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| |  |  |  | | --- | --- | --- | |  |  | **E** | |  |  |  | |  | wordml://75.png | |  | | --- | | **TG/44/12(proj.3)** | | **ORIGINAL:** English | | **DATE:** 2023-03-16 | | | **INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS** | | | |  | Geneva |  | |  | |  |  |  | | --- | --- | --- | |  |  |  | |  | DRAFT |  | |  |  |  | |  | |  |  |  | |  | |  | | --- | |  | | **TOMATO** | |  | | |  | | --- | |  | | |  | | --- | | UPOV Code(s): SOLAN\_LYC; SOLAN\_LCH; SOLAN\_LPI | | |  | | |  | | |  |  | | --- | --- | | |  | | --- | | *Solanum lycopersicum* L.;  *Solanum lycopersicum* L. x  *Solanum cheesmaniae* (L. Ridley) Fosberg; *Solanum lycopersicum* L.x  *Solanum pimpinellifolium* L. | | | |  | | |  | | --- | | \* | | |  |  |  | | |  | | --- | | **GUIDELINES** | |  | | **FOR THE CONDUCT OF TESTS** | |  | | **FOR DISTINCTNESS, UNIFORMITY AND STABILITY** | | | | |  |  |  | | |  | | --- | | *prepared by experts from the Netherlands* | | *to be considered by the* | | |  | | --- | | *Technical Working Party for Vegetables* | | | *at its fifty-seventh session, to be held in Antalya, Türkiye,* | | |  | | --- | | *from 2023-05-01 to 2023-05-05* | | | | | | *Disclaimer: this document does not represent UPOV policies or guidance* | | | |

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| 1. | Subject of these Test Guidelines |
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|  | |  | | --- | | These Test Guidelines apply to all varieties of *Solanum lycopersicum* L., *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosber  and *Solanum lycopersicum* L.x *Solanum pimpinellifolium* L.  (including rootstocks of these species).   For tomato rootstock varieties belonging to other species TG/294 applies. | |

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| 2. | Material Required |
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| 2.1 | |  | | --- | | The competent authorities decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with. | |
|  |  |
| 2.2 | |  | | --- | | The material is to be supplied in the form of seed or plants. | |
|  |  |
| 2.3 | |  | | --- | | The minimum quantity of plant material, to be supplied by the applicant, should be: | |
|  |  |
|  | |  | | --- | | (a) seed propagated varieties:                         2,500 seeds  (b) vegetatively propagated varieties:        25 non-grafted young plants without fruit. For disease resistance testing, additional plant material may be requested. | |
|  |  |
|  | In the case of seed, the seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority. |
|  |  |
| 2.4 | |  | | --- | | The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease. | |
|  |  |
| 2.5 | |  | | --- | | 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. | |

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| 3. | Method of Examination |
|  |  |
| *3.1* | *Number of Growing Cycles* |
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| |  | | --- | | 3.1.1 | | The minimum duration of tests should normally be two independent growing cycles. |
|  |  |
| |  | | --- | | 3.1.2 | | The two independent growing cycles should be in the form of two separate plantings. |
|  |  |
| |  | | --- | | 3.1.3 | | The testing of a variety may be concluded when the competent authority can determine with certainty the outcome of the test. |
|  |  |

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| --- | --- |
| *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”. |
|  |  |
| *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. |
|  |  |

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| --- | --- |
| *3.4* | *Test Design* |
|  |  |
| 3.4.1 | |  | | --- | | Each test should be designed to result in a total of at least 20 plants, which should be divided between at least 2 replicates. | |
|  |  |
| |  | | --- | | 3.4.2 | | |  | | --- | | The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle. | |
|  |  |
| |  | | --- | | 3.4.3 | | |  | | --- | | When resistance characteristics are used for assessing distinctness, uniformity and stability, records must be taken under conditions of controlled infection and, unless otherwise specified, on at least 20 plants.  In case of vegetatively propagated varieties, when resistance characteristics are used for the assessment of Distinctness, Uniformity and Stability, records must be taken on at least 10 plants. | |
|  |  |
| |  | | --- | |  |   *3.5* | *Additional Tests* |
|  |  |
|  | Additional tests, for examining relevant characteristics, may be established. |

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| 4. | Assessment of Distinctness, Uniformity and Stability |
|  |  |
| *4.1* | *Distinctness* |
|  |  |
| 4.1.1 | General Recommendations |
|  |  |
|  | It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in these Test Guidelines. |
|  |  |
| 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 Test Guidelines are familiar with the recommendations contained in the General Introduction prior to making decisions regarding distinctness. |
|  |  |
| 4.1.4 | |  | | --- | | Number of Plants or Parts of Plants to be Examined | |
|  |  |
|  | |  | | --- | | Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 10 plants or parts of plants taken from each of 10 plants and any other observations made on all plants in the test, disregarding any off-type plants. | |
|  |  |
| 4.1.5 | Method of Observation |
|  |  |
|  | The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the 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* |
|  |  |
| 4.2.1 | It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines: |
|  |  |
| |  | | --- | | 4.2.2 | | |  | | --- | | These Test Guidelines have been developed for the examination of seed-propagated and vegetatively propagated varieties. For varieties with other types of propagation, the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species" Section 4.5 "Testing Uniformity" should be followed. | |
|  |  |
| 4.2.3 | |  | | --- | | For the assessment of uniformity of self-pollinated varieties, single cross hybrids and vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 20 plants, 1 off-type is allowed. | |
|  |  |
| *4.3* | *Stability* |
|  |  |
| 4.3.1 | 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. |

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| 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) | |  | |  | | --- | | Plant: growth type (characteristic 2) | | | |  | | --- | | (b) | |  | |  | | --- | | Leaf: type of blade (characteristic 10) | | | |  | | --- | | (c) | |  | |  | | --- | | Peduncle: abscission layer (characteristic 19) | | | |  | | --- | | (d) | |  | |  | | --- | | Immature fruit: green shoulder  (characteristic 21) | | | |  | | --- | | (e) | |  | |  | | --- | | Immature fruit: green stripes  (characteristic 25) | | | |  | | --- | | (f) | |  | |  | | --- | | Immature fruit: anthocyanin coloration  (characteristic 26) | | | |  | | --- | | (g) | |  | |  | | --- | | Fruit: size (characteristic 28) | | | |  | | --- | | (h) | |  | |  | | --- | | Fruit: shape in longitudinal section (characteristic 30) | | | |  | | --- | | (i) | |  | |  | | --- | | Fruit: number of locules (characteristic 38) | | | |  | | --- | | (j) | |  | |  | | --- | | Fruit: gel in locules (characteristic 39) | | |
|  | |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | | (k) | |  | |  | | --- | | Fruit: color (characteristic 40) | | | |  | | --- | | (l) | |  | |  | | --- | | Resistance to *Meloidogyne incognita* (Mi) (characteristic 45) | | | |  | | --- | | (m) | |  | |  | | --- | | Resistance to *Verticillium* sp. (Va and Vd) - Race 0 (characteristic 46) | | | |  | | --- | | (n) | |  | |  | | --- | | Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 0EU/1US (Fol: 0EU/1US) (characteristic 47) | | | |  | | --- | | (o) | |  | |  | | --- | | Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 1EU/2US (Fol: 1EU/2US) (characteristic 48) | | | |  | | --- | | (p) | |  | |  | | --- | | Resistance to *Tomato mosaic virus* - Strain 0 (ToMV: 0) (characteristic 59) | | | |  | | --- | | (q) | |  | |  | | --- | | Resistance to *Tomato spotted wilt virus* - Pathotype 0 (TSWV: 0) (characteristic 68) | | | |  |  | | --- | --- | | |  | | --- | |  | | | | | |
| 5.4 | Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 “Examining Distinctness”. |

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| 6. | Introduction to the Table of Characteristics |
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| *6.1* | *Categories of Characteristics* |
| 6.1.1 | Standard Test Guidelines Characteristics |
|  | Standard Test Guidelines characteristics are those which are approved by UPOV for examination of DUS and from which members of the Union can select those suitable for their particular circumstances. |
| 6.1.2 | Asterisked Characteristics |
|  | Asterisked characteristics (denoted by \*) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description by all members of the Union, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate. |
| *6.2* | *States of Expression and Corresponding Notes* |
| 6.2.1 | 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. |
| 6.2.2 | All relevant states of expression are presented in the characteristic. |
|  |  |
| 6.2.3 | Further explanation of the presentation of states of expression and notes is provided in document TGP/7 “Development of Test Guidelines”. |
| *6.3* | *Types of Expression* |
|  | An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction. |

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| *6.4* | *Example Varieties* |
|  | Where appropriate, example varieties are provided to clarify the states of expression of each characteristic. |

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| *6.5* | *Legend* |
|  |  |
| |  |  | English | | français | | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | **1** | | |  | | --- | | **2** | | |  | | --- | | **3** | | |  | | --- | | **4** | | |  | | --- | | **5** | | |  | | --- | | **6** | | |  | | --- | | **7** | | | | | |  |  | |  | | --- | | **Name of characteristics in English** | | | |  | | --- | | **Nom du caractère en français** | | | |  | | --- | | **Name des Merkmals auf Deutsch** | | |  | | --- | | **Nombre del carácter en español** | |  |  | |  |  | |  | | --- | | states of expression | | | |  | | --- | | types d’expression | | | |  | | --- | | Ausprägungsstufen | | |  | | --- | | tipos de expresión | | |  | | --- | |  | |  | |  |  |  |  |  |  |  |  |  |  | | |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | Characteristic number | | | |  |  |  |  | | 2 | (\*) | Asterisked characteristic | – see Chapter 6.1.2 | |  |  |  |  | | 3 | Type of expression | | | |  | QL | Qualitative characteristic | – see Chapter 6.3 | |  | QN | Quantitative characteristic | – see Chapter 6.3 | |  | PQ | Pseudo-qualitative characteristic | – see Chapter 6.3 | |  |  |  |  | | 4 | Method of observation (and type of plot, if applicable) | | | |  | MG, MS, VG, VS | | – see Chapter 4.1.5 | |  |  |  |  | | 5 | |  | | --- | | (+) | | |  |  | | --- | --- | | |  | | --- | | See Explanations on the Table of Characteristics in Chapter 8.2 | | | | |  |  |  |  | | 6 | |  | | --- | | (a)-(c) | | |  |  | | --- | --- | | |  | | --- | | See Explanations on the Table of Characteristics in Chapter 8.1 | | | | |  |  |  |  | | 7 | |  | | --- | | Not applicable | | | | | |

|  |  |
| --- | --- |
| 7. | Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres |
|  |  |

|  |  | English | | français | | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1.** | **(\*)** | **QN** | **VS** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Seed-propagated varieties only: Seedling: anthocyanin coloration of hypocotyl** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Colt, VTM215 | 1 |
|  |  | partially present | |  | |  |  |  | 2 |
|  |  | totally present | |  | |  |  | Daniela, Marmande VR | 3 |
| **2.** | **(\*)** | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Plant: growth type** | | |  | |  |  |  |  |
|  |  | determinate | |  | |  |  | Rio Grande, Siluet | 1 |
|  |  | indeterminate | |  | |  |  | Daniela, Florenteen, Marmande VR, Saint‑Pierre | 2 |
| **3.** | **(\*)** | **QN** | **MS/VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Only varieties with plant growth type determinate: Plant: number of inflorescences on main stem** | | |  | |  |  |  |  |
|  |  | very few | |  | |  |  | Cherry Falls | 1 |
|  |  | very few to few | |  | |  |  | Monty | 2 |
|  |  | few | |  | |  |  | Simplex | 3 |
|  |  | few to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Miceno | 5 |
|  |  | medium to many | |  | |  |  |  | 6 |
|  |  | many | |  | |  |  | Malkonet | 7 |
|  |  | many to very many | |  | |  |  | Grownet | 8 |
|  |  | very many | |  | |  |  |  | 9 |
| **4.** |  | **QN** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Stem: anthocyanin coloration** | | |  | |  |  |  |  |
|  |  | absent or very weak | |  | |  |  | Rebelski | 1 |
|  |  | very weak to weak | |  | |  |  |  | 2 |
|  |  | weak | |  | |  |  | Montfavet 63-5 | 3 |
|  |  | weak to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Miniprio, Philovita | 5 |
|  |  | medium to strong | |  | |  |  |  | 6 |
|  |  | strong | |  | |  |  | Grinta | 7 |
|  |  | strong to very strong | |  | |  |  |  | 8 |
|  |  | very strong | |  | |  |  | Villax | 9 |
| **5.** |  | **QN** | **MS/VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Only varieties with plant growth type indeterminate: Stem: length of internode** | | |  | |  |  |  |  |
|  |  | very short | |  | |  |  |  | 1 |
|  |  | very short to short | |  | |  |  |  | 2 |
|  |  | short | |  | |  |  | Primioso | 3 |
|  |  | short to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Campari, Montfavet 63-5 | 5 |
|  |  | medium to long | |  | |  |  |  | 6 |
|  |  | long | |  | |  |  | Rebelski, Tomawak | 7 |
|  |  | long to very long | |  | |  |  |  | 8 |
|  |  | very long | |  | |  |  |  | 9 |
| **6.** | **(\*)** | **QN** | **MS/VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Only varieties with plant growth type indeterminate: Plant: height** | | |  | |  |  |  |  |
|  |  | very short | |  | |  |  | Garderner's Delight, Maresme, Zadenna | 1 |
|  |  | very short to short | |  | |  |  |  | 2 |
|  |  | short | |  | |  |  | Delfine, Despina | 3 |
|  |  | short to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Brooklyn, Campari | 5 |
|  |  | medium to tall | |  | |  |  |  | 6 |
|  |  | tall | |  | |  |  | Climberley, Pitenza | 7 |
|  |  | tall to very tall | |  | |  |  |  | 8 |
|  |  | very tall | |  | |  |  | Goldwin, Romindo | 9 |
| **7.** | **(\*)** | **QN** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: attitude** | | |  | |  |  |  |  |
|  |  | erect | |  | |  |  |  | 1 |
|  |  | erect to semi-erect | |  | |  |  |  | 2 |
|  |  | semi-erect | |  | |  |  | Zadenna | 3 |
|  |  | semi-erect to horizontal | |  | |  |  |  | 4 |
|  |  | horizontal | |  | |  |  | Brioso, Geronimo | 5 |
|  |  | horizontal to semi-drooping | |  | |  |  |  | 6 |
|  |  | semi-drooping | |  | |  |  | Leonce, Montfavet 63-5, Upper | 7 |
|  |  | semi-drooping to drooping | |  | |  |  |  | 8 |
|  |  | drooping | |  | |  |  | Caboverde | 9 |
| **8.** |  | **QN** | **MS/VG** |  | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: length** | | |  | |  |  |  |  |
|  |  | very short | |  | |  |  |  | 1 |
|  |  | very short to short | |  | |  |  |  | 2 |
|  |  | short | |  | |  |  | Red Robin | 3 |
|  |  | short to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Mezcal, Rio Grande | 5 |
|  |  | medium to long | |  | |  |  |  | 6 |
|  |  | long | |  | |  |  | Geronimo, Montfavet 63-5 | 7 |
|  |  | long to very long | |  | |  |  |  | 8 |
|  |  | very long | |  | |  |  |  | 9 |
| **9.** |  | **QN** | **MS/VG** |  | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: width** | | |  | |  |  |  |  |
|  |  | very narrow | |  | |  |  |  | 1 |
|  |  | very narrow to narrow | |  | |  |  |  | 2 |
|  |  | narrow | |  | |  |  | Red Robin | 3 |
|  |  | narrow to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Rio Grande | 5 |
|  |  | medium to broad | |  | |  |  |  | 6 |
|  |  | broad | |  | |  |  | Brioso, Saint‑Pierre | 7 |
|  |  | broad to very broad | |  | |  |  |  | 8 |
|  |  | very broad | |  | |  |  |  | 9 |
| **10.** | **(\*)** | **QL** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: type of blade** | | |  | |  |  |  |  |
|  |  | pinnate | |  | |  |  | Matina | 1 |
|  |  | bipinnate | |  | |  |  | Daniela, Saint‑Pierre | 2 |
| **11.** |  | **QN** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: size of leaflets** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Microtom | 1 |
|  |  | very small to small | |  | |  |  |  | 2 |
|  |  | small | |  | |  |  | Tiny Tim | 3 |
|  |  | small to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Geronimo, Marmande VR | 5 |
|  |  | medium to large | |  | |  |  |  | 6 |
|  |  | large | |  | |  |  | Daniela | 7 |
|  |  | large to very large | |  | |  |  |  | 8 |
|  |  | very large | |  | |  |  |  | 9 |
| **12.** | **(\*)** | **QN** | **VG** |  | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: intensity of green color** | | |  | |  |  |  |  |
|  |  | very light | |  | |  |  |  | 1 |
|  |  | very light to light | |  | |  |  |  | 2 |
|  |  | light | |  | |  |  | Rossol | 3 |
|  |  | light to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Rebelski | 5 |
|  |  | medium to dark | |  | |  |  |  | 6 |
|  |  | dark | |  | |  |  | Daniela, Red Robin | 7 |
|  |  | dark to very dark | |  | |  |  |  | 8 |
|  |  | very dark | |  | |  |  |  | 9 |
| **13.** |  | **QN** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: glossiness** | | |  | |  |  |  |  |
|  |  | very weak | |  | |  |  | Speedax | 1 |
|  |  | very weak to weak | |  | |  |  |  | 2 |
|  |  | weak | |  | |  |  | Daniela, Losna | 3 |
|  |  | weak to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Marmande VR | 5 |
|  |  | medium to strong | |  | |  |  |  | 6 |
|  |  | strong | |  | |  |  | Albis, Dulcemiel, Lutecia | 7 |
|  |  | strong to very strong | |  | |  |  | Wasino | 8 |
|  |  | very strong | |  | |  |  |  | 9 |
| **14.** |  | **QN** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: blistering** | | |  | |  |  |  |  |
|  |  | very weak | |  | |  |  |  | 1 |
|  |  | very weak to weak | |  | |  |  |  | 2 |
|  |  | weak | |  | |  |  | Daniela | 3 |
|  |  | weak to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Marmande VR, Octavio, Syrio | 5 |
|  |  | medium to strong | |  | |  |  |  | 6 |
|  |  | strong | |  | |  |  | Albis, Delfine, Paronset, Red Robin | 7 |
|  |  | strong to very strong | |  | |  |  |  | 8 |
|  |  | very strong | |  | |  |  |  | 9 |
| **15.** |  | **QN** | **VG** | **(+)** | **(a)** |  | | | |
|  |  | |  | | --- | | **Leaf: attitude of petiole of leaflet in relation to main axis** | | |  | |  |  |  |  |
|  |  | erect | |  | |  |  | Volantis | 1 |
|  |  | erect to semi-erect | |  | |  |  |  | 2 |
|  |  | semi-erect | |  | |  |  | Geronimo, Marmande VR | 3 |
|  |  | semi-erect to horizontal | |  | |  |  |  | 4 |
|  |  | horizontal | |  | |  |  | Delisher | 5 |
| **16.** |  | **QN** | **MG/MS** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Time of flowering** | | |  | |  |  |  |  |
|  |  | very early | |  | |  |  | Pyremello, Trambellino | 1 |
|  |  | very early to early | |  | |  |  | Creativo, Tropical | 2 |
|  |  | early | |  | |  |  | Delizia, Lemonade, Zorayda | 3 |
|  |  | early to medium | |  | |  |  | Cindel, Goldwin, Organza | 4 |
|  |  | medium | |  | |  |  | Delisher, Losna, Montfavet 63-5, Sonico | 5 |
|  |  | medium to late | |  | |  |  | Orama, Soltyno | 6 |
|  |  | late | |  | |  |  | Octydia, Raymos, Saint‑Pierre, Sylvana | 7 |
|  |  | late to very late | |  | |  |  | Nissos, Paronset | 8 |
|  |  | very late | |  | |  |  | Atago, Brito, Wafira | 9 |
| **17.** |  | **PQ** | **MS/VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Inflorescence: type** | | |  | |  |  |  |  |
|  |  | mainly uniparous | |  | |  |  | Geronimo, Red Robin | 1 |
|  |  | equally uniparous and multiparous | |  | |  |  | Harzfeuer | 2 |
|  |  | mainly multiparous | |  | |  |  | Karelya | 3 |
|  |  | multiflora | |  | |  |  | Mini Star, Sweedor | 4 |
| **18.** | **(\*)** | **QL** | **VG** |  |  |  | | | |
|  |  | |  | | --- | | **Flower: color** | | |  | |  |  |  |  |
|  |  | yellow | |  | |  |  | Marmande VR, Santorange | 1 |
|  |  | orange | |  | |  |  | Mountain Vineyard, Orama | 2 |
| **19.** | **(\*)** | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Peduncle: abscission layer** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Merlice, Rio Grande | 1 |
|  |  | present | |  | |  |  | Daniela, Grownet, Montfavet 63-5 | 9 |
| **20.** | **(\*)** | **QN** | **MS/VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Only varieties with peduncle abscission layer present: Peduncle: length** | | |  | |  |  |  |  |
|  |  | very short | |  | |  |  |  | 1 |
|  |  | very short to short | |  | |  |  |  | 2 |
|  |  | short | |  | |  |  | Cerise, Ferline | 3 |
|  |  | short to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Caboverde, Grownet | 5 |
|  |  | medium to long | |  | |  |  |  | 6 |
|  |  | long | |  | |  |  | Sir Elyan | 7 |
|  |  | long to very long | |  | |  |  |  | 8 |
|  |  | very long | |  | |  |  |  | 9 |
| **21.** | **(\*)** | **QL** | **VG** | **(+)** | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: green shoulder** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Geronimo | 1 |
|  |  | present | |  | |  |  | Daniela, Montfavet 63-5 | 9 |
| **22.** |  | **QN** | **VG** | **(+)** | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: extent of green shoulder** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Daniela | 1 |
|  |  | very small to small | |  | |  |  |  | 2 |
|  |  | small | |  | |  |  | Shiren, Siluet | 3 |
|  |  | small to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Marmalindo, Montfavet 63-5, Red Robin | 5 |
|  |  | medium to large | |  | |  |  |  | 6 |
|  |  | large | |  | |  |  | Cobra, Dulcemiel | 7 |
|  |  | large to very large | |  | |  |  |  | 8 |
|  |  | very large | |  | |  |  |  | 9 |
| **23.** |  | **QN** | **VG** | **(+)** | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: intensity of green color of shoulder** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | very light | |  | |  |  |  | 1 |
|  |  | very light to light | |  | |  |  |  | 2 |
|  |  | light | |  | |  |  | Daniela, Soltyno | 3 |
|  |  | light to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Montfavet 63-5, Santonio, Sunita | 5 |
|  |  | medium to dark | |  | |  |  |  | 6 |
|  |  | dark | |  | |  |  | Brito, Nugget | 7 |
|  |  | dark to very dark | |  | |  |  |  | 8 |
|  |  | very dark | |  | |  |  |  | 9 |
| **24.** | **(\*)** | **QN** | **VG** | **(+)** | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: intensity of green color excluding shoulder** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | very light | |  | |  |  | Claree | 1 |
|  |  | very light to light | |  | |  |  |  | 2 |
|  |  | light | |  | |  |  | Daniela, Durinta, Trust | 3 |
|  |  | light to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Sunita, Tropical | 5 |
|  |  | medium to dark | |  | |  |  |  | 6 |
|  |  | dark | |  | |  |  | Centella, Chocomate, Uragano | 7 |
|  |  | dark to very dark | |  | |  |  |  | 8 |
|  |  | very dark | |  | |  |  | Momi, Verdi | 9 |
| **25.** | **(\*)** | **QL** | **VG** | **(+)** | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: green stripes** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Daniela, Guanche, Jasminia | 1 |
|  |  | present | |  | |  |  | Green Zebra, Tigerella | 9 |
| **26.** | **(\*)** | **QL** | **VG** |  | **(b)** |  | | | |
|  |  | |  | | --- | | **Immature fruit: anthocyanin coloration** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Durinta | 1 |
|  |  | present | |  | |  |  | HN5003 | 9 |
| **27.** | **(\*)** | **QN** | **MG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Time of maturity** | | |  | |  |  |  |  |
|  |  | very early | |  | |  |  | Goldwin, Pyremello, Sweet Baby, Trambellino | 1 |
|  |  | very early to early | |  | |  |  | Delisher | 2 |
|  |  | early | |  | |  |  | Lemonade, Shiren, Zorayda | 3 |
|  |  | early to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Delizia, Losna, Sonico | 5 |
|  |  | medium to late | |  | |  |  |  | 6 |
|  |  | late | |  | |  |  | Mariana, Saneh | 7 |
|  |  | late to very late | |  | |  |  |  | 8 |
|  |  | very late | |  | |  |  | Atago, Brito, Daniela, Raymos, Wafira | 9 |
| **28.** | **(\*)** | **QN** | **MS/VG** |  | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: size** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Cerise, Sweet 100 | 1 |
|  |  | very small to small | |  | |  |  | Dolcetini, Genio | 2 |
|  |  | small | |  | |  |  | Brioso, Tankini | 3 |
|  |  | small to medium | |  | |  |  | Larimar, Progress | 4 |
|  |  | medium | |  | |  |  | Mezcal, Oceano | 5 |
|  |  | medium to large | |  | |  |  | Luminance, Rio Grande | 6 |
|  |  | large | |  | |  |  | Carmello, Floradade | 7 |
|  |  | large to very large | |  | |  |  | Florenteen, Grownet | 8 |
|  |  | very large | |  | |  |  | Cupidissimo, Marsilia | 9 |
| **29.** | **(\*)** | **QN** | **MS/VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: ratio length/diameter** | | |  | |  |  |  |  |
|  |  | very compressed | |  | |  |  | Margold, Marmande VR | 1 |
|  |  | very compressed to moderately compressed | |  | |  |  | Lutecia, Shourouq | 2 |
|  |  | moderately compressed | |  | |  |  | Cupidissimo, Motto | 3 |
|  |  | moderately compressed to medium | |  | |  |  | Kaponet, Laureen, Merlice | 4 |
|  |  | medium | |  | |  |  | Chocostar, Mezcal, Red Robin | 5 |
|  |  | medium to moderately elongated | |  | |  |  | Dulcini, Ibix | 6 |
|  |  | moderately elongated | |  | |  |  | Oceano, Oribustar,  Rio Grande | 7 |
|  |  | moderately elongated to very elongated | |  | |  |  | Ibrax, Sir Elyan | 8 |
|  |  | very elongated | |  | |  |  | Bellandine, Capriccio, Elko | 9 |
| **30.** | **(\*)** | **PQ** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: shape in longitudinal section** | | |  | |  |  |  |  |
|  |  | flattened | |  | |  |  | Margold, Marmande VR | 1 |
|  |  | oblate | |  | |  |  | Cartesio, Gloriette, Merlice, Montfavet 63-5 | 2 |
|  |  | circular | |  | |  |  | Cerise, Soussia | 3 |
|  |  | oblong | |  | |  |  | Landolino, Red Sky | 4 |
|  |  | cylindric | |  | |  |  | Hypeel 244, Sir Elyan | 5 |
|  |  | elliptic | |  | |  |  | Obock | 6 |
|  |  | cordate | |  | |  |  | Cuor di Bue, Cupidissimo, Laureen, Valenciano | 7 |
|  |  | ovate | |  | |  |  | Dualrow, Soto | 8 |
|  |  | obovate | |  | |  |  | Duquesa, Estelle, Mezcal | 9 |
|  |  | pyriform | |  | |  |  | Oceano, Olivenza, Operino | 10 |
|  |  | obcordate | |  | |  |  | Cuore del Ponente, Ingrid | 11 |
| **31.** | **(\*)** | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: ribbing** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent or very weak | |  | |  |  | Cerise, Conchita | 1 |
|  |  | very weak to weak | |  | |  |  |  | 2 |
|  |  | weak | |  | |  |  | Baikonur, Guanche | 3 |
|  |  | weak to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Montfavet 63-5, Shourouq | 5 |
|  |  | medium to strong | |  | |  |  |  | 6 |
|  |  | strong | |  | |  |  | Marmalindo,  Marmande VR, Marsilia | 7 |
|  |  | strong to very strong | |  | |  |  |  | 8 |
|  |  | very strong | |  | |  |  | Ingrid, Marsalato | 9 |
| **32.** |  | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: depression at peduncle end** | | |  | |  |  |  |  |
|  |  | absent or very weak | |  | |  |  | Mirante, Sweet Baby | 1 |
|  |  | very weak to weak | |  | |  |  |  | 2 |
|  |  | weak | |  | |  |  | Bodega, Lebron, Melody | 3 |
|  |  | weak to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Fandango, Hibisco, Jasminia, Saint‑Pierre | 5 |
|  |  | medium to strong | |  | |  |  |  | 6 |
|  |  | strong | |  | |  |  | Igido, Losna,  Marmande VR | 7 |
|  |  | strong to very strong | |  | |  |  |  | 8 |
|  |  | very strong | |  | |  |  |  | 9 |
| **33.** |  | **QN** | **MS/VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: size of peduncle scar** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Cerise, Sweet Baby | 1 |
|  |  | very small to small | |  | |  |  |  | 2 |
|  |  | small | |  | |  |  | Cherrubino, Tukami | 3 |
|  |  | small to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Bodega, Hibisco, Montfavet 63-5 | 5 |
|  |  | medium to large | |  | |  |  |  | 6 |
|  |  | large | |  | |  |  | Fandango, Gloriette, Jasminia | 7 |
|  |  | large to very large | |  | |  |  |  | 8 |
|  |  | very large | |  | |  |  | Baikonur, Ensemble, Marmande VR | 9 |
| **34.** |  | **QN** | **MS/VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: size of blossom scar** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Cerise, Conchita, Mirante | 1 |
|  |  | very small to small | |  | |  |  |  | 2 |
|  |  | small | |  | |  |  | Ensemble, Lilos, Montfavet 63-5 | 3 |
|  |  | small to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Pink Bisou | 5 |
|  |  | medium to large | |  | |  |  |  | 6 |
|  |  | large | |  | |  |  | Esmira, Marinda, Marmande VR, Saint‑Pierre | 7 |
|  |  | large to very large | |  | |  |  |  | 8 |
|  |  | very large | |  | |  |  | Marsalato, Marsilia | 9 |
| **35.** |  | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: shape at blossom end** | | |  | |  |  |  |  |
|  |  | indented | |  | |  |  | Marmande VR | 1 |
|  |  | indented to flat | |  | |  |  | Framboo, Linnea | 2 |
|  |  | flat | |  | |  |  | Montfavet 63-5, Realeza, Viniccio | 3 |
|  |  | flat to pointed | |  | |  |  | Batistuta | 4 |
|  |  | pointed | |  | |  |  | Roma VF, Talentum | 5 |
| **36.** |  | **QN** | **MS/VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: diameter of core in cross section in relation to total diameter** | | |  | |  |  |  |  |
|  |  | very small | |  | |  |  | Cerise | 1 |
|  |  | very small to small | |  | |  |  |  | 2 |
|  |  | small | |  | |  |  | Dolcevita, Takumi | 3 |
|  |  | small to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Losna, Montfavet 63-5, Tastery | 5 |
|  |  | medium to large | |  | |  |  |  | 6 |
|  |  | large | |  | |  |  | Commodo, Paradigma | 7 |
|  |  | large to very large | |  | |  |  |  | 8 |
|  |  | very large | |  | |  |  | Baikonur, Marmande VR, Valenciano | 9 |
| **37.** |  | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: thickness of pericarp** | | |  | |  |  |  |  |
|  |  | very thin | |  | |  |  | Cerise | 1 |
|  |  | very thin to thin | |  | |  |  |  | 2 |
|  |  | thin | |  | |  |  | Astuto, Conchita, Marmande VR | 3 |
|  |  | thin to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Jayran, Montfavet 63-5, Refosco | 5 |
|  |  | medium to thick | |  | |  |  |  | 6 |
|  |  | thick | |  | |  |  | Losna, Reconquista | 7 |
|  |  | thick to very thick | |  | |  |  |  | 8 |
|  |  | very thick | |  | |  |  | Delibes, Floyd, Myriade, Orinade | 9 |
| **38.** | **(\*)** | **QN** | **MS/VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: number of locules** | | |  | |  |  |  |  |
|  |  | only two | |  | |  |  | Creativo, San Marzano 2, Tropical | 1 |
|  |  | two and three | |  | |  |  | Bomfado, Orinade | 2 |
|  |  | three and four | |  | |  |  | Durinta, Montfavet 63-5 | 3 |
|  |  | four, five or six | |  | |  |  | Rovente, Tosmar, Tradiro | 4 |
|  |  | more than six | |  | |  |  | Bronson, Chocostar, Marmande VR | 5 |
| **39.** | **(\*)** | **QL** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: gel in locules** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Allflesh 1120, Nun 03560 | 1 |
|  |  | present | |  | |  |  | Daniela, Rio Grande | 9 |
| **40.** | **(\*)** | **PQ** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: color** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | yellowish white | |  | |  |  | Cream Sausage | 1 |
|  |  | yellow | |  | |  |  | Babylor, Mimosa | 2 |
|  |  | orange | |  | |  |  | Operino, Oranjestar | 3 |
|  |  | pink | |  | |  |  | Framboo, Pink Wand, Tomimaru Muchoo | 4 |
|  |  | red | |  | |  |  | Daniela, Ferline, Montfavet 63-5, Saint‑Pierre, Umaca | 5 |
|  |  | brown | |  | |  |  | Chocostar, Marbruni | 6 |
|  |  | green | |  | |  |  | Green Grape, Green Zebra | 7 |
| **41.** |  | **PQ** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: color of flesh** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | yellowish white | |  | |  |  | Cream Sausage | 1 |
|  |  | yellow | |  | |  |  | Babylor, Mimosa | 2 |
|  |  | orange | |  | |  |  | Operino, Oranjestar | 3 |
|  |  | pink | |  | |  |  | Framboo, Pink Wand | 4 |
|  |  | red | |  | |  |  | Daniela, Ferline, Montfavet 63-5, Saint‑Pierre, Tomimaru Muchoo, Umaca | 5 |
|  |  | brown | |  | |  |  | Chocostar, Marbruni | 6 |
|  |  | green | |  | |  |  | Green Grape, Green Zebra | 7 |
| **42.** |  | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: glossiness of skin** | | |  | |  |  |  |  |
|  |  | weak | |  | |  |  | Focale, Josefina, Sylvana | 1 |
|  |  | medium | |  | |  |  | Ventero | 2 |
|  |  | strong | |  | |  |  | Daltoma, Mecano | 3 |
| **43.** | **(\*)** | **QL** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: color of epidermis** | | |  | |  |  |  |  |
|  |  | colorless | |  | |  |  | Black Opal, Fruits,  House Momotaro, Marvori | 1 |
|  |  | yellow | |  | |  |  | Brown Berry, Daniela | 2 |
| **44.** | **(\*)** | **QN** | **VG** | **(+)** | **(c)** |  | | | |
|  |  | |  | | --- | | **Fruit: firmness** | | |  | |  |  |  |  |
|  |  | very soft | |  | |  |  | Marmande VR | 1 |
|  |  | very soft to soft | |  | |  |  |  | 2 |
|  |  | soft | |  | |  |  | Marinda, Marsalato | 3 |
|  |  | soft to medium | |  | |  |  |  | 4 |
|  |  | medium | |  | |  |  | Rosannita, Sunita | 5 |
|  |  | medium to firm | |  | |  |  |  | 6 |
|  |  | firm | |  | |  |  | Losna, Octavio, Tradiro | 7 |
|  |  | fim to very firm | |  | |  |  |  | 8 |
|  |  | very firm | |  | |  |  | Brito, Daniela, Larimar, Lolek | 9 |
| **45.** |  | **QN** | **MS/VS** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Meloidogyne incognita* (Mi)** | | |  | |  |  |  |  |
|  |  | absent or low | |  | |  |  | Casaque Rouge | 1 |
|  |  | medium | |  | |  |  | Campeon, Tyonic | 2 |
|  |  | high | |  | |  |  | Anahu, Anahu x Casaque Rouge | 3 |
| **46.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Verticillium* sp. (Va and Vd) - Race 0** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Marmande verte, Moneymaker | 1 |
|  |  | present | |  | |  |  | Marmande VR, Monalbo | 9 |
| **47.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *lycopersici* -  Race 0EU/1US  (Fol: 0EU/1US)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Marmande verte, Moneymaker | 1 |
|  |  | present | |  | |  |  | Anabel, Marporum, Marsol | 9 |
| **48.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *lycopersici* -  Race 1EU/2US  (Fol: 1EU/2US)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Marmande verte, Moneymaker | 1 |
|  |  | present | |  | |  |  | Motelle | 9 |
| **49.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *lycopersici* -  Race 2EU/3US  (Fol: 2EU/3US)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Marmande verte, Motelle | 1 |
|  |  | present | |  | |  |  | Alliance, Ivanhoé | 9 |
| **50.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *radicis-lycopersici* (For)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Moneymaker, Motelle | 1 |
|  |  | present | |  | |  |  | Momor | 9 |
| **51.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Race 0** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Antique, Pink Treat, Retinto, Sprigel, Triatlon | 9 |
| **52.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group A** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker, Retinto | 1 |
|  |  | present | |  | |  |  | Antique, Pink Treat, Sprigel, Triatlon | 9 |
| **53.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group B** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker, Pink Treat | 1 |
|  |  | present | |  | |  |  | Antique, Retinto, Sprigel, Triatlon | 9 |
| **54.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group C** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker, Pink Treat, Retinto | 1 |
|  |  | present | |  | |  |  | Antique, Sprigel, Triatlon | 9 |
| **55.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group D** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker, Triatlon | 1 |
|  |  | present | |  | |  |  | Antique, Pink Treat, Retinto, Sprigel | 9 |
| **56.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group E** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Antique, Sprigel | 9 |
| **57.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Passalora fulva* (Pf) - Group F** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Chelino, Completo | 9 |
| **58.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to Passalora fulva (Pf) - Group J** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Chelino, Completo | 1 |
|  |  | present | |  | |  |  | Mogami | 9 |
| **59.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato mosaic virus* - Strain 0 (ToMV: 0)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Mobaci, Mocimor, Momor, Moperou | 9 |
| **60.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato mosaic virus* - Strain 1 (ToMV: 1)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Mobaci, Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Mocimor, Momor, Moperou | 9 |
| **61.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato mosaic virus* - Strain 2 (ToMV: 2)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker, Moperou | 1 |
|  |  | present | |  | |  |  | Mobaci, Mocimor, Momor | 9 |
| **62.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Phytophthora infestans* (Pi)** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Moneymaker, Saint‑Pierre | 1 |
|  |  | present | |  | |  |  | Phantasia, Sixtina | 9 |
| **63.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Pseudopyrenochaeta lycopersici (ex Pyrenochaeta lycopersici* (Pl)** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Marmande verte | 1 |
|  |  | present | |  | |  |  | Garance | 9 |
| **64.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Stemphylium* spp. (Ss)** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo | 1 |
|  |  | present | |  | |  |  | Motelle | 9 |
| **65.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Pseudomonas syringae* pv. *tomato* (Pst)** | | |  | |  |  |  |  |
|  |  | absent | |  | |  |  | Monalbo, Moneymaker | 1 |
|  |  | present | |  | |  |  | Fuzzer | 9 |
| **66.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Ralstonia solanacearum* – Race 1 (Rs: 1)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Floradel | 1 |
|  |  | present | |  | |  |  | Caraïbo | 9 |
| **67.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato yellow leaf curl virus* (TYLCV)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Marmande, Moneymaker | 1 |
|  |  | present | |  | |  |  | Delyca, Montenegro | 9 |
| **68.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato spotted wilt virus* - Pathotype 0 (TSWV: 0)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Moneymaker, Montfavet 63-5,  Mountain Magic | 1 |
|  |  | present | |  | |  |  | Bodar, Mospomor | 9 |
| **69.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Leveillula taurica* (Lt)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Montfavet 63-5 | 1 |
|  |  | present | |  | |  |  | Radiance | 9 |
| **70.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Pseudoidium neolycopersici (ex Oidium neolycopersici)*(Pn (ex On))** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Montfavet 63-5 | 1 |
|  |  | present | |  | |  |  | Romiro | 9 |
| **71.** |  | **QL** | **VG** | **(+)** |  |  | | | |
|  |  | |  | | --- | | **Resistance to *Tomato torrado virus* (ToTV)** | | | |  | | --- | |  | | | |  | | --- | |  | | |  | | --- | |  | |  |  |
|  |  | absent | |  | |  |  | Daniela | 1 |
|  |  | present | |  | |  |  | Matias | 9 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | 8. | Explanations on the Table of Characteristics | | | |  | | | | | *8.1* | *Explanations covering several characteristics* | | | |  | |  | | --- | |  | | | | |  |  |  |  | |  | Characteristics containing the following key in the Table of Characteristics should be examined as indicated below: | | | |  | | | | | |  | | --- | | (a) | | |  | | --- | | In the case of indeterminate varieties, observations on the plant, stem and leaf should be done after a fruit set on at least five trusses and before ripening of the second truss.  In the case of determinate varieties, all observations on the plant and leaves should be done after a fruit set on the second truss. Observations should be done in the middle third of the plant, before deterioration of the leaves. | | | | |  |  |  |  | | |  | | --- | | (b) | | |  | | --- | | Observations should be made on fully developed immature fruits. | | | | |  |  |  |  | | |  | | --- | | (c) | | |  | | --- | | Observations should be made on mature fruits from the second or higher truss, avoiding first and last mature fruit on the truss. | | | | |  |  |  |  | |
| |  |  |  | | --- | --- | --- | | |  | | --- | | *8.2* | | *Explanations for individual characteristics* | |  | | | |  | | --- | | Ad. 1: Seed-propagated varieties only: Seedling: anthocyanin coloration of hypocotyl  Observations should be made on the hypocotyl, before development of the first leaves.  Partial presence of anthocyanin coloration of hypocotyl:  A variety (parent line) with partial presence of anthocyanin coloration of hypocotyl consists of 50% of plants without anthocyanin coloration and 50% of plants with anthocyanin coloration.  This segregation (ref. TG/1/3 and TGP/10 section 2.4) is a result of the method of propagation of the variety.  The heredity of this segregation is known, and behaves in the predicted manner.    Selfing and maintenance of a the variety (parent line):  Absence of anthocyanin on hypocotyl is recessive, only the *aa* genotypes will be without anthocyanin coloration while *Aa* and *AA* genotypes will cause presence of anthocyanin coloration of hypocotyl.  After selfing the offspring will be 50% Aa, 25% aa and 25% AA.  Absence of anthocyanin is linked with male sterility. Therefore for the maintenance of the line the cross aa x Aa is made. This results in 50% of plants without anthocyanin coloration of hypocotyl and 50% of plants with anthocyanin coloration of hypocotyl . | | | | |  | | --- | | Ad. 2: Plant: growth type  Determinate (1):  This type produces a limited number of trusses. The number of trusses is different among varieties (Note: can be influenced by agro climatic conditions). In this type, the number of leaves or internodes between inflorescences is irregular within a plant and varies from one to three. The stem ends with an inflorescence and no lateral shoots are produced.  This type also includes some so-called “semi-determinate” varieties which do not have consistently three leaves or internodes between inflorescences, and show semi-determinate growth, for example, with the termination of the stem with the 9th inflorescence (e.g. ‘Prisca’ type) or higher than the 20th inflorescence (e.g. Early Pack type).  Indeterminate (2):  In this type, as a rule, three leaves or internodes are observed between inflorescences. After every group of three leaves, the plant produces three buds: the terminal bud is transformed into an inflorescence and one of the two lateral buds starts the prolongation of stem. Plants of this type grow with the continuous repetition of this growth pattern.  It should be noted that sometimes only two leaves or internodes might be observed between inflorescences in some parts of plants in a certain group of indeterminate variety types (e.g. varieties originating from ‘Daniela’). These varieties nevertheless are indeterminate.  This type includes ‘Marmande’ and ‘Costoluto Fiorentino’ types which might be considered to be categorized into an intermediate class between indeterminate and determinate, but they always have three leaves or internodes between inflorescences. They should therefore be categorized into the indeterminate type. | | | | |  | | --- | | Ad. 3: Only varieties with plant growth type determinate: Plant: number of inflorescences on main stem  Remove side shoots during plant development. | | | | |  | | --- | | Ad. 4: Stem: anthocyanin coloration  Indeterminate growth type varieties: observation should be made around flowering of 3rd or 4th truss, on the upper third of the plant.  Determinated growth type varieties: observation should be made before the main stem is ended in a truss/leaf division, on the upper third of the plant. | | | |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 5: Only varieties with plant growth type indeterminate: Stem: length of internode  Observation should be made at one time for the whole trial, e.g after a fruit set on approximately 5 nodes. The total length of the stem should be observed/measured between the 1st and 4th truss. When this observation/measure is divided by the number of internodes in between, an indication of the length of the internode is given. | | | |  | | --- | | Ad. 6: Only varieties with plant growth type indeterminate: Plant: height  Observation should be made at one time for the whole trial, e.g. 60 days after planting, or after a fruit set on approximately 5 nodes, or when the first variety in the trial has reached the wire in the green house or the top of the stake. | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Ad. 7: Leaf: attitude  The attitude of the middle third part of the leaves in respect to the main stem should be observed. The line in the picture indicates the angle between the stem and leaf (middle third of leaf).  ​   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  | | --- | --- | --- | --- | | wordml://76.png | wordml://77.png | wordml://78.png | wordml://79.png | | 3 | 5 | 7 | 9 | | semi-erect | horizontal | semi-drooping | drooping | | | | |

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Ad. 14: Leaf: blistering  Caution is required for confusion between blistering and creasing.  Blistering is the difference in height of the surface of the leaf between the veins.  Creasing is independent form the veins. The blistering should be observed in the middle third of the plant.     |  |  | | --- | --- | | wordml://82.png | wordml://83.png | | blistering | creasing | | | | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Ad. 15: Leaf: attitude of petiole of leaflet in relation to main axis   |  |  |  | | --- | --- | --- | | wordml://84.png | wordml://85.png | wordml://86.png | | 1 | 3 | 5 | | erect | semi-erect | horizontal | | | | |  | | --- | | Ad. 16: Time of flowering  For staked varieties, this characteristic is assessed by observing the flowering date of the third flower on the second trusses, plant by plant. It is recommended not to record the time of flowering on the first truss, as the expression on the first truss is more influenced by the seed vigour and the plantation quality.    The date of flowering is reached when 50% of plants have the third flower on the second truss open.    For determinate non-staked varieties, it is recommended to grow them on pruned stakes on the main stem and to record the characteristics in the same way as those for ‘staked varieties’. On non-staked crops, this characteristic cannot be observed easily due to the branching of the plant. | | |

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Higher temperatures will cause breakdown of resistance. | | 9.7 | Light | at least 12 h per day | | 10. | Inoculation |  | | 10.1 | Preparation inoculum | small pieces of diseased roots mixed with soil | | 10.2 | Quantification inoculum | the ratio is depending of aggressiveness of test and lab’s conditions (e.g. between 30 g to 60 g of infested roots, for 100 plants in a tray of 45\*30 cm containing approximately 5.5 kg of substrate), galls should be homogeneously mixed with soil. | | 10.3 | Plant stage at inoculation | seed | | 10.4 | Inoculation method | seeds sown in soil contaminated with galls | | 10.7 | Final observations | 28 to 45 days after inoculation depending on test conditions (temperature, season) | | 11. | Observations |  | | 11.1 | Method | root inspection | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | | 11.2 | Observation scale |  | | http://www.wipo.int/birt/images/2995/tom_45_11.2.png The germination percentage of non-inoculated plants of the same seed lot in the same experiment should be used to calculate the number of seeds that did not produce a plant due to the presence of nematodes, and add these to plants in class 4. | | | | 11.3 | Validation of test | Validation on controls. Expected reactions of controls: Susceptible control: - most plants at classes 3 and 4, - at most 2 plants can be observed at class 2 Intermediate resistant control: - clearly different from other controls, - with majority of plants around class 2. Highly resistant control: - most plants at classes 0 and 1, - at most 2 plants can be observed at class 2 | | 11.4 | Off-types | Highly resistant varieties may have a few plants with a few galls | | 12. | Interpretation of data in terms of UPOV characteristic states | Resistance to Meloidogyne incognita (Mi): [1] absent or low: distribution of plants in the classes comparable with the susceptible controls. [2] medium: distribution of plants in the classes comparable with the intermediate resistant controls. [3] high: distribution of plants in the classes comparable with the highly resistant controls.   If results are not clear, statistical analysis is advised. | | 13. | Critical control points | Avoid overwatering. This may result in rotting of roots. In case of aggressive test, put seeds in a layer of non-contaminated soil or decrease the quantity of inoculum. |   [[1]](" \l "_ftnref1" \o ") GEVES; [matref@geves.fr](mailto:matref@geves.fr)  [[2]](" \l "_ftnref2" \o ") INIA - CSIC;  [resistencias@inia.es](mailto:resistencias@inia.es)  [[3]](" \l "_ftnref3" \o ") Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl) [[4]](#_ftn3) ISF; [https://www.worldseed.org](https://www.worldseed.org/) | | |

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Race 0EU/1US (e.g. isolate Orange 71 or PRI 20698 or Fol 071), race 1EU/2US (e.g. isolate 4152, PRI40698 or RAF 70) and race 2EU/3US | | 6. | Establishment isolate identity | use differential varieties, see ISF website: https://www.worldseed.org | | 7. | Establishment pathogenicity | on susceptible tomato varieties | | 8. | Multiplication inoculum |  | | 8.1 | Multiplication medium | Potato Dextrose Agar or Medium “S” of Messiaen or Czapek-Dox | | 8.4 | Inoculation medium | water for scraping agar plates or Czapek-Dox culture medium (7 d-old aerated culture) | | 8.6 | Harvest of inoculum | filter through double muslin cloth | | 8.7 | Check of harvested inoculum | see 10.2 | | 8.8 | Shelflife/viability inoculum | 4-8 h, keep cool to prevent spore germination | | 9. | Format of the test |  | | 9.1 | Number of plants per genotype | at least 20 plants plus at least 5 non-inoculated plants | | 9.2 | Number of replicates | plants have to be divided into at least 2 replicates | | 9.3 | Control varieties |  | | 9.3.1 | Control varieties for the test with race 0EU/1US | Susceptible: Marmande, Marmande verte, Resal, Moneymaker Resistant: Marporum, Larissa, “Marporum x Marmande verte”, Motelle, Gourmet; and Riesling as additional resistant control for medium level | | 9.3.2 | Control varieties for the test with race 1EU/2US | Susceptible: Marmande verte, Cherry Belle, Roma, Marporum, Ranco, Moneymaker Resistant: Tradiro, Motelle, “Motelle x Marmande verte”; and Agostino as additional resistant control for medium level | | 9.3.3 | Control varieties for the test with race 2EU/3US | Susceptible: Marmande verte, Motelle, Marporum Resistant: Alliance, Florida, Murdoch, “Marmande verte x Florida” | | 9.5 | Test facility | glasshouse or climate room | | 9.6 | Temperature | 24-28°C (severe test, with mild isolate), 20-24°C (mild test, with severe isolate) | | 9.7 | Light | 12 hours per day or longer | | 9.8 | Season | all seasons | | 10. | Inoculation |  | | 10.1 | Preparation inoculum | 3-5 days in aerated liquid cultures like PDB, Czapek Dox or S of Messiaen or scraping of plates of 10 days cultures on agar medium. | | 10.2 | Quantification inoculum | spore count, adjust to 106 spores per ml, in case of very aggressive isolate inoculum concentration can be decreased | | 10.3 | Plant stage at inoculation | 10-18 d, cotyledon to first leaf | | 10.4 | Inoculation method | plants at the inoculation stage are harvested carefully, roots and hypocotyls are immersed in spore suspension for 5-15 min; trimming of roots is an option, and transplanted in trays | | 10.7 | Final observations | 14-21 days after inoculation | | 11. | Observations |  | | 11.1 | Method | visual | |  |  |  | |  |  |  | |  |  |  | | 11.2 | Observation scale |  | | http://www.wipo.int/birt/images/2995/tom_47_11.2.png | | | | 11.3 | Validation of test | Validation on controls. Expected response of controls: Susceptible control:   most plants in class 2 and 3, max.10% of plants class  0 and 1 Resistant control:   most plants in class 0 and 1, max. 10% of plants class 2 and 3. Controls with medium level of resistance can show a higher number of plants in class 2 and 3. | | 12. | Interpretation of data in terms of UPOV characteristic states | [1] absent: Average symptom level higher than in the medium-resistant control [9] present: Average symptom level not different from the medium-resistant control or the high-resistant control If no clear results, statistics may be used. |   http://www.wipo.int/birt/images/2995/tom_47_12.png  [[1]](#_ftnref1) GEVES: [matref@geves.fr](mailto:matref@geves.fr)  [[2]](#_ftnref2) INIA - CSIC: [resistencias@inia.es](mailto:resistencias@inia.es)  [[3]](#_ftnref3) Naktuinbouw: [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl) (\*) Harmores 3 CPVO project: <https://cpvo.europa.eu/sites/default/files/documents/report_harmores_3_final_meeting_v0_0.pdf> | | |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 48: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 1EU/2US (Fol: 1EU/2US)  See Ad. 47 | | | |  | | --- | | Ad. 49: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 2EU/3US (Fol: 2EU/3US)  See Ad. 47 | | |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 50: Resistance to *Fusarium oxysporum* f. sp. *radicis-lycopersici* (For) | | |

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Fusarium oxysporum f. sp. radicis-lycopersici |
| 2. | Quarantine status |  |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Naktuinbouw[[1]](#_ftn1) (NL) and GEVES[[2]](#_ftn2) (FR) |
| 5. | Isolate | - |
| 7. | Establishment pathogenicity | symptoms on susceptible tomato |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | Potato Dextrose Agar, or Medium agar “S” of Messiaen |
| 8.4 | Inoculation medium | Water for scraping agar plates or Czapek-Dox (7 d-old aerated culture) |
| 8.6 | Harvest of inoculum | filter through double muslin cloth |
| 8.7 | Check of harvested inoculum | spore count; adjust to 106 per ml |
| 8.8 | Shelflife/viability inoculum | 4-8 h, keep cool to prevent spore germination |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | at least 20 |
| 9.2 | Number of replicates | Not applicable |
| 9.3 | Control varieties |  |
|  | Susceptible | Motelle, Moneymaker |
|  | Resistant | Momor, “Momor x Motelle” |
|  | Remark | “Momor x Motelle” has slightly weaker resistance than Momor |
| 9.4 | Test design | >20 plants; e.g. 35 seeds for 24 plants, including 2 blanks |
| 9.5 | Test facility | glasshouse or climate room |
| 9.6 | Temperature | 24-28°C (severe test, with mild isolate) 17-24°C (mild test, with severe isolate) |
| 9.7 | Light | at least 12 hours per day |
| 9.8 | Season | all seasons |
| 9.9 | Special measures | slightly acidic peat soil is optimal; keep soil humid but avoid water stress |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | aerated culture or scraping of plates |
| 10.2 | Quantification inoculum | spore count, adjust to 106 spores per ml |
| 10.3 | Plant stage at inoculation | 12-18 d, cotyledon to third leaf |
| 10.4 | Inoculation method | roots and hypocotyls are immersed in spore suspension for 5-15 min |
| 10.7 | Final observations | 10-21 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual; a few plants are lifted at the end of the test |
| 11.2 | Observation scale | Symptoms: Plant death Growth retardation caused by root degradation Root degradation Necrotic pinpoints and necrotic lesions on stems |
| 11.3 | Validation of test | Evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 11.4 | Off-types |  |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms present [9]        no symptoms |
| 13. | Critical control points | Temperature should never exceed 27°C during the test period. Isolates may lose pathogenicity after repeated subculturing. Isolates should not be subcultured more than two times. |

[[1]](#_ftnref1) Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl)

[[2]](#_ftnref2) GEVES; [matref@geves.fr](mailto:matref@geves.fr)

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| |  |  | | --- | --- | | |  | | --- | | Ad. 51: Resistance to *Passalora fulva* (Pf) - Race 0 | | |

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| --- | --- | --- |
| 1. | Pathogen | Passalora fulva |
| 2. | Quarantine status | - |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Naktuinbouw[[1]](#_ftn1) (NL) or GEVES[[2]](#_ftn2) (FR) |
| 5. | Isolate | Race group 0, A, B, C, D, E, F and J |
| 6. | Establishment isolate identity | with genetically defined differentials A breaks Cf-2, B Cf-4, C Cf-2.4, D Cf-5, E Cf-2.4.5, F Cf-2.9, J Cf-2.6.9 <https://www.worldseed.org> |
| 7. | Establishment pathogenicity | symptoms on susceptible tomato |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | Potato Dextrose Agar or Malt Agar or a synthetic medium |
| 8.8 | Shelflife/viability inoculum | 4 hours, keep cool |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | At least 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Monalbo, Moneymaker |
|  | Resistant for race group A: | Purdue, IVT1154, IVT1149, Antique, Pink Treat, Sprigel, Triatlon |
|  | Resistant for race group B: | Vétomold, IVT1154, IVT1149, Antique, Retinto, Sprigel, Triatlon |
|  | Resistant for race group C: | IVT1154, IVT1149, Antique, Sprigel, Triatlon |
|  | Resistant for race group D: | Vétomold, IVT1154, Antique, Pink Treat, Retinto, Sprigel |
|  | Resistant for race group E: | IVT 1154, Antique, Sprigel |
|  | Resistant for race group F: | Purdue 135, IVT1149, Ontario 7818, Chelino, Completo |
|  | Resistant for race group J: | Purdue 135, IVT1149 |
| 9.5 | Test facility | glasshouse or climate room |
| 9.6 | Temperature | day: 22° C, night: 20°or day: 25°C, night 20°C |
| 9.7 | Light | 12 hours or longer |
| 9.8 | Season |  |
| 9.9 | Special measures | depending on facility and weather, there may be a need to raise the humidity, e.g. humidity tent fully closed 3-4 days after inoculation and after that partly closed (66% to 80%, 24 h per day), until end |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | prepare evenly colonized plates, e.g. 1 for 36 plants; remove spores from plate by scraping with water with Tween20; filter through double muslin cloth |
| 10.2 | Quantification inoculum | count spores; adjust to 105 spores per ml or more |
| 10.3 | Plant stage at inoculation | 19-20 d (incl. 12 d at 24°), 2-3 leaves |
| 10.4 | Inoculation method | spray on dry leaves |
| 10.7 | Final observations | 14 days after inoculation; when susceptible control does not show clear symptoms the test may be prolonged until for example 18 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual inspection of abaxial side of inoculated leaves |
| 11.2 | Observation scale | Symptom: velvety, white spots |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms present [9]        no symptoms |
| 13. | Critical control points | Pf spores have a variable size and morphology. Small spores are also viable. Fungal plates will gradually become sterile after 6-10 weeks and repeated subculturing. Do not subculture more often than strictly necessary for multiplication. Excessively high humidity may cause rugged brown spots on all leaves. |

[[1]](#_ftnref1) Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl)

[[2]](#_ftnref2) GEVES; [matref@geves.fr](mailto:matref@geves.fr)

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| |  |  | | --- | --- | | |  | | --- | | Ad. 52: Resistance to *Passalora fulva* (Pf) - Group A  See Ad. 51 | | | |  | | --- | | Ad. 53: Resistance to *Passalora fulva* (Pf) - Group B  See Ad. 51 | | | |  | | --- | | Ad. 54: Resistance to *Passalora fulva* (Pf) - Group C  See Ad. 51 | | | |  | | --- | | Ad. 55: Resistance to *Passalora fulva* (Pf) - Group D  See Ad. 51 | | | |  | | --- | | Ad. 56: Resistance to *Passalora fulva* (Pf) - Group E  See Ad. 51 | | | |  | | --- | | Ad. 57: Resistance to *Passalora fulva* (Pf) - Group F  See Ad. 51 | | | |  | | --- | | Ad. 58: Resistance to Passalora fulva (Pf) - Group J  See Ad. 51 | | |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 59: Resistance to *Tomato mosaic virus* - Strain 0 (ToMV: 0) | | |

Resistance to strain 0, 1 and 2 to be tested in a bio-assay (method i) or in a DNA marker test (method ii), if appropriate.  
   
            (i)         bio-assay

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato mosaic virus |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Naktuinbouw[[1]](#_ftn1) (NL) or GEVES[[2]](#_ftn2) (FR) or INIA - CSIC [[3]](#_ftn3) (ES, strain 0) |
| 5. | Isolate | Strain 0, (e.g. isolate INRA Avignon 6-5-1-1), strain 1 and strain 2 |
| 6. | Establishment isolate identity | genetically defined tomato standards Mobaci (Tm1), Moperou (Tm2), Momor (Tm22) Use diffential varieties, see ISF website :  https:// www.woldseed.org |
| 7. | Establishment pathogenicity | on susceptible plant |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | living plant |
| 8.2 | Multiplication variety | e.g. Moneymaker, Marmande |
| 8.7 | Check of harvested inoculum | option: on Nicotiana tabacum “Xanthi”, check lesions after 2 days |
| 8.8 | Shelf life/viability inoculum | fresh>1 day, desiccated>1year |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | at least 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Marmande, Monalbo, Moneymaker |
|  | Resistant to ToMV: 0 and 2 | Mobaci |
|  | Resistant to ToMV: 0 and 1 | Moperou |
|  | Resistant to ToMV: 0, 1 and 2 | “Monalbo x Momor” (with necrosis), Gourmet, Mocimor, Momor |
| 9.4 | Test design | blank treatment with PBS and carborundum or similar buffer |
| 9.5 | Test facility | glasshouse or climate room |
| 9.6 | Temperature | 24 to 26°C |
| 9.7 | Light | 12 hours or longer |
| 9.8 | Season | symptoms are more pronounced in summer |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | 1 g leaf with symptoms with 10 ml PBS or similar buffer Homogenize, add carborundum to buffer (1 g/30 ml) |
| 10.4 | Inoculation method | gentle rubbing |
| 10.6 | Second observation | cotyledons or 2 leaves |
| 10.7 | Final observations | 11-21 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | symptoms of susceptibility: mosaic in top, leaf malformation symptoms of resistance (based on hypersensitivity): local necrosis, top necrosis, systemic necrosis |

[[1]](#_ftnref1) Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl)

[[2]](#_ftnref2) GEVES; [matref@geves.fr](mailto:matref@geves.fr)

[[3]](#_ftnref3) INIA - CSIC; [resistencias@inia.es](mailto:resistencias@inia.es)

|  |  |  |
| --- | --- | --- |
| 11.3 | Validation of test | Evaluation of variety resistance should be calibrated with results of resistant and susceptible controls   Remark: in some heterozygous varieties a variable proportion of plants may have severe systemic necrosis or some necrotic spots while the other plants have no symptoms. This proportion may vary between experiments. |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms of susceptibility present [9]        no symptoms, or symptoms of hypersensitive                   resistance |
| 13. | Critical control points | Temperature and light may influence the development of necrosis. More light means more necrosis. At temperatures above 26°C the resistance may break down. Resistant heterozygous varieties may have symptomless plants and plants with severe necrosis; in spite of apparent segregation the sample may be evaluated as uniform for resistance.   Remark: Strain INRA Avignon 6-5-1-1 is recommended for ToMV: 0. This strain causes a striking yellow Aucuba mosaic. |

            (ii)        DNA marker test  
   
Resistance to ToMV is often based on resistance gene Tm2 (allele Tm2 or Tm22). The presence of the allele for resistance Tm2 and Tm22 and/or susceptible allele tm2 can be detected by the co-dominant markers as described in Arens et al (2010). Two methods are available, conventional PCR and Taqman PCR. Specific aspects:  
   
            (a)        Conventional PCR

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato mosaic virus |
| 2. | Functional gene | Tm2/22 (with two alleles for resistance Tm2 and Tm22 and one allele for susceptibility tm2) |
| 3. | Primers |  |
| 3.1 | Assay 1 to check resistant allele Tm2 or Tm22 | Outer primer TMV-2286F: 5’GGGTATACTGGGAGTGTCCAATTC3’ Outer primer TMV-2658R: 5’CCGTGCACGTTACTTCAGACAA3’ Tm22 SNP2494F:  5’CTCATCAAGCTTACTCTAGCCTACTTTAGT3’ Tm2 SNP2493R: 5’CTGCCAGTATATAACGGTCTACCG3’ |
| 3.2 | Assay 2 to check susceptible or resistant allele | Outer primer TM2-748F:5’CGGTCTGGGGAAAACAACTCT3’ Outer primer TM2-1256R:5’CTAGCGGTATACCTCCACATCTCC3’ TM2-SNP901misR: 5’GCAGGTTGTCCTCCAAATTTTCCATC3’ TM2-SNP901misF: 5’CAAATTGGACTGACGGAACAGAAAGTT3’ |
| 4. | Format of the test |  |
| 4.1 | Number of plants per genotype | at least 20 plants |
| 4.2 | Control varieties | homozygous susceptible allele tm2 present: Mobaci [[4]](#_ftn4), Monalbo, Moneymaker Homozygous resistant allele Tm2 present: Moperou Homozygous resistant allele Tm22 present: Mocimor, Momor |
| 5. | Preparation of DNA | Harvest per individual plant a part of a young leaf. Isolate total DNA with a standard DNA isolation protocol. Pipette each DNA sample and the PCR mix (primers, dNTP’s and Taq polymerase) into individual wells for assay 1 and assay 2. |

[[4]](" \l "_ftnref4" \o ") Available at [matref@geves.fr](mailto:matref@geves.fr)

|  |  |  |
| --- | --- | --- |
| 6. | PCR conditions | 1. Initial denaturation step at 94°C for 3 minutes 2. 35 cycles at 94°C for 1 minute, 56°C for 1 minute, 72°C for 2 minutes 3. Final extension step of 72°C for 10 minutes   Visualize PCR product on 1-2% agarose gel. |
| 7. | Observations |  |
| 7.1 | Observation scale |  |
| Assay 1 A: Control fragment (416bp) and Tm2 fragment (255bp) B: Control fragment (416bp) and Tm22fragment (214bp) C: Control fragment (416bp)  http://www.wipo.int/birt/images/2995/tom_57_assay1.png    Assay 2 D: Control fragment (509bp), tm2 fragment (S-allele; 381bp) and Tm2 or Tm22 fragment (R-allele; 185bp) E: Control fragment (509bp) and Tm2 or Tm22 fragment (R-allele; 185bp) F: Control fragment (509bp) and tm2 fragment (S-allele; 381bp) http://www.wipo.int/birt/images/2995/tom_57_assay2.png | | |
| 7.2 | Validation of test | Control varieties should give the expected results. |
| 8. | Interpretation of data in terms of UPOV characteristic states | the presence of the alleles tm2, Tm2, Tm22 lead to different interpretation for characteristics 56, 57 and 58, see table.   In case the DNA marker test result does not confirm the declaration in the TQ, a bio-assay should be performed to observe whether the resistance is absent or present for the variety (possibly based on another resistance gene, e.g. gene Tm1). |
| |  |  |  |  | | --- | --- | --- | --- | | Test result DNA marker test | tm2/tm2 | Tm2/tm2 or Tm2/Tm2 | Tm22/tm2 or Tm22/Tm22 or Tm22/Tm2 | |  |  | (less frequent) | (more frequent) | | 56 Strain 0 | [1] absent | [9] resistant | [9] resistant | | 57 Strain 1 | [1] absent | [9] resistant | [9] resistant | | 58 Strain 2 | [1] absent | [1] absent | [9] resistant | | | |

 

(b) Taqman PCR

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato mosaic virus |
| 2. | Functional gene | Tm2/22 (with two alleles for resistance Tm2 and Tm22 and one allele for susceptibility tm2) |
| 3. | Primers | TOMV RES Forward: 5’-CTCAATCATTTCCTCCAAATCTC-’  TOMV RES Reverse: 5’-GGGAAATGTCTTAAGTACTGCCA-3’ TOMV SUS Forward: 5’-GAAGCATTCCCTCCAAATATT-3’ TOMV SUS Reverse: 5’-GGTAATGTCTTAAGCACTGCCAG-3’ TOMV Probe Res TM22: 5’-Texas Red-CTACTTTAGTGTAGACCGT-BHQ2-3’ TOMV Probe Res TM2: 5’-Atto 532-CAACTTTACGGTAGACC-BHQ1-3’ TOMV Probe SUS: 5’-6FAM-TGCTTTATGGTAGACAGT-BHQ1-3’ The probes are MGB probes or XS probes, designed with a temperature of 65°C. |
| 4. | Format of the test |  |
| 4.1 | Number of plants per genotype | at least 20 plants |
| 4.2 | Control varieties | homozygous susceptible allele tm2 present: Mobaci, Monalbo, Moneymaker Homozygous resistant allele Tm2 present: Moperou Homozygous resistant allele Tm22 present: Mocimor, Momor |
| 5. | Preparation of DNA | Harvest per individual plant a part of a young leaf. Isolate total DNA with a standard DNA isolation protocol. Pipette each DNA sample and a commercial real-time PCR mastermix (primers, probes) into individual wells. Analyse the samples in a real-time PCR machine capable of reading the fluorophores of all the probes, with reaction conditions suitable for the mastermix used. |
| 6. | PCR conditions | 1. Initial denaturation step at 94°C for 2-10 minutes (mastermix dependent) 2. 40 cycles at 94°C for 15 sec, 60°C 1 min. Every cycle ends with plate reading |
| 7. | Observations |  |
| 7.1 | Observation scale | |  |  |  | | --- | --- | --- | | Probe | Ct/Cq | Interpretation | | TOMV Probe Res TM22 | <35 | resistance allele Tm22 present | | N/A | resistance allele Tm22 absent | | TOMV Probe Res TM2 | <35 | resistance allele Tm2 present | | N/A | resistance allele Tm2 absent | | TOMV Probe SUS | <35 | Susceptible allele tm2 present | | N/A | Susceptible allele tm2 absent | |
| 7.2 | Validation of test | Control varieties should give the expected results. In case of Ct/Cq 35-40: repeat the test. |
| 8. | Interpretation of data in terms of UPOV characteristic states | the presence of the alleles tm2, Tm2, Tm22 lead to different interpretation for characteristics 56, 57 and 58, see table.   In case the DNA marker test result does not confirm the declaration in the TQ, a bio-assay should be performed to observe whether the resistance is absent or present for the variety (possibly based on another resistance gene, e.g. gene Tm1). |
| |  |  |  |  | | --- | --- | --- | --- | | Test result DNA marker test | tm2/tm2 | Tm2/tm2 or Tm2/Tm2 | Tm22/tm2 or Tm22/Tm22 or Tm22/Tm2 | |  |  | (less frequent) | (more frequent) | | 56 Strain 0 | [1] absent | [9] resistant | [9] resistant | | 57 Strain 1 | [1] absent | [9] resistant | [9] resistant | | 58 Strain 2 | [1] absent | [1] absent | [9] resistant | | | |

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| --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | |  | | --- | | Ad. 60: Resistance to *Tomato mosaic virus* - Strain 1 (ToMV: 1)  See Ad. 59 | | | |  | | --- | | Ad. 61: Resistance to *Tomato mosaic virus* - Strain 2 (ToMV: 2)  See Ad. 59 | | |
| |  |  | | --- | --- | | |  | | --- | | Ad. 62: Resistance to *Phytophthora infestans* (Pi) | | |

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | *Phytophthora infestans* |
| 3. | Host species | *Solanum lycopersicum* |
| 5. | Isolate | highly pathogenic on tomato |
| 6. | Establishment isolate identity | biotest |
| 7. | Establishment pathogenicity | biotest |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | V8 Agar or PDA or Malt Agar medium |
| 8.2 | Multiplication variety | susceptible tomato variety |
| 8.3 | Plant stage at inoculation | 4 weeks |
| 8.4 | Inoculation medium | water |
| 8.5 | Inoculation method | spraying |
| 8.6 | Harvest of inoculum | wash spores from wetted plates |
| 8.7 | Check of harvested inoculum | count sporangiospores |
| 8.8 | Shelflife/viability inoculum | 4 h after chilling at 8-10°C |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Moneymaker, Saint-Pierre |
|  | Resistant | Phantasia, Sixtina |
| 9.5 | Test facility | glasshouse |
| 9.6 | Temperature | 18°C |
| 9.7 | Light | after inoculation darkness during 24 h, thereafter 10 h darkness per 24 h |
| 9.9 | Special measures | humidity tent during four days after inoculation |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | wash spores from sporulating leaves, chill at 8-10°C chilling will induce zoospore release   remark: Use fresh spores from repeated infection cycles on tomato plants during 3 weeks before inoculation |
| 10.2 | Quantification inoculum | count sporangiospores; adjust to 104 spores per ml |
| 10.3 | Plant stage at inoculation | 10 leaves developed (6 to 7 weeks) |
| 10.4 | Inoculation method | spraying |
| 10.7 | Final observations | 5-7 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | Symptoms: water-soaked lesions, yellowing, and death |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls   heterozygous varieties may have a slightly lower level of expression of resistance |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        severe symptoms present [9]        no or mild symptoms |
| 13. | Critical control points | resistance is only well-expressed in the adult plant |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 63: Resistance to *Pseudopyrenochaeta lycopersici (ex Pyrenochaeta lycopersici* (Pl) | | |

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| --- | --- | --- |
| 1. | Pathogen | Pyrenochaeta lycopersici |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | GEVES[[1]](#_ftn1) (FR) |
| 5. | Isolate | e.g. strain Pl 21 |
| 7. | Establishment pathogenicity | On susceptible plant |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | Messiaen agar or synthetic medium |
| 8.4 | Inoculation medium | Autoclaved grains (e.g. barley) |
| 8.5 | Inoculation method | Mix grains (e.g. 1 kg) with inoculum (e.g. medium from 2 Petri dishes with mycelium) |
| 8.6 | Harvest of inoculum | After 3 weeks |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | At least 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Marmande verte, Montfavet H 63.5 |
|  | Resistant | Garance and (S. lycopersicum x S. habrochaites) Emperador |
| 9.4 | Test design | Add non-inoculated plants |
| 9.5 | Test facility | Greenhouse or climatic chamber |
| 9.6 | Temperature | 20°C |
| 9.7 | Light | At least 12h |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | Homogenize the contaminated grains and mix with soil (volume ratio of grains to soil ca. 1:5) |
| 10.3 | Plant stage at inoculation | 3-4 leaf stage |
| 10.4 | Inoculation method | Transplanting of plantlets in the mixture of soil and contaminated grains |
| 10.7 | Final observations | 40 days post inoculation |
| 11. | Observations |  |
| 11.1 | Method | Visual |
| 11.2 | Observation scale | Class 0: no necrotic lesions on roots Class 1: few small and uncoloured necrotic lesions Class 2: some brown necrotic lesions clearly visible (less than half the surface of the main root) Class 3: several brown necrotic lesions clearly visible (more than half the surface of the main root) Class 4: complete necrosis or destruction of the main root |
| 11.3 | Validation of test | Evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | Any variety judged to be of the same resistance level or higher than Garance is judged as resistant. Classes 0, 1 and 2 are commonly judged as resistant – Note 9 Classes 3 and 4 are commonly judged as susceptible – Note 1 |
| 13. | Critical control points | Pathogenicity maybe lost after 3 weeks growing on an agar medium. |

[[1]](#_ftnref1) GEVES: [matref@geves.fr](mailto:matref@geves.fr)

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| |  |  | | --- | --- | | |  | | --- | | Ad. 64: Resistance to *Stemphylium* spp. (Ss) | | |

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| --- | --- | --- |
| 1. | Pathogen | Stemphylium spp. e.g. Stemphylium solani (see note below) |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | GEVES[[1]](#_ftn1) (FR) |
| 7. | Establishment pathogenicity | biotest |
| 8.1 | Multiplication medium | PDA (12 hours per day under near-ultraviolet light to induce sporulation) or V8-Agar |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 at least |
| 9.3 | Control varieties |  |
|  | Susceptible | Monalbo |
|  | Resistant | Motelle, “Motelle x Monalbo” (border) |
| 9.5 | Test facility | greenhouse or climate cell |
| 9.6 | Temperature | 24°C |
| 9.7 | Light | 12 hours minimum |
| 9.9 | Special measures | incubation in tunnel with 100% relative humidity or humidity tent closed 5 days after inoculation, after this, 80% RH until end. |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | sporulating plates (8.1) are scraped and air-dried overnight. The next day plates are soaked and stirred for 30 min in a beaker with demineralized water, or sporulating plates are scraped with water with Tween20. The resulting suspension is sieved through a double layer of muslin. |
| 10.2 | Quantification inoculum | 5.103 – 105 spores per ml |
| 10.3 | Plant stage at inoculation | 20-22 days (three expanded leaves) |
| 10.4 | Inoculation method | spraying |
| 10.7 | Final observations | 4-10 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | 0. no symptoms 1. some very rare lesions plus yellowing onleaves, and no symptoms on cotyledons 2. some lesions on leaves and cotyledons 3. many lesions on leaves, and cotyledons attached 4. coalescence of lesions, and cotyledons falling 5. total drying of the first two or the first three leaves, and cotyledons fallen |
| 11.3 | Validation of test | Symptoms on Motelle x Monalbo should be a little bit stronger than on Motelle. Symptoms on Monalbo should be much stronger than on Motelle. |
| 12. | Interpretation of data in terms of UPOV characteristic states | Resisance absent [1]   strong symptoms Resistance present [9]   weak symptoms or no symptoms  When the resistance level is just below the lower border of resistance, the test should be repeated one or two times before a final decision is taken |
| 13. | Critical control points | Individuel isolates may differ stightly in pathogenicity. Some isolates of Stemphylium cannot be classified easily as either Stemphylium solani or a related species. These Stemphylium isolates may still be useful for identifying resistance to Stemphylium solani. |

[[1]](#_ftnref1) GEVES: [matref@geves.fr](mailto:matref@geves.fr)

[[2]](#_ftnref2) Naktuinbouw: resistentie@naktuinbouw.nl

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| |  |  | | --- | --- | | |  | | --- | | Ad. 65: Resistance to *Pseudomonas syringae* pv. *tomato* (Pst) | | |

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Pseudomonas syringae pv. tomato |
| 2. | Quarantine status | - |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | GEVES[[1]](#_ftn1) (FR) |
| 5. | Isolate | - |
| 7. | Establishment pathogenicity | biotest |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | e.g. King’s B agar medium, darkness |
| 8.2 | Multiplication variety | susceptible variety |
| 8.4 | Inoculation medium | water |
| 8.8 | Shelflife/viability inoculum | plates become old after 10 days |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 at least |
| 9.2 | Number of replicates | Not applicable |
| 9.3 | Control varieties |  |
|  | Susceptible | Monalbo, Moneymaker |
|  | Resistant | Ontario 7710, “Monalbo x Ontario 7710”, Fuzzer |
| 9.5 | Test facility | greenhouse or growth chamber |
| 9.6 | Temperature | day: 22° C, night: 16° C or 20°C |
| 9.7 | Light | 12 hours |
| 9.9 | Special measures | humidity tent needed for 3 days or longer |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | wash off spores from plate and addv a drop of surfactant to the bacterial suspension. Plate should be less than 2-4 days old. |
| 10.2 | Quantification inoculum | OD 0.1 or less, supported by dilution plating. Density 106 colony forming units per ml |
| 10.3 | Plant stage at inoculation | three leaves expanded (20-22 days) |
| 10.4 | Inoculation method | spraying a bacterial suspension on leaves |
| 10.7 | Final observations | 8 days after inoculation or longer |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | bacterial speck, greasy in appearance with marginal chlorosis pinpoint lesions can be observed on resistant plants < 1.0 mm |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        bacterial speck present [9]        no symptoms or pinpoint lesions |
| 13. | Critical control points | Strains may lose virulence in storage |

[[1]](#_ftnref1) GEVES: [matref@geves.fr](mailto:matref@geves.fr)

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| |  |  | | --- | --- | | |  | | --- | | Ad. 66: Resistance to *Ralstonia solanacearum* – Race 1 (Rs: 1) | | |

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Ralstonia solanacearum – Race 1 |
| 2. | Regulatory status | See EPPO Global database: <https://gd.eppo.int> |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | - |
| 5. | Isolate | Race 1 (Race 1 has a wide host range, including tomato. Race 3 has a narrow host range, also including tomato.) |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | Yeast Peptone Glucose (YPG) Agar or PYDAC Special conditions: 25-30°C (Race 3 usually needs 20-23°C) |
| 8.5 | Inoculation method | 2 ml of inoculum placed at the foot of each plantlet prior to transplanting |
| 8.8 | Shelf life/viability inoculum | suspension in sterile distilled water at 15°C (<1 year) |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Floradel |
|  | Resistant | Caraïbo |
| 9.5 | Test facility | climate room |
| 9.6 | Temperature | day: 26-30°C; night: 25°C |
| 9.7 | Light | 10 - 12 hours |
| 9.9 | Special measures | high humidity |
| 10. | Inoculation |  |
| 10.2 | Quantification inoculum | 107colony forming units per ml |
| 10.3 | Plant stage at inoculation | 3 to 4 well-developed leaves (3 weeks) |
| 10.7 | Final observations | 3 weeks after inoculation |
| 11. | Observations | in intermediate resistant varieties, bacteria could be present in the lower part of the plant |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms present [9]        no symptoms, or less than resistant standard |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 67: Resistance to *Tomato yellow leaf curl virus* (TYLCV) | | |

1. agroinoculation method

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| --- | --- | --- |
| 1. | Pathogen | Tomato yellow leaf curl virus (TYLCV) |
| 2. | Regulatory status | See EPPO Global Database: <https://gd.eppo.int> |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Dr. Eduardo R. Bejarano, Plant Genetics Laboratory, HMS UMA-CSIC[[1]](#_ftn1) |
| 5. | Isolate | Alm:Pep:99, strain IL |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | YEP/Kanamycin. |
| 8.3 | Plant stage at inoculation | 3-4 leaf |
| 8.4 | Inoculation medium | YEP |
| 8.5 | Inoculation method | Stem puncture agroinfiltration. Plant agroinoculation is carried out using Agrobacterium tumefaciens transformed with plasmids containing the infectious clones (Morilla, et al. 2005. Phytopathology 95: 1089-1097) |
| 8.8 | Shelf life/viability inoculum | A. tumefaciens stocks are maintained frozen at -80ºC in 15-20% glycerol for long term storage. Cultures to be stored are typically started from a single colony and grown in 5 ml YEP +2.5 µl kanamycin (100mg/ml) during 48 h at 28ºC. |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.2 | Number of replicates | 2 |
| 9.3 | Control varieties |  |
|  | Susceptible | Moneymaker, Marmande |
|  | Resistant | Delyca, Montenegro |
| 9.5 | Test facility | Glasshouse or climatic chamber with permission to confined use of use of LMO/GMO, confinement level 1 (N-1) (see 9.9) |
| 9.6 | Temperature | 23-25°C |
| 9.7 | Light | 16 h |
| 9.9 | Special measures | The transformed Agrobacterium tumefaciens is a living modified organism (LMO; or genetically modified organism (GMO)) and in many countries it requires to comply with Cartagena Protocol on Biosafety in case of transboundary movement, transit, handling and use that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health. |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | Streak the surface of the frozen A. tumefaciens stock tube and submerge in 5ml YEP+2.5 µl kanamycin (100mg/ml) during 48 h at 28°C. Shaking is needed. Take 100 µl and place them into 100 ml YEP and 50 µl kanamycin (100mg/ml). Shake 48 h at 28ºC. Centrifuge the saturated culture for 20 min at 3500 rpm and discard supernatant |
| 10.2 | Quantification inoculum | Dissolve in sterile deionize water to a final OD600 of 1. |
| 10.3 | Plant stage at inoculation | 3-4th leaf |
| 10.4 | Inoculation method | Take up into a 1 ml syringe with a 27-gauge needle and few drops (about 20 µl of the culture) were deposited on 10-15 puncture wounds made with the needle into the stem of test tomato plants. Maintain on ice while inoculating plants. |
| 10.5 | First observation | 20 days post inoculation |
| 10.6 | Second observation | 30 dpi |
| 10.7 | Final observations | 45 dpi |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | Symptoms: leaf yellowing and curling |

[[1]](#_ftnref1) Source of inoculum; HMS UMA (CSIC) [edu\_rodri@uma.es](mailto:edu_rodri@uma.es), INIA [resistencias@inia.es](mailto:resistencias@inia.es)

[[2]](#_ftnref2) Source of inoculum; IHSM, CSIC [guillamon@eelm.csic.es](mailto:guillamon@eelm.csic.es), INIA [resistencias@inia.es](mailto:resistencias@inia.es)

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| --- | --- | --- |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 11.4 | Off-types |  |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        severe symptoms present [9]        no symptoms |
| 13. | Critical control points | TYLCV is endemic in many tropical and subtropical areas and has a quarantine status in many countries with a temperate climate. TYLCV-IL is the strain most widely spread worldwide. With this strain, symptoms do not appear in varieties with Ty-1 and Ty-2. Some TYLCV resistant varieties may be susceptible to the closely related virus Tomato yellow leaf curl Sardinia virus (TYLCSV). |

            (ii)        White fly inoculation method

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato yellow leaf curl virus (TYLCV) IL strain |
| 2. | Quarantine status | See EPPO Global Database: <https://gd.eppo.int> |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Spain[[2]](#_ftn2) |
| 5. | Isolate | TYLCV-IL La Mayora |
| 8. | Multiplication inoculum | White flies |
| 8.1 | Multiplication medium |  |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.2 | Number of replicates | Two replicates |
| 9.3 | Control varieties |  |
|  | Susceptible | Moneymaker, Marmande |
|  | Resistant | Delyca, Montenegro |
| 9.5 | Test facility | Greenhouse/plastic tunnel |
| 9.9 | Special measures | prevent spread of white-flies |
| 10. | Inoculation |  |
| 10.3 | Plant stage at inoculation | 2-4 weeks |
| 10.4 | Inoculation method | vector (Bemisia white-flies carrying TYLCV-IL) |
| 10.7 | Final observations | 1-2 months after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | Symptoms: leaf yellowing and curling |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        severe symptoms present [9]        no or mild symptoms |
| 13. | Critical control points | TYLCV is endemic in many tropical and subtropical areas and has a quarantine status in many countries with a temperate climate. TYLCV-IL is the strain most widely spread worldwide. With this strain, symptoms do not appear in varieties with Ty-1 and Ty-2. Some Some TYLCV resistant varieties may be susceptible to the closely related virus Tomato yellow leaf curl Sardinia virus (TYLCSV). |

[[2]](#_ftnref2) Source of inoculum; IHSM, CSIC [guillamon@eelm.csic.es](mailto:guillamon@eelm.csic.es), INIA [resistencias@inia.es](mailto:resistencias@inia.es)

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| |  |  | | --- | --- | | |  | | --- | | Ad. 68: Resistance to *Tomato spotted wilt virus* - Pathotype 0 (TSWV: 0) | | |

Resistance to strain 0 to be tested in a bio-assay (method i) or in a DNA marker test (method ii), if appropriate.  
   
            (i)         bio-assay

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato spotted wilt virus, Pathotype 0 (TSWV: 0) |
| 2. | Regulatory status | See EPPO Global database: <https://gd.eppo.int> |
| 3. | Host species | Solanum lycopersicum |
| 4. | Source of inoculum | Naktuinbouw[[1]](#_ftn1) (NL), GEVES[[2]](#_ftn2) (FR) |
| 5. | Isolate | pathotype 0, preferably a thrips-transmission deficient variant |
| 6. | Establishment isolate identity | symptomatic leaves may be stored below -70°C |
| 7. | Establishment pathogenicity | Biotest |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | at least 20 |
| 9.2 | Number of replicates | 1 replicate |
| 9.3 | Control varieties |  |
|  | Susceptible | Monalbo, Momor, Montfavet 63-5, Moneymaker |
|  | Resistant | Bodar, Mospomor |
| 9.5 | Test facility | glasshouse or climatic chamber |
| 9.6 | Temperature | 20°C |
| 9.7 | Light | 12 hours or longer |
| 9.9 | Special measures | prevent or combat thrips |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | press symptomatic leaves in ice-cold buffer 0,01 M PBS, pH 7.4, with 0,01 M sodium sulfite or similar buffer Option: sieve the leaf sap through double muslin |
| 10.3 | Plant stage at inoculation | one or two expanded leaves |
| 10.4 | Inoculation method | mechanical, rubbing with a suitable abrasive on cotyledons, inoculum suspension < 10°C |
| 10.7 | Final observations | 7 -21 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | Visual, comparative |
| 11.2 | Observation scale | Symptoms: top mosaic, bronzing, various malformations, strong necrosis can be a sign of hypersensitivity |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms present [9]        no symptoms or symptoms of hypersensitivity |
| 13. | Critical control points | TSWV is transmitted by Thrips tabaci and Western flower thrips (Frankliniella occidentalis). Pathotype 0 is defined by its inability to break resistance in tomato varieties carrying the resistance gene Sw-5. |

[[1]](#_ftnref1) Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl)

[[2]](#_ftnref2) GEVES; [matref@geves.fr](mailto:matref@geves.fr)

(ii)        DNA marker test  
   
            Resistance to TSWV pathotype 0 is often based on resistance gene Sw-5. The presence of allele for resistance and/or susceptible allele(s) can be detected by the co-dominant markers as described in Dianese et al (2010). Specific aspects:

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | Tomato spotted wilt virus – pathotype 0 |
| 2. | Functional gene | Sw-5b |
| 3. | Primers |  |
| 3.1 | Susceptible alleles | Sw5-Vat1-F: 5’-ACAACATCAAACAATGTTAGCC-3’ Sw5-Vat2-F: 5’-CATCAAACAATGCAGTTAGCC-3’ |
| 3.2 | Resistant allele | Sw5-Res-F: 5’-ATCAACCAATACAGCCTAACC-3 |
| 3.3 | Universal reverse | Sw5-universal-R: 5’-TTTCTCCCTGCAAGTTCACC-3’ |
| 3.3 | Allele specific probes | Sw5-Sus1: 5’-VIC-TACATTATGAAGGGTTAACAAG-MGB-NFQ-3’ Sw5-Sus2: 5’-6FAM-ACAACAGAGGGTTAACAAGTTTAGG-BHQ1-3’ Sw5-Res: 5’-TEXAS RED-TGGGCGAAAATCCCAACAAG-BHQ2-3’ |
| 4. | Format of the test |  |
| 4.1 | Number of plants per genotype | at least 20 plants |
| 4.2 | Control varieties | homozygous susceptible allele 1 present: Moneymaker homozygous susceptible allele 2 present: Mountain Magic homozygous resistant allele present: Montealto Heterozygous 1 (allele for resistance and allele 1 for susceptibility present): Bodar Heterozygous 2 (allele for resistance and allele 2 for susceptibility present): Sharmita |
| 5. | Preparation of DNA | Harvest per individual plant a part of a young leaf. Isolate total DNA with a standard DNA isolation protocol. Pipette each DNA sample and a commercial real-time PCR mastermix into individual wells. Analyse the samples in a real-time PCR machine capable of reading the fluorophores of all the probes, with reaction conditions suitable for the mastermix used. |
| 6. | PCR conditions | 1. Initial denaturation step 10 min 95 °C 2. 40 cycles 15 sec 95 °C and 1 min 60°C. Every cycle ends with a plate reading. |
| 7. | Observations |  |
| 7.1 | Observation scale | |  |  |  | | --- | --- | --- | | probe | Ct/Cq | interpretation | | Sw5-Sus1 | <35 | susceptible allele sw5b-1 present | | N/A | susceptible allele sw5b-1 absent | | Sw5-Sus2 | <35 | susceptible allele sw5b-2 present | | N/A | susceptible allele sw5b-2 absent | | Sw5-Res | <35 | resistance allele Sw-5b present | | N/A | resistance allele Sw-5b absent | |
| 7.2 | Validation of the test | Control varieties should give the expected results. In case of Ct/Cq 35-40: repeat the test. |
| 8. | Interpretation of data in terms of UPOV characteristic states | absent   [1]  susceptible allele(s) present and resistant allele absent present  [9]  resistant allele present (homozygous or heterozygous)   In case the DNA marker test result does not confirm the declaration in the TQ, a bio-assay should be performed to observe whether the resistance is absent or present for the variety (on another mechanism). |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 69: Resistance to *Leveillula taurica* (Lt) | | |

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| --- | --- | --- |
| 1. | Pathogen | *Leveillula taurica* |
| 2. | Quarantine status | - |
| 3. | Host species | *Solanum lycopersicum* |
| 4. | Source of inoculum | no long term storage method is available |
| 8.1 | Multiplication medium | detached leaves of a susceptible host plant |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Monalbo, Montfavet 63-5 |
|  | Resistant | Radiance |
| 10. | Inoculation |  |
| 10.3 | Plant stage at inoculation | adult plants |
| 10.4 | Inoculation method | natural infection, mainly by wind dispersal of spores |
| 10.7 | Final observations | before maturity of fruits |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | Symptoms: Yellow chlorotic spots on upper side of leaves, mycelium on abaxial side of leaves |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        symptoms present [9]        no symptoms, or same level as the resistant control. |
| 13. | Critical control points | Check cleistothecia under microscope to confirm presence of *Leveillula* and not another powdery mildew. Plant stage dependent action of resistance can cause difficulties in the interpretation |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 70: Resistance to *Pseudoidium neolycopersici (ex Oidium neolycopersici)*(Pn (ex On)) | | |

|  |  |  |
| --- | --- | --- |
| 1. | Pathogen | *Oidium neolycopersici* |
| 2. | Quarantine status | - |
| 3. | Host species | *Solanum lycopersicum* |
| 5. | Isolate | see remark under 13 |
| 7. | Establishment pathogenicity | biotest |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | plant |
| 8.3 | Plant stage at inoculation | 24°C during the day; 18°C during the night |
| 8.4 | Inoculation medium | water |
| 8.5 | Inoculation method | see 10.4 |
| 8.6 | Harvest of inoculum | by washing off |
| 8.7 | Check of harvested inoculum | check for contaminants under microscope |
| 8.8 | Shelf life/viability inoculum | 1-2 hours |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.2 | Number of replicates | Not applicable |
| 9.3 | Control varieties |  |
|  | Susceptible | Momor, Montfavet 63-5 |
|  | Resistant | Romiro, PI 247087 |
| 9.5 | Test facility | glasshouse |
| 9.6 | Temperature | 20°C or 18/24°C |
| 9.7 | Light | 12 hours |
| 10. | Inoculation |  |
| 10.1 | Preparation inoculum | collect spores in water |
| 10.2 | Quantification inoculum | 104 conidia/ml |
| 10.3 | Plant stage at inoculation | 3 weeks |
| 10.4 | Inoculation method | by spraying on leaves or dredging of leaves |
| 10.7 | Final observations | 7-18 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | 0. no sporulation 1. necrotic points and sometimes locally restricted sporulation 2. moderate sporulation 3. abundant sporulation |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        Moderate or abundant sporulation present [9]        No or restricted sporulation |
| 13. | Critical control points | Resistance-breaking isolates should be avoided. Resistance to *O. neolycopersici* is usually race-specific. However, as long as a differential series of tomato genotypes with well-defined resistances is lacking, it will remain hard to conclude that different races of *O. neolycopersici* exist. |

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| |  |  | | --- | --- | | |  | | --- | | Ad. 71: Resistance to *Tomato torrado virus* (ToTV) | | |
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| 1. | Pathogen | *Tomato torrado virus* |
| 2. | Quarantine status | in regions with temperate climate |
| 3. | Host species | *Solanum lycopersicum* |
| 7. | Establishment pathogenicity | biotest |
| 8. | Multiplication inoculum |  |
| 8.1 | Multiplication medium | *Nicotiana tabacum* ‘Xanthi’ |
| 8.3 | Plant stage at inoculation | cotyledon to first leaf |
| 8.5 | Inoculation method | see 10.4 |
| 8.6 | Harvest of inoculum | after 3 weeks |
| 8.7 | Check of harvested inoculum | plants yellow, systemic infection |
| 8.8 | Shelf life/viability inoculum | instable at room temperature |
| 9. | Format of the test |  |
| 9.1 | Number of plants per genotype | 20 |
| 9.3 | Control varieties |  |
|  | Susceptible | Daniela |
|  | Resistant | Matias |
| 9.5 | Test facility | glasshouse |
| 9.6 | Temperature | 23°C during the day; 21°C during the night |
| 9.7 | Light | 16 hours |
| 10. | Inoculation |  |
| 10.3 | Plant stage at inoculation | 14 days |
| 10.4 | Inoculation method | with ice-cold 0,01 M PBS pH 7 and carborundum |
| 10.5 | First observation | 7 days after inoculation |
| 10.6 | Second observation | 14 days after inoculation |
| 10.7 | Final observations | 18 days after inoculation |
| 11. | Observations |  |
| 11.1 | Method | visual |
| 11.2 | Observation scale | necrotic spots on the top leaves |
| 11.3 | Validation of test | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls |
| 12. | Interpretation of data in terms of UPOV characteristic states | absent  [1]        necrotic spots present present [9]        No symptoms |
| 13. | Critical control points | ToTV is transmitted by white fly (*Bemisia tabaci*). Produce inoculum with ice-cold mortar and pestle. During inoculation the temperature should be below 25°C. |

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  |  |  | | --- | --- | --- | | |  |  | | --- | --- | | 9. | Literature | | |  |  |  | | --- | | Ano, G., Brand, R., Causse, M., Chauvet, M., Damidaux, R., Laterrot, H., Philouze, J., Plages, J.N., Rousselle, 2006: La Tomate, in Histoire et amélioration de cinquante plantes cultivées au XXème siècle. Coordinatrice C. Doré, Collection « Savoir faire », Editions INRA Quae. Paris, FR, 840 pp.  Arens P., Mansilla C., Deinum D., Cavellini L., Moretti A., Rolland S., van der Schoot H., Calvache D., Ponz F., Collonnier C., Mathis R., Smilde D., Caranta C,; Vosman B., 2010: Development and evaluation of robust molecular markers linked to disease resistance in tomato for distinctness, uniformity and stability testing. Theoretical and applied genetics 120(3). pp. 655-64  Bai, Y. 2004: The genetics and mechanisms of resistance to tomato powdery mildew (Oidium neolycopersici) in Lycopersicon species. Thesis Wageningen University. NL, 103 pp.  Barbieri, M., et al., 2010: Introgressions of resistance to two Mediterranean virus species causing tomato yellow leaf curl into a valuable traditional tomato variety. Journal of Plant Pathology 92(2). pp.485-493  Brand, R., 2000: Evolution des variétés de Tomate au cours du siècle, dans ‘La Tomate : pour un produit de qualité’, Edition Ctifl, C85105 (ouvrage collectif). FR, pp. 97-105  Denby, L.G., Wooliams, G.E., 1962: The Development of Verticillium Resistant Strains of Established Tomato Varieties. Canadian Journal Plant Science 42. CA, pp. 681-685  Dianese, E.C. et al, 2010: Development of a locus-specific, co-dominant SCAR marker for assisted-selection of the Sw-5 (Topovirus resistance) gene cluster in a wide range of tomato accessions. Molecular Breeding, 25(1). pp. 133-142  Garcia, S., et al., 2009: Resistance driven selection of begomoviruses associated with the TYLCV. Virus research 146. pp. 66-72  Garland, S., Sharman, M., Persley, D. and McGrath, D., 2005: The development of an improved PCR-based marker system for Sw-5, an important TSWV resistance gene of tomato. Australian Journal of Agricultural Research, 56 (3). pp 285-289  Gordillo, L.F. and Stevens, M.R., 2008: Screening two Lycopersicon peruvianum collections for resistance to Tomato spotted wilt virus. Plant Disease 92(5). pp. 694-704  Hubbeling, N., 1978: Breakdown of resistance to the Cf-5 gene in tomato by another new race of Fulvia fulva. Mededelingen van de Faculteit Landbouwwetenschappen Universiteit Gent 42/2.  International Seed Federation (ISF): Trade Issues, Phytosanitary Matters, Pathogen coding, Strain Denomination, Differential sets. https://www.worldseed.org/our-work/plant-health/overview/  Laterrot, H., 1973: Sélection de variétés de Tomate résistantes aux Meloidogyne. OEPP/EPPO Bulletin 3(1). pp. 89-92  Laterrot, H., 1972: Sélection de tomates résistantes à Fusarium oxysporum f. sp. lycopersici. Phytopathologia Mediterranea, 11(3), Firenze, IT, pp. 154-158  Laterrot, H., 1981: La lutte génétique contre la Cladosporiose de la Tomate en France. P.H.M. Revue Horticole, No. 214. Montpellier, FR, pp. 27-30  Laterrot, H., 1973: Résistance de la Tomate au virus de la Mosaïque du Tabac. Difficultés rencontrées pour la sélection de variétés résistantes. Ann. Amelior. Plantes, 23 (49). pp. 287-313  Laterrot, H., 1990: Situation de la lutte génétique contre les parasites de la Tomate dans les pays méditerranéens. P.H.M. Revue Horticole, No. 303. Montpellier, FR  Laterrot, H., 1975: Sélection pour la résistance au Mildiou, Phytophthora infestans MONT. DE BARY chez la Tomate, Ann. Amelior. Plantes, 25 (2). pp.129-149  Laterrot, H., 1982: L’argenture de la Tomate. P.H.M. Revue Horticole, No. 225. Montpellier, FR. pp. 21/22  Laterrot, H., 1983: La lutte génétique contre la maladie des racines liégeuses de la Tomate, P.H.M. Revue Horticole, No. 238. Montpellier, FR. pp. 23-26  Laterrot, H., Blancard, D., 1983: Criblage d’une série de lignées et d’hybrides F1 de Tomate pour la résistance à la Stemphyliose, Phytopathologia Mediterranea, 22. Firenze, IT. pp. 188-193  Laterrot, H., Blancard, D., 1986: Les Stemphylia rencontrés sur la Tomate, Phytopathologia Mediterranea, 25. Firenze, IT. pp.140-144  Martin, G. B., Frary, A., Wu, T., Brommonschenkel, S., Chunwongse, J., Earle, E.D., Tanksley, S.D., 1994: A member of the tomato Pto family confers sensitivity to fenthion resulting in rapid cell death. The Plant Cell, 6. pp. 1543-1552  Smilde, W.D., Peters, D., 2007: Pathotyping TSWV in pepper and tomato. In: K. Niemirowicz-Szczytt (ed.), Progress in Research on Capsicum and Eggplant, Proceedings of Eucarpia Meeting. Warszawa, PL. pp. 231-236 | | |

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| |  |  | | --- | --- | | 10. | Technical Questionnaire | |
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| |  |  | | --- | --- | |  | Application date: (not to be filled in by the applicant) | | TECHNICAL QUESTIONNAIRE to be completed in connection with an application for plant breeders' rights | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | 1. | Subject of the Technical Questionnaire | | | | |  |  |  |  |  | |  | |  | | --- | | 1.1.1 | | Botanical name | |  | | --- | | *Solanum lycopersicum* L. | | |  | | --- | | [  ] | | |  |  |  |  |  | |  | |  | | --- | | 1.1.2 | | Common name | |  | | --- | | Cherry tomato; Tomato; tomato | |  | |  |  |  | |  | | --- | |  | |  | |  |  |  |  |  | |  | |  | | --- | | 1.2.1 | | Botanical name | |  | | --- | | *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg | | |  | | --- | | [  ] | | |  |  |  |  |  | |  | |  | | --- | | 1.2.2 | | Common name | |  | | --- | |  | |  | |  |  |  | |  | | --- | |  | |  | |  |  |  |  |  | |  | |  | | --- | | 1.3.1 | | Botanical name | |  | | --- | | *Solanum lycopersicum* L.x *Solanum pimpinellifolium* L. | | |  | | --- | | [  ] | | |  |  |  |  |  | |  | |  | | --- | | 1.3.2 | | Common name | |  | | --- | |  | |  | |  |  |  | |  | | --- | |  | |  | |  |  |  |  |  | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | 2. | Applicant | | | | |  |  |  |  |  | |  | Name | |  |  | |  |  |  |  |  | |  | Address | |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  |  | |  | Telephone No. | |  |  | |  |  |  |  |  | |  | Fax No. | |  |  | |  |  |  |  |  | |  | E-mail address | |  |  | |  |  |  |  |  | |  | Breeder (if different from | |  |  | |  | applicant) | |  |  | |  |  |  |  |  | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | 3. | Proposed denomination and breeder's reference | | | | |  |  |  |  |  | |  | Proposed denomination | |  |  | |  | (if available) | |  |  | |  |  |  |  |  | |  | Breeder's reference | |  |  | |  |  |  |  |  | |

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | TECHNICAL QUESTIONNAIRE | | | Page {x} of {y} | Reference Number: | |  | | | | | | |  | | --- | | #4. | | Information on the breeding scheme and propagation of the variety | | | | |  |  |  | | | |  | 4.1 | Breeding scheme | | | |  | Variety resulting from: | | | | |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | | 4.1.1 | | |  | | --- | | Crossing | |  | |  |  | | | |  | | --- | | 4.1.2 | | |  | | --- | | Mutation  (please state parent variety) | | [ ] | |  |  | | |  |  | | | |  | | --- | | 4.1.3 | | |  | | --- | | Discovery and development  (please state where and when discovered and how developed) | | [ ] | |  |  | | |  |  | | | |  | | --- | | 4.1.4 | | Other (Please provide details) | [ ] | |  |  | | |  |  | | | | | | |

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| |  |  |  | | --- | --- | --- | |  |  |  | |  | 4.2 | Method of propagating the variety | |  | |  |  |  | | --- | --- | --- | | |  | | --- | | 4.2.1 | | |  | | --- | | Seed-propagated varieties | |  | | |  | | --- | | (a) | | |  | | --- | | Self-pollination | | [ ] | | |  | | --- | | (b) | | |  | | --- | | Hybrid | | [ ] | | |  | | --- | | (c) | | |  | | --- | | Inbred line | | [ ] | | |  | | --- | | (d) | | |  | | --- | | Other (please provide details) | | [ ] | |  |  |  | |  |  |  | |  |  |  | | |  | | --- | | 4.2.2 | | |  | | --- | | Vegetative propagation | |  | | |  | | --- | | (a) | | |  | | --- | | Cuttings | | [ ] | | |  | | --- | | (b) | | |  | | --- | | *In vitro* propagation | | [ ] | | |  | | --- | | (c) | | |  | | --- | | Other (state method) | | [ ] | |  |  |  | |  |  |  | |  |  |  | | |  | | --- | | 4.2.3 | | Other (Please provide details) | [ ] | |  |  |  | |  |  |  | |  |  |  | | | |  | |  |  | | --- | --- | | |  | | --- | |  | | | | |

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| |  |  |  |  | | --- | --- | --- | --- | | 5. | Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds). | | | |  |  |  |  | |

|  | Characteristics | Example Varieties | Note |
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| |  | | --- | | **5.1** |  |  | | --- | | **(2)** | | |  | | --- | | **Plant: growth type** | |  |  |
|  | |  | | --- | | determinate | | |  | | --- | | Rio Grande, Siluet | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | indeterminate | | |  | | --- | | Daniela, Florenteen, Marmande VR, Saint‑Pierre | | |  | | --- | | 2 [   ] | |
|  |  |  |  |
|  |  |  |  |
| |  | | --- | | **5.2** |  |  | | --- | | **(6)** | | |  | | --- | | **Only varieties with plant growth type indeterminate: Plant: height** | |  |  |
|  | |  | | --- | | very short | | |  | | --- | | Garderner's Delight, Maresme, Zadenna | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very short to short | | |  | | --- | |  | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | short | | |  | | --- | | Delfine, Despina | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | short to medium | | |  | | --- | |  | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Brooklyn, Campari | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to tall | | |  | | --- | |  | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | tall | | |  | | --- | | Climberley, Pitenza | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | tall to very tall | | |  | | --- | |  | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very tall | | |  | | --- | | Goldwin, Romindo | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not applicable | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  | | --- | | **5.3** |  |  | | --- | | **(10)** | | |  | | --- | | **Leaf: type of blade** | |  |  |
|  | |  | | --- | | pinnate | | |  | | --- | | Matina | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | bipinnate | | |  | | --- | | Daniela, Saint‑Pierre | | |  | | --- | | 2 [   ] | |
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| |  | | --- | | **5.4** |  |  | | --- | | **(12)** | | |  | | --- | | **Leaf: intensity of green color** | |  |  |
|  | |  | | --- | | very light | | |  | | --- | |  | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very light to light | | |  | | --- | |  | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | light | | |  | | --- | | Rossol | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | light to medium | | |  | | --- | |  | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Rebelski | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to dark | | |  | | --- | |  | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | dark | | |  | | --- | | Daniela, Red Robin | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | dark to very dark | | |  | | --- | |  | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very dark | | |  | | --- | |  | | |  | | --- | | 9 [   ] | |
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|  | Characteristics | Example Varieties | Note |
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| |  | | --- | | **5.5** |  |  | | --- | | **(19)** | | |  | | --- | | **Peduncle: abscission layer** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Merlice, Rio Grande | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Daniela, Grownet, Montfavet 63-5 | | |  | | --- | | 9 [   ] | |
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| |  | | --- | | **5.6** |  |  | | --- | | **(21)** | | |  | | --- | | **Immature fruit: green shoulder** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Geronimo | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Daniela, Montfavet 63-5 | | |  | | --- | | 9 [   ] | |
|  |  |  |  |
|  |  |  |  |
| |  | | --- | | **5.7** |  |  | | --- | | **(25)** | | |  | | --- | | **Immature fruit: green stripes** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Daniela, Guanche, Jasminia | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Green Zebra, Tigerella | | |  | | --- | | 9 [   ] | |
|  |  |  |  |
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| |  | | --- | | **5.8** |  |  | | --- | | **(26)** | | |  | | --- | | **Immature fruit: anthocyanin coloration** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Durinta | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | HN5003 | | |  | | --- | | 9 [   ] | |
|  |  |  |  |
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| |  | | --- | | **5.9** |  |  | | --- | | **(27)** | | |  | | --- | | **Time of maturity** | |  |  |
|  | |  | | --- | | very early | | |  | | --- | | Goldwin, Pyremello, Sweet Baby, Trambellino | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very early to early | | |  | | --- | | Delisher | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | early | | |  | | --- | | Lemonade, Shiren, Zorayda | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | early to medium | | |  | | --- | |  | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Delizia, Losna, Sonico | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to late | | |  | | --- | |  | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | late | | |  | | --- | | Mariana, Saneh | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | late to very late | | |  | | --- | |  | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very late | | |  | | --- | | Atago, Brito, Daniela, Raymos, Wafira | | |  | | --- | | 9 [   ] | |
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| |  | | --- | | **5.10** |  |  | | --- | | **(28)** | | |  | | --- | | **Fruit: size** | |  |  |
|  | |  | | --- | | very small | | |  | | --- | | Cerise, Sweet 100 | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very small to small | | |  | | --- | | Dolcetini, Genio | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | small | | |  | | --- | | Brioso, Tankini | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | small to medium | | |  | | --- | | Larimar, Progress | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Mezcal, Oceano | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to large | | |  | | --- | | Luminance, Rio Grande | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | large | | |  | | --- | | Carmello, Floradade | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | large to very large | | |  | | --- | | Florenteen, Grownet | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very large | | |  | | --- | | Cupidissimo, Marsilia | | |  | | --- | | 9 [   ] | |
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|  | Characteristics | Example Varieties | Note |
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| |  | | --- | | **5.11** |  |  | | --- | | **(30)** | | |  | | --- | | **Fruit: shape in longitudinal section** | |  |  |
|  | |  | | --- | | flattened | | |  | | --- | | Margold, Marmande VR | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | oblate | | |  | | --- | | Cartesio, Gloriette, Merlice, Montfavet 63-5 | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | circular | | |  | | --- | | Cerise, Soussia | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | oblong | | |  | | --- | | Landolino, Red Sky | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | cylindric | | |  | | --- | | Hypeel 244, Sir Elyan | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | elliptic | | |  | | --- | | Obock | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | cordate | | |  | | --- | | Cuor di Bue, Cupidissimo, Laureen, Valenciano | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | ovate | | |  | | --- | | Dualrow, Soto | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | obovate | | |  | | --- | | Duquesa, Estelle, Mezcal | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | pyriform | | |  | | --- | | Oceano, Olivenza, Operino | | |  | | --- | | 10 [   ] | |
|  | |  | | --- | | obcordate | | |  | | --- | | Cuore del Ponente, Ingrid | | |  | | --- | | 11 [   ] | |
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| |  | | --- | | **5.12** |  |  | | --- | | **(31)** | | |  | | --- | | **Fruit: ribbing** | |  |  |
|  | |  | | --- | | absent or very weak | | |  | | --- | | Cerise, Conchita | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very weak to weak | | |  | | --- | |  | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | weak | | |  | | --- | | Baikonur, Guanche | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | weak to medium | | |  | | --- | |  | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Montfavet 63-5, Shourouq | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to strong | | |  | | --- | |  | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | strong | | |  | | --- | | Marmalindo, Marmande VR, Marsilia | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | strong to very strong | | |  | | --- | |  | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very strong | | |  | | --- | | Ingrid, Marsalato | | |  | | --- | | 9 [   ] | |
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| |  | | --- | | **5.13** |  |  | | --- | | **(38)** | | |  | | --- | | **Fruit: number of locules** | |  |  |
|  | |  | | --- | | only two | | |  | | --- | | Creativo, San Marzano 2, Tropical | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | two and three | | |  | | --- | | Bomfado, Orinade | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | three and four | | |  | | --- | | Durinta, Montfavet 63-5 | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | four, five or six | | |  | | --- | | Rovente, Tosmar, Tradiro | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | more than six | | |  | | --- | | Bronson, Chocostar, Marmande VR | | |  | | --- | | 5 [   ] | |
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| |  | | --- | | **5.14** |  |  | | --- | | **(39)** | | |  | | --- | | **Fruit: gel in locules** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Allflesh 1120, Nun 03560 | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Daniela, Rio Grande | | |  | | --- | | 9 [   ] | |
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|  | Characteristics | Example Varieties | Note |
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| |  | | --- | | **5.15** |  |  | | --- | | **(40)** | | |  | | --- | | **Fruit: color** | |  |  |
|  | |  | | --- | | yellowish white | | |  | | --- | | Cream Sausage | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | yellow | | |  | | --- | | Babylor, Mimosa | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | orange | | |  | | --- | | Operino, Oranjestar | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | pink | | |  | | --- | | Framboo, Pink Wand, Tomimaru Muchoo | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | red | | |  | | --- | | Daniela, Ferline, Montfavet 63-5, Saint‑Pierre, Umaca | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | brown | | |  | | --- | | Chocostar, Marbruni | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | green | | |  | | --- | | Green Grape, Green Zebra | | |  | | --- | | 7 [   ] | |
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| |  | | --- | | **5.16** |  |  | | --- | | **(44)** | | |  | | --- | | **Fruit: firmness** | |  |  |
|  | |  | | --- | | very soft | | |  | | --- | | Marmande VR | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | very soft to soft | | |  | | --- | |  | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | soft | | |  | | --- | | Marinda, Marsalato | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | soft to medium | | |  | | --- | |  | | |  | | --- | | 4 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Rosannita, Sunita | | |  | | --- | | 5 [   ] | |
|  | |  | | --- | | medium to firm | | |  | | --- | |  | | |  | | --- | | 6 [   ] | |
|  | |  | | --- | | firm | | |  | | --- | | Losna, Octavio, Tradiro | | |  | | --- | | 7 [   ] | |
|  | |  | | --- | | fim to very firm | | |  | | --- | |  | | |  | | --- | | 8 [   ] | |
|  | |  | | --- | | very firm | | |  | | --- | | Brito, Daniela, Larimar, Lolek | | |  | | --- | | 9 [   ] | |
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| |  | | --- | | **5.17** |  |  | | --- | | **(45)** | | |  | | --- | | **Resistance to *Meloidogyne incognita* (Mi)** | |  |  |
|  | |  | | --- | | absent or low | | |  | | --- | | Casaque Rouge | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | medium | | |  | | --- | | Campeon, Tyonic | | |  | | --- | | 2 [   ] | |
|  | |  | | --- | | high | | |  | | --- | | Anahu, Anahu x Casaque Rouge | | |  | | --- | | 3 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  | | --- | | **5.18** |  |  | | --- | | **(46)** | | |  | | --- | | **Resistance to *Verticillium* sp. (Va and Vd) - Race 0** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Marmande verte, Moneymaker | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Marmande VR, Monalbo | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  | | --- | | **5.19** |  |  | | --- | | **(47)** | | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 0EU/1US (Fol: 0EU/1US)** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Marmande verte, Moneymaker | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Anabel, Marporum, Marsol | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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|  | Characteristics | Example Varieties | Note |
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| |  | | --- | | **5.20** |  |  | | --- | | **(48)** | | |  | | --- | | **Resistance to *Fusarium oxysporum* f. sp. *lycopersici* - Race 1EU/2US (Fol: 1EU/2US)** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Marmande verte, Moneymaker | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Motelle | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  | | --- | | **5.21** |  |  | | --- | | **(59)** | | |  | | --- | | **Resistance to *Tomato mosaic virus* - Strain 0 (ToMV: 0)** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Monalbo, Moneymaker | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Mobaci, Mocimor, Momor, Moperou | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  | | --- | | **5.22** |  |  | | --- | | **(68)** | | |  | | --- | | **Resistance to *Tomato spotted wilt virus* - Pathotype 0 (TSWV: 0)** | |  |  |
|  | |  | | --- | | absent | | |  | | --- | | Moneymaker, Montfavet 63-5, Mountain Magic | | |  | | --- | | 1 [   ] | |
|  | |  | | --- | | present | | |  | | --- | | Bodar, Mospomor | | |  | | --- | | 9 [   ] | |
|  | |  | | --- | | not tested | | |  | | --- | |  | | |  | | --- | | [   ] | |
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| |  |  | | --- | --- | | 6. | Similar varieties and differences from these varieties | | |  | | --- | | *Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.* | | | | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | Denomination(s) of variety(ies) similar to your candidate variety | | |  | | --- | | Characteristic(s) in which your candidate variety differs from the similar variety(ies) | | |  | | --- | | Describe the expression of the characteristic(s) for the **similar** variety(ies) | | |  | | --- | | Describe the expression of the characteristic(s) for **your** candidate variety | | | | | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | *Example* | |  | | --- | |  | | |  | | --- | |  | | |  | | --- | |  | | |  |  |  |  | |  |  |  |  | |  |  |  |  | | | |  | Comments: | |

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  | | --- | | #7. | | Additional information which may help in the examination of the variety | | | | |  |  |  | | | | 7.1 | In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety? | | | | |  | Yes | [ ] | No | [ ] | |  | (If yes, please provide details) | | | | | 7.2 | Are there any special conditions for growing the variety or conducting the examination? | | | | |  | Yes | [ ] | No | [ ] | |  | (If yes, please provide details) | | | | | 7.3 | Other information  7.3.1 Other characteristics  (a) Fruits of the variety reach maturity yes [ ] / no [ ]  (b) LSL gene present yes [ ] / no [ ]    (c) LSL genetics homozygous RIN [ ] / heterozygous RIN [ ]  homozygous NOR [ ] / heterozygous NOR [ ] /  not known [ ] / other (please specify) [ ]  7.3.2 Resistance to:  absent present not tested  (a) *Fusarium* *oxysporum f.* *sp.* *lycopersici (*Fol) race 2EU/ 3US (char. 49) [ ] [ ] [ ]    (b) *Fusarium oxysporum f. sp. radicis-lycopersici* (For) (char. 50) [ ] [ ] [ ]  (c) *Passalora fulva* (Pf)  (i) Race 0 (char. 51) [ ] [ ] [ ]  (ii) group A (char. 52) [ ] [ ] [ ]  (iii) group B (char. 53) [ ] [ ] [ ]  (iv) group C (char. 54) [ ] [ ] [ ]  (v) group D (char. 55) [ ] [ ] [ ]  (vi) group E (char. 56) [ ] [ ] [ ]  (vii) group F (char. 57) [ ] [ ] [ ]  (viii) group J (char. 58) [ ] [ ] [ ]  (d) *Tomato mosaic virus* (ToMV)  (i) Strain 1 (char. 60) [ ] [ ] [ ]  (ii) Strain 2 (char. 61) [ ] [ ] [ ]    (e) *Phytophthora infestans* (Pi) (char. 62) [ ] [ ] [ ]  (f) *Pyrenochaeta lycopersici* (Pl) (char. 63) [ ] [ ] [ ]  (g) *Stemphylium spp.* (Ss) (char. 64) [ ] [ ] [ ]    (h) *Pseudomonas syringae* pv. *tomato* (Pst) (char. 65) [ ] [ ] [ ]    (i) *Ralstonia* *solanacearum* (Rs) Race 1 (char. 66) [ ] [ ] [ ]  (j) *Tomato yellow leaf curl virus* (TYLCV) (char. 67) [ ] [ ] [ ]  (k) *T*omato spotted wilt virus - Pathotype 0 (TSWV: 0) (char. 68)  (l) *Leveillula* *taurica* (Lt) (char. 69) [ ] [ ] [ ]    (m) Pseudoidium neolycopersici (Pn) (char. 70) [ ] [ ] [ ]    (n) *Tomato torrado virus (*ToTV) (char. 71) [ ] [ ] [ ]  (o) Other (please specify, including races and strains)    7.3.3. Special conditions for the examination of the variety  (a) Type of culture:  - under glass [ ]  - in the open [ ]  (b) Main use:  -fresh market or garden [ ]  -industrial processing [ ]  - peel [ ]  - paste [ ]  - other [ ]  - pot plant [ ]  - rootstock [ ]  - other [ ]  It is strongly recommended to add a representative colour image of the fruits of the variety to the TQ. | | | | |

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 8. | Authorization for release | | | | | |  | (a) | Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health? | | | | |  |  | Yes | [ ] | No | [ ] | |  | (b) | Has such authorization been obtained? | | | | |  |  | Yes | [ ] | No | [ ] | |  | If the answer to (b) is yes, please attach a copy of the authorization. | | | | | |  |  |  |  |  |  | |
| |  |  | | --- | --- | | |  | | --- | | 9. Information on plant material to be examined or submitted for examination | | |  | | 9.1 The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc. | |  | | |  | | --- | | 9.2 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 the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to: | | | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | (a) | Microorganisms (e.g. virus, bacteria, phytoplasma) | Yes [ ] | No [ ] |  | |  | (b) | Chemical treatment (e.g. growth retardant, pesticide) | Yes [ ] | No [ ] |  | |  | (c) | Tissue culture | Yes [ ] | No [ ] |  | |  | (d) | Other factors | Yes [ ] | No [ ] |  | |  | Please provide details for where you have indicated “yes”. | | | |  | |  |  | | | |  | | |  | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 10. | I hereby declare that, to the best of my knowledge, the information provided in this form is correct: | | | | | |  |  |  |  |  |  | |  |  |  | | |  | |  | Applicant’s name |  | |  |  |  |  |  |  | |  | Signature |  | Date |  |  | |  |  |  | |  |  | |  |  |  |  |  |  | |
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