | M 7                                 | 3 |
| <b>16.</b><br>(+ ) | <b>16.</b>         | <b>VG</b>     | <b>One-year-old shoot: position of vegetative bud in relation to shoot</b> |            |                   |                                     |   |
|                    |                    |               | <b>QN</b>  | <b>(b)</b> | adpressed         |                                     | 1 |
|                    |                    |               |  |            | slightly held out |                                     | 2 |
|                    |                    |               |  |            | strongly held out | Cepiland, M 4, M 2                  | 3 |
| <b>17.</b><br>(+ ) | <b>17.</b>         | <b>VG</b>     | <b>One-year-old shoot: size of vegetative bud support</b>                  |            |                   |                                     |   |
|                    |                    |               | <b>QN</b>  | <b>(b)</b> | small             |                                     | 1 |
|                    |                    |               |  |            | medium            | Last Minute/ P22, M 7               | 2 |
|                    |                    |               |  |            | large             | M 2, Mark                           | 3 |
| <b>18.</b><br>(+ ) | <b>18.</b><br>(* ) | <b>VG</b>     | <b>Young shoot: colour of upper part</b>                                   |            |                   |                                     |   |
|                    |                    |               | <b>PQ</b>  | <b>(c)</b> | whitish           |                                     | 1 |
|                    |                    |               |  |            | greenish          |                                     | 2 |
|                    |                    |               |  |            | reddish           |                                     | 3 |
|                    |                    |               |  |            | blackish          |                                     | 4 |

| CPVO N°                  | UPOV N°                  | Stage, Method | Characteristics                                      | Examples | Note                 |                       |   |
|--------------------------|--------------------------|---------------|--|----------|----------------------|-----------------------|---|
| <b>19.</b>               | <b>19.</b><br><b>(*)</b> | <b>VG</b>     | <b>Young shoot: extent of anthocyanin coloration</b> |          |                      |                       |   |
|                          |                          |               | <b>QN</b>  | (c)      | absent or very small | 1                     |   |
|                          |                          |               |  |          | small                | 2                     |   |
|                          |                          |               |  |          | medium               | 3                     |   |
|                          |                          |               |  |          | large                | 4                     |   |
| <b>G</b>                 |                          |               | very large   | 5        |                      |                       |   |
| <b>20.</b><br><b>(+)</b> | <b>20.</b><br><b>(*)</b> | <b>VG</b>     | <b>Leaf blade: attitude in relation to shoot</b>     |          |                      |                       |   |
|                          |                          |               | <b>QN</b>  | (d)      | upwards              | M 27                  | 1 |
|                          |                          |               |  |          | outwards             | Last Minute/P22, Mark | 2 |
| <b>G</b>                 |                          |               | downwards  |          | 3                    |                       |   |
| <b>21.</b>               | <b>21.</b><br><b>(*)</b> | <b>VG/MG</b>  | <b>Leaf blade: length</b>                            |          |                      |                       |   |
|                          |                          |               | <b>QN</b>  | (d)      | very short           |                       | 1 |
|                          |                          |               |  |          | very short to short  |                       | 2 |
|                          |                          |               |  |          | short                | M 27, M 26            | 3 |
|                          |                          |               |  |          | short to medium      |                       | 4 |
|                          |                          |               |  |          | medium               |                       | 5 |
|                          |                          |               |  |          | medium to long       |                       | 6 |
|                          |                          |               |  |          | long                 | B 9, M 9              | 7 |
|                          |                          |               |  |          | long to very long    |                       | 8 |
|                          |                          | very long     |  | 9        |                      |                       |   |

| CPVO N°                               | UPOV N°                  | Stage, Method                  | Characteristics                             | Examples                      | Note |
|---------------------------------------|--------------------------|--------------------------------|---|-------------------------------|------|
| <b>22.</b><br><b>QN</b>               | <b>22.</b><br><b>(*)</b> | <b>VG/MG</b><br><br><b>(d)</b> | <b>Leaf blade: width</b>                    |                               |      |
|                                       |                          |                                | very narrow                                 |                               | 1    |
|                                       |                          |                                | very narrow to narrow                       |                               | 2    |
|                                       |                          |                                | narrow                                      |                               | 3    |
|                                       |                          |                                | narrow to medium                            |                               | 4    |
|                                       |                          |                                | medium                                      | M 27                          | 5    |
|                                       |                          |                                | medium to broad                             |                               | 6    |
|                                       |                          |                                | broad                                       |                               | 7    |
|                                       |                          |                                | broad to very broad                         |                               | 8    |
| very broad                            |                          | 9                              |   |                               |      |
| <b>23.</b><br><b>(+)</b><br><b>QN</b> | <b>23.</b><br><b>(*)</b> | <b>VG/MG</b><br><br><b>(d)</b> | <b>Leaf blade: ratio length/width</b>       |                               |      |
|                                       |                          |                                | very low                                    |                               | 1    |
|                                       |                          |                                | low   | M 27, M 8                     | 2    |
|                                       |                          |                                | medium                                      | Last Minute/ P22, Supporter 1 | 3    |
|                                       |                          |                                | high  |                               | 4    |
| very high                             |                          | 5                              |   |                               |      |
| <b>24.</b><br><b>(+)</b><br><b>QN</b> | <b>24.</b>               | <b>VG</b><br><br><b>(d)</b>    | <b>Leaf blade: profile in cross section</b> |                               |      |
|                                       |                          |                                | concave                                     | M 27                          | 1    |
|                                       |                          |                                | flat  | M 9, M 7                      | 2    |
| convex                                |                          | 3                              |   |                               |      |
| <b>25.</b><br><b>(+)</b><br><b>QN</b> | <b>25.</b>               | <b>VG</b><br><br><b>(d)</b>    | <b>Leaf blade: length of tip</b>            |                               |      |
|                                       |                          |                                | short                                       | M 26                          | 1    |
|                                       |                          |                                | medium                                      | MM 106                        | 2    |
| long                                  | Last Minute/ P22, P 1    | 3                              |   |                               |      |

| CPVO N°                  | UPOV N°                  | Stage, Method | Characteristics                                 | Examples                 | Note           |
|--------------------------|--------------------------|---------------|---|--------------------------|----------------|
| <b>26.</b><br><b>(+)</b> | <b>26.</b><br><b>(*)</b> | <b>VG</b>     | <b>Leaf blade: incisions of margin</b>          |                          |                |
|                          |                          | <b>(d)</b>    | crenate   | J 9                      | 1              |
|                          |                          |               | bicrenate                                       | J-TE-G                   | 2              |
|                          |                          |               | serrate type 1                                  | J-TE-H, M 9              | 3              |
|                          |                          |               | serrate type 2                                  | J-TE-A                   | 4              |
|                          |                          |               | <b>G</b>  | biserrate                | MM 112, MM 114 |
| <b>27.</b>               | <b>27.</b>               | <b>VG</b>     | <b>Leaf blade: depth of incisions of margin</b> |                          |                |
|                          |                          | <b>(d)</b>    | very shallow                                    |                          | 1              |
|                          |                          |               | shallow   |                          | 2              |
|                          |                          |               | medium  |                          | 3              |
|                          |                          |               | deep  |                          | 4              |
|                          |                          |               | very deep                                       |                          | 5              |
| <b>28.</b>               | <b>28.</b><br><b>(*)</b> | <b>VG</b>     | <b>Leaf blade: undulation of margin</b>         |                          |                |
|                          |                          | <b>(d)</b>    | absent or very weak                             | MM 105, Pi 80            | 1              |
|                          |                          |               | weak  | MM 106                   | 2              |
|                          |                          |               | medium  | Cepiland, J-TE-H         | 3              |
|                          |                          |               | strong  | CG 24, M 18              | 4              |
| <b>29.</b>               | <b>29.</b>               | <b>VG</b>     | <b>Leaf blade: pubescence on lower side</b>     |                          |                |
|                          |                          | <b>(d)</b>    | weak  | M 7                      | 1              |
|                          |                          |               | medium  | Lizzy/ P 16, Supporter 1 | 2              |
|                          |                          |               | strong  |                          | 3              |
| <b>30.</b>               | <b>30.</b><br><b>(*)</b> | <b>VG</b>     | <b>Leaf blade: glossiness of upper side</b>     |                          |                |
|                          |                          | <b>(d)</b>    | absent or very weak                             | M 16, MM 114             | 1              |
|                          |                          |               | weak  | MM 111                   | 2              |
|                          |                          |               | medium  | MM 106                   | 3              |
|                          |                          |               | strong  | M 9, MM 102, MM 112      | 4              |

| CPVO N°                  | UPOV N°                  | Stage, Method | Characteristics                                    | Examples    | Note            |            |   |
|--------------------------|--------------------------|---------------|--|-------------|-----------------|------------|---|
| <b>31.</b>               | <b>31.</b><br><b>(*)</b> | <b>VG</b>     | <b>Leaf blade: intensity of green colour</b>       |             |                 |            |   |
|                          |                          |               | <b>QN</b>  | <b>(d)</b>  | light           | J-TE-G     | 1 |
|                          |                          |               |  |             | light to medium |            | 2 |
|                          |                          |               |  |             | medium          | CG 24, M 9 | 3 |
|                          |                          |               |  |             | medium to dark  |            | 4 |
|                          |                          |               | dark   | CG 10, M 26 | 5               |            |   |
| <b>32.</b>               | <b>32.</b><br><b>(*)</b> | <b>VG/MG</b>  | <b>Petiole: length</b>                             |             |                 |            |   |
|                          |                          |               | <b>QN</b>  | <b>(d)</b>  | short           |            | 1 |
|                          |                          |               |  |             | short to medium |            | 2 |
|                          |                          |               |  |             | medium          | M 27, M 9  | 3 |
|                          |                          |               |  |             | medium to long  |            | 4 |
|                          |                          |               | long   | MM 106      | 5               |            |   |
| <b>33.</b><br><b>(+)</b> | <b>33.</b><br><b>(*)</b> | <b>VG/MG</b>  | <b>Petiole: length relative to length of blade</b> |             |                 |            |   |
|                          |                          |               | <b>QN</b>  | <b>(d)</b>  | short           |            | 1 |
|                          |                          |               |  |             | short to medium |            | 2 |
|                          |                          |               |  |             | medium          |            | 3 |
|                          |                          |               |  |             | medium to long  |            | 4 |
|                          |                          |               | long   |             | 5               |            |   |
| <b>34.</b><br><b>(+)</b> | <b>34.</b>               | <b>VG</b>     | <b>Petiole: extent of anthocyanin coloration</b>   |             |                 |            |   |
|                          |                          |               | <b>QN</b>  | <b>(d)</b>  | small           | J-TE-F     | 1 |
|                          |                          |               |  |             | medium          | M 9        | 2 |
|                          |                          |               | large  | CG 10       | 3               |            |   |
| <b>35.</b>               | <b>35.</b><br><b>(*)</b> | <b>VG</b>     | <b>Stipule: size</b>                               |             |                 |            |   |
|                          |                          |               | <b>QN</b>  | <b>(d)</b>  | small           | M 27       | 1 |
|                          |                          |               |  |             | medium          | M 9        | 2 |
|                          |                          |               | large  | MM 106      | 3               |            |   |

| CPVO N°            | UPOV N°             | Stage, Method | Characteristics                       | Examples         | Note |
|--------------------|---------------------|---------------|---------------------------------------|------------------|------|
| <b>36.<br/>(+)</b> | <b>51.<br/>(* )</b> | <b>MG</b>     | <b>Time of beginning of bud burst</b> |                  |      |
| <b>QN</b>          |                     |               | very early                            |                  | 1    |
|                    |                     |               | very early to early                   |                  | 2    |
|                    |                     |               | early                                 | M 4              | 3    |
|                    |                     |               | early to medium                       |                  | 4    |
|                    |                     |               | medium                                | B 9, Cepiland    | 5    |
|                    |                     |               | medium to late                        |                  | 6    |
|                    |                     |               | late                                  | Last Minute/ P22 | 7    |
|                    |                     |               | late to very late                     |                  | 8    |
|                    |                     |               | very late                             |                  | 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:

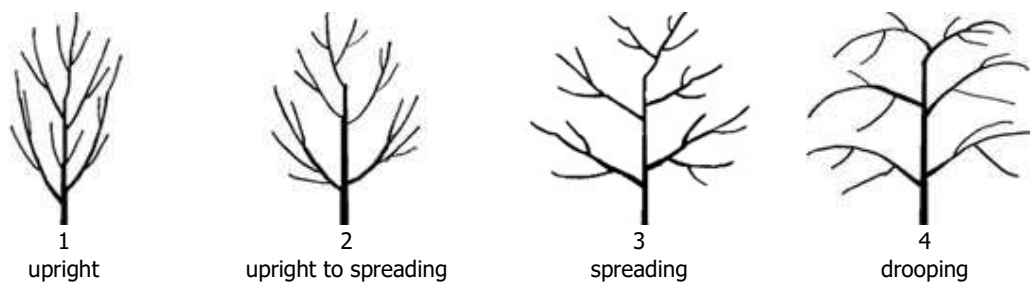
- a) Plant: Observations on the plant should be made in the dormant season.
- b) One-year-old shoot: Observations on the shoot should be made on the middle third of the one-year-old shoot in the dormant season.
- c) Young shoot: Observation of the young shoot should be made on the upper third of the one-year-old shoot during rapid growth.
- d) Leaf: Observations on the leaf should be made on fully developed leaves from the middle third of vigorous current season shoots.

### 8.2 Explanations for individual characteristics

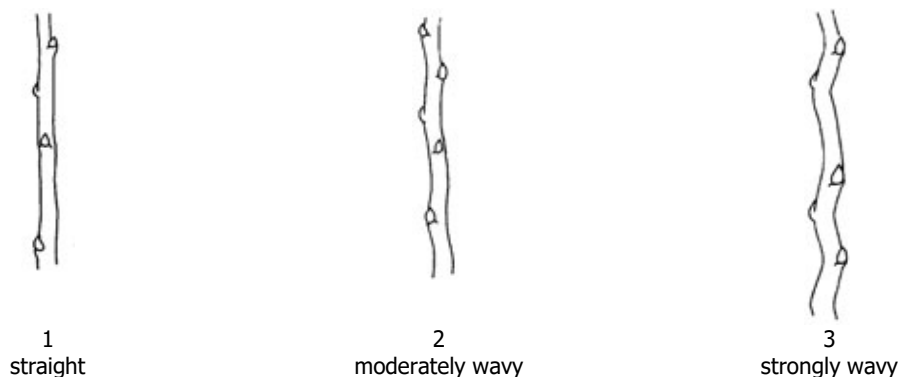
#### Ad. 1: Plant: vigour

The vigour of the plant should be considered as the overall abundance of vegetative growth.

#### Ad. 4: Plant: habit



#### Ad. 6: One-year-old shoot: growth pattern



#### Ad. 7: One-year-old shoot: pubescence

The pubescence should be assessed on the distal half of the shoot.

Ad. 15: One-year-old shoot: shape of apex of vegetative bud



1  
acute



2  
obtuse



3  
rounded

Ad. 16: One-year-old shoot: position of vegetative bud in relation to shoot



1  
adpressed



2  
slightly held out



3  
strongly held out

Ad. 17: One-year-old shoot: size of vegetative bud support



1  
small



2  
medium



3  
large

Ad. 18: Young shoot: colour of upper part

The colour observed should be of the underlying skin underneath the pubescence.

Ad. 20: Leaf blade: attitude in relation to shoot



1  
upwards



2  
outwards



3  
downwards

Ad. 23: Leaf blade: ratio length/width



1  
very low



2  
low



3  
medium



4  
high



5  
very high

Ad. 24: Leaf blade: profile in cross section



1  
concave



2  
flat



3  
convex

Ad. 25: Leaf blade: length of the tip



1  
short



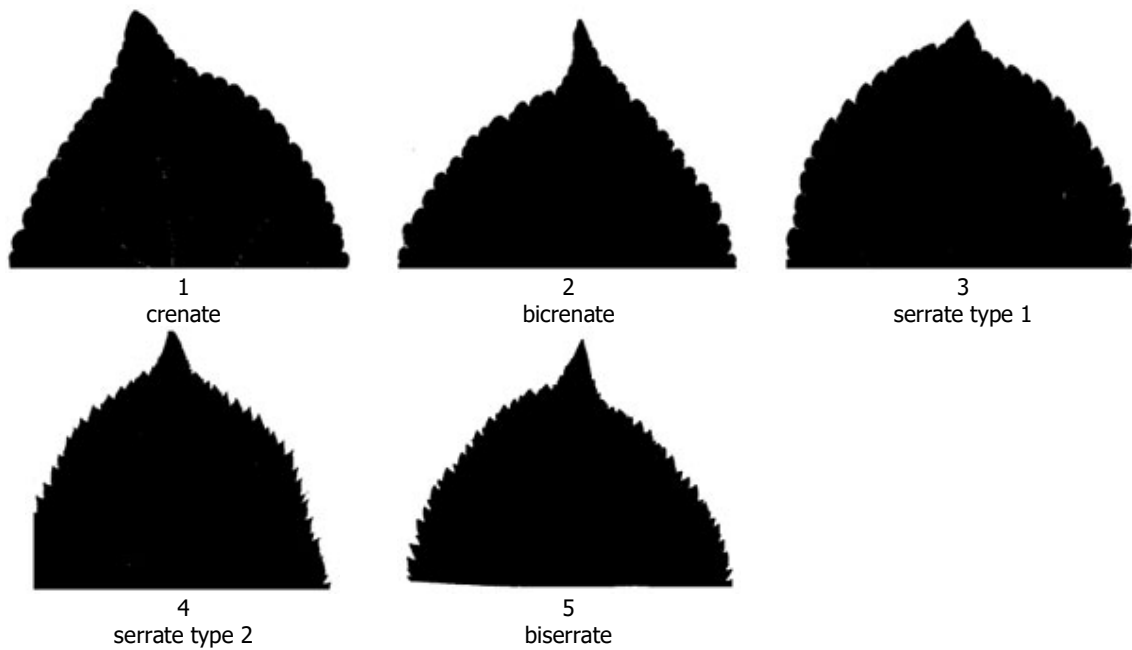
2  
medium



3  
long

Ad. 26: Leaf blade: incisions of margin

Observations should be done on the upper half of the leaf blade.



Ad. 33: Petiole: length relative to length of blade

Should be assessed regarding the length of the petiole compared to the length of the middle vein of the leaf.

Ad. 34: Petiole: extent of anthocyanin coloration

Should be assessed regarding the degree to which the anthocyanin coloration extends from the petiole base towards the base of the leaf.

Ad. 36: Time of beginning of bud burst

The time of beginning of bud burst is when 10% of the buds show green points.

## 9. LITERATURE

Embree, C.G., 1995: A Photographic Description of the Fruit of Certain Apple Rootstocks. *Fruit Varieties Journal*. 49 (1):59-64, US

Ferree, D. C., Carlson, R. F., 1987: Apple Rootstocks, in *Rootstocks for Fruit Crops*. Ed. Rom, Roy C. and Carlson, Robert F., Wiley, 107-143, US

Krümmel, H., 1956: Die vegetativ vermehrbaren Unterlagen des Kern- und Steinobstes. Deutscher Bauernverlag, Berlin, DE

Maurer, Erich., 1939: Die Unterlagen der Obstgehölze. Parey Verlag, Berlin, DE

Simons, Roy K., 1986: Leaf Characteristics of Apple Dwarfing Rootstocks. *Fruit Varieties Journal*, 40 (3): 71-79, US

Tydeman, H.M., 1953: A Description of Classification of the Malling-Merton and Malling XXV Apple Rootstocks. Report East Malling Research Station for 1952, pp. 53-63, GB

Tydeman, H.M., 1954: A Description of Certain MIX Crosses. Report East Malling Research Station for 1953, GB

Tydeman, H.M., 1955: Descriptions of the Malling Apple Rootstocks. Report East Malling Research Station for 1954, pp. 64-66, GB

## 10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the [CPVO website](#) under the following reference:  
CPVO/TQ-163/2-Rev – *Malus* Mill. – apple rootstocks

Link to the e-TQ:

<https://online.plantvarieties.eu/backOfficeFormQuestions?viewFormId=18237&viewFormType=TQ&viewFormLang=EN&speciesName=malus&status=1,2&order=formName>