



These Test Guidelines have been superseded by a later version. The latest adopted version of Test Guidelines can be found at [http://www.upov.int/test\\_guidelines/en/list.jsp](http://www.upov.int/test_guidelines/en/list.jsp)

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Ces principes directeurs d'examen ont été remplacés par une version ultérieure. La version adoptée la plus récente des principes directeurs d'examen figure à l'adresse suivante : [http://www.upov.int/test\\_guidelines/fr/list.jsp](http://www.upov.int/test_guidelines/fr/list.jsp)

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Diese Prüfungsrichtlinien wurden durch eine neuere Fassung ersetzt. Die neueste angenommene Fassung von Prüfungsrichtlinien ist unter [http://www.upov.int/test\\_guidelines/de/list.jsp](http://www.upov.int/test_guidelines/de/list.jsp) zu finden.

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Las presentes directrices de examen han sido reemplazadas por una versión posterior. La versión de las directrices de examen de más reciente aprobación está disponible en [http://www.upov.int/test\\_guidelines/es/list.jsp](http://www.upov.int/test_guidelines/es/list.jsp).



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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**

GENEVA

**TOMATO**

UPOV Code: SOLAN\_LYC

*Solanum lycopersicum* L.**GUIDELINES****FOR THE CONDUCT OF TESTS****FOR DISTINCTNESS, UNIFORMITY AND STABILITY**

Alternative Names:\*

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Solanum lycopersicum</i> L., <i>Lycopersicon esculentum</i> Mill., <i>Lycopersicon lycopersicum</i> (L.) Karsten ex Farw.	Tomato	Tomate	Tomate	Tomate

The purpose of these guidelines (“Test Guidelines”) is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

**ASSOCIATED DOCUMENTS**

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

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

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## 1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Solanum lycopersicum* L..

## 2. Material Required

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: 10g or 2,500 seeds
- b) vegetatively propagated varieties: 25 plants plus the number required for disease resistance tests

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. For disease resistance testing, additional plant material may be requested.

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.

## 3. Method of Examination

### 3.1 *Number of Growing Cycles*

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

### 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. On non-staked plants, the time of flowering (characteristic 43) cannot be easily observed due to the branching of the plant.

### 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 two replicates.

3.4.2 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.

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

### 3.5 *Additional Tests*

Additional tests, for examining relevant characteristics, may be established.

## 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 / 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 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 second column of the Table of Characteristics (see document TGP/9 “Examining Distinctness”, Section 4 “Observation of characteristics”):

MG: single measurement of a group of plants or parts of plants

MS: measurement of a number of individual plants or parts of plants

VG: visual assessment by a single observation of a group of plants or parts of plants

VS: visual assessment by observation of individual plants or parts of plants

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

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

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

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

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

## 4.2 *Uniformity*

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 For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 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.

### 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) Fruit: green shoulder (before maturity) (characteristic 21)
- (e) Fruit: size (characteristic 26)
- (f) Fruit: shape in longitudinal section (characteristic 28)
- (g) Fruit: number of locules (characteristic 36)
- (h) Fruit: color (at maturity) (characteristic 37)
- (i) Resistance to *Meloidogyne incognita* (Mi) (characteristic 46)
- (j) Resistance to *Verticillium* sp. (Va and Vd) – Race 0 (characteristic 47)
- (k) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) – Race 0 (ex 1) (characteristic 48.1)
- (l) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) – Race 1 (ex 2) (characteristic 48.2)
- (m) Resistance to Tomato mosaic virus (ToMV) – Strain 0 (characteristic 51.1)
- (n) Resistance to Tomato spotted wilt virus (TSWV) - Race 0 (characteristic 58)

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”.

## 6. Introduction to the Table of Characteristics

### 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 In the case of qualitative and pseudo-qualitative characteristics (see Chapter 6.3), all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	Note
small	3
medium	5
large	7

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

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



6.2.3 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.

### 6.4 *Example Varieties*

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

### 6.5 *Legend*

(\*) Asterisked characteristic – see Chapter 6.1.2

QL Qualitative characteristic – see Chapter 6.3

QN Quantitative characteristic – see Chapter 6.3

PQ Pseudo-qualitative characteristic – see Chapter 6.3

MG, MS, VG, VS – see Chapter 4.1.5

(a)-(c) See Explanations on the Table of Characteristics in Chapter 8.1

(+) See Explanations on the Table of Characteristics in Chapter 8.2

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

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>1.</b>	<b>VG</b>	<b><u>Seed-propagated varieties only:</u></b>	<b><u>Variétés reproduites par voie sexuée</u></b>	<b><u>Nur samenvermehrte Sorten:</u></b>	<b><u>Sólo variedades de reproducción sexuada:</u></b>	
(+)	Seedling: anthocyanin coloration of hypocotyl	Plantule : pigmentation anthocyanique de l'hypocotyle	Sämling: Anthocyanfärbung des Hypocotyls	Plántula: pigmentación antocianica del hipocótilo		
<b>QL</b>	absent	absente	fehlend	ausente	Colt, Heinz 8104, Mogeor, Momorvert, VTM215	1
	present	présente	vorhanden	presente	DG-039, Montfavet H 63.4	9
<b>2.</b>	<b>VG</b>	<b>Plant: growth type</b>	<b>Plante : type de croissance</b>	<b>Pflanze: Wuchstyp</b>	<b>Planta: hábito de crecimiento</b>	
(*) (+)						
<b>QL</b>	determinate	déterminée	begrenzt wachsend	determinado	Campbell 1327, Prisca	1
	indeterminate	indéterminée	unbegrenzt wachsend	indeterminado	Marmande VR, Saint-Pierre, San Marzano 2	2
<b>3.</b>	<b>VG/ MS</b>	<b><u>Only varieties with plant growth type determinate:</u></b>	<b><u>Seulement variétés à type de croissance déterminée :</u></b>	<b><u>Nur begrenzt wachsende Sorten:</u></b>	<b><u>Sólo variedades con tipo de crecimiento determinado:</u></b>	
	Plant: number of inflorescences on main stem (side shoots to be removed)	Plante : nombre d'inflorescences sur la tige principale (bourgeons axillaires à éliminer)	Pflanze: Anzahl Blütenstände am Haupttrieb (Seitentriebe sind zu entfernen)	Planta: número de inflorescencias en el tallo principal (eliminar ramas axilares)		
<b>QN</b>	few	petit	gering	bajo	Campbell 1327	3
	medium	moyen	mittel	medio	Montfavet H 63.4	5
	many	grand	groß	alto	Prisca	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>4.</b>	<b>VG</b>	<b>Stem: anthocyanin coloration</b>	<b>Tige : pigmentation anthocyanique</b>	<b>Stengel: Anthocyanfärbung</b>	<b>Tallo: pigmentación antociánica</b>	
(+)						
<b>QN</b>	<b>(a)</b>	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Mogeor, Momorvert, 1
		weak	faible	gering	débil	Montfavet H 63.5 3
		medium	moyenne	mittel	media	Rondello 5
		strong	forte	stark	fuerte	Grinta, Nemato 7
		very strong	très forte	sehr stark	muy fuerte	9
<b>5.</b>	<b>VG/ MS</b>	<b><u>Only varieties with plant growth type indeterminate:</u> Stem: length of internode</b>	<b><u>Seulement les variétés à type de croissance indéterminé :</u> Tige : longueur de l'entre-nœud</b>	<b><u>Nur unbegrenzt wachsende Sorten:</u> Stengel: Internodienlänge</b>	<b><u>Sólo variedades con tipo de crecimiento indeterminado:</u> Tallo: longitud del entrenudo</b>	
(+)						
<b>QN</b>	<b>(a)</b>	short	court	kurz	corta	Dombito, Manific, Paso, Trend 3
		medium	moyen	mittel	media	Montfavet H 63.5 5
		long	long	lang	larga	Berdy, Calimero 7
<b>6.</b>	<b>VG/ MS</b>	<b><u>Only varieties with plant growth type indeterminate:</u> Plant: height</b>	<b><u>Seulement les variétés à type de croissance indéterminée :</u> Plante : hauteur</b>	<b><u>Nur unbegrenzt wachsende Sorten:</u> Pflanze: Höhe</b>	<b><u>Sólo variedades con tipo de crecimiento indeterminado:</u> Planta: altura</b>	
(+)						
<b>QN</b>		very short	très basse	sehr niedrig	muy corta	Cherry Belle 1
		short	basse	niedrig	corta	Carson, Despina 3
		medium	moyenne	mittel	media	Brooklyn, Buffalo, Vision 5
		long	haute	hoch	larga	Classy, Clarence, Climberly, Massada 7
		very long	très haute	sehr hoch	muy larga	Daydream, Minired 9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>7.</b>	<b>VG</b>	<b>Leaf: attitude</b>	<b>Feuille : port</b>	<b>Blatt: Haltung</b>	<b>Hoja: porte</b>	
(*)						
(+)						
<b>QN</b>	<b>(a)</b>	erect	dressé	aufgerichtet	erecto	1
		semi-erect	demi-dressé	halbaufrecht	semierecto	Allround, Drakar, Vitador
		horizontal	horizontal	waagerecht	horizontal	Aromata, Triton
		semi-drooping	demi-retombant	halbüberhängend	semicolgante	Montfavet H 63.5
		drooping	retombant	überhängend	colgante	Multolino, Naram, Tibet
<b>8.</b>	<b>VG/ MS</b>	<b>Leaf: length</b>	<b>Feuille : longueur</b>	<b>Blatt: Länge</b>	<b>Hoja: longitud</b>	
<b>QN</b>	<b>(a)</b>	short	courte	kurz	corta	Nelson, Red Robin, Tiny Tim
		medium	moyenne	mittel	media	Lorena
		long	longue	lang	larga	Montfavet H 63.5
<b>9.</b>	<b>VG/ MS</b>	<b>Leaf: width</b>	<b>Feuille : largeur</b>	<b>Blatt: Breite</b>	<b>Hoja: anchura</b>	
<b>QN</b>	<b>(a)</b>	narrow	étroite	schmal	estrecha	Marmande VR, Red Robin, Tiny Tim
		medium	moyenne	mittel	media	
		broad	large	breit	ancha	Saint-Pierre
<b>10.</b>	<b>VG</b>	<b>Leaf: type of blade</b>	<b>Feuille : type de limbe</b>	<b>Blatt: Typ der Blattspreite</b>	<b>Hoja: división del limbo</b>	
(*)						
(+)						
<b>QL</b>	<b>(a)</b>	pinnate	penné	gefiedert	pinnada	Mikado, Pilot, Red Jacket
		bipinnate	bipenné	doppelt gefiedert	bipinnada	Lukullus, Saint-Pierre

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>11.</b>	<b>VG</b>	<b>Leaf: size of leaflets</b>	<b>Feuille : taille des folioles</b>	<b>Blatt: Größe der Blattfiedern</b>	<b>Hoja: tamaño de los folíolos</b>		
	(+)						
<b>QN</b>	<b>(a)</b>	very small	très petites	sehr klein	muy pequeños	Minitom	1
		small	petites	klein	pequeños	Tiny Tim	3
		medium	moyennes	mittel	medios	Marmande VR, Royesta	5
		large	grandes	groß	grandes	Daniela, Hynema	7
		very large	très grandes	sehr groß	muy grandes	Dombo	9
<b>12.</b>	<b>VG</b>	<b>Leaf: intensity of green color</b>	<b>Feuille : intensité de la couleur verte</b>	<b>Blatt: Intensität der Grünfärbung</b>	<b>Hoja: intensidad del color verde</b>		
<b>QN</b>	<b>(a)</b>	light	claire	hell	clara	Macero II, Poncette, Rossol	3
		medium	moyenne	mittel	media	Lucy	5
		dark	foncée	dunkel	oscura	Allround, Daniela, Lorena, Red Robin	7
<b>13.</b>	<b>VG</b>	<b>Leaf: glossiness</b>	<b>Feuille : brillance</b>	<b>Blatt: Glanz</b>	<b>Hoja: brillo</b>		
	(+)						
<b>QN</b>	<b>(a)</b>	weak	faible	gering	débil	Daniela	3
		medium	moyenne	mittel	medio	Marmande VR	5
		strong	forte	stark	fuerte	Guindilla	7
<b>14.</b>	<b>VG</b>	<b>Leaf: blistering</b>	<b>Feuille : cloûre</b>	<b>Blatt: Blasigkeit</b>	<b>Hoja: abullonado</b>		
	(+)						
<b>QN</b>	<b>(a)</b>	weak	faible	gering	débil	Daniela	3
		medium	moyenne	mittel	medio	Marmande VR	5
		strong	forte	stark	fuerte	Delfine, Tiny Tim	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>15.</b>	<b>VG</b>	<b>Leaf: attitude of petiole of leaflet in relation to main axis</b>	<b>Feuille : port du pétiole par rapport à l'axe central</b>	<b>Blatt: Stellung des Blattstiels im Verhältnis zur Hauptachse</b>	<b>Hoja: porte del pecíolo de los folíolos en relación con el eje principal</b>		
(+)							
<b>QN</b>	(a)	semi-erect	demi-dressé	halbaufrecht	semierecto	Blizzard, Marmande VR	3
		horizontal	horizontal	waagrecht	horizontal	Sonatine	5
		semi-drooping	demi-retombant	halbüberhängend	semicolgante	Montfavet H63.5	7
<b>16.</b>	<b>VG/ MS</b>	<b>Inflorescence: type</b>	<b>Inflorescence : type</b>	<b>Blütenstand: Typ</b>	<b>Inflorescencia: tipo</b>		
(+)							
<b>QN</b>		mainly uniparous	principalement unipare	überwiegend unverzweigt	principalmente unípara	Dynamo	1
		equally uniparous and multiparous	autant unipare que multipare	intermediär	intermedia	Harzfeuer	2
		mainly multiparous	principalement multipare	überwiegend verzweigt	principalmente múltipara	Marmande VR	3
<b>17.</b>	<b>VG</b>	<b>Flower: color</b>	<b>Fleur : couleur</b>	<b>Blüte: Farbe</b>	<b>Flor: color</b>		
(*)							
<b>QL</b>		yellow	jaune	gelb	amarillo	Exota, MarmandeVR	1
		orange	orange	orange	anaranjado	Orama, Pericherry	2
<b>18.</b>	<b>VG</b>	<b>Flower: pubescence of style</b>	<b>Fleur : pilosité du style</b>	<b>Blüte: Behaarung des Griffels</b>	<b>Flor: pubescencia del estilo</b>		
(+)							
<b>QL</b>		absent	absente	fehlend	ausente	Campbell 1327	1
		present	présente	vorhanden	presente	Saint Pierre	9
<b>19.</b>	<b>VG</b>	<b>Peduncle: abscission layer</b>	<b>Péduncule : assise d'abscission</b>	<b>Blütenstiel: Bruchstelle</b>	<b>Pedúnculo: capa de abscisión</b>		
(*)							
(+)							
<b>QL</b>		absent	absente	fehlend	ausente	Aledo, Bandera, Count, Lerica	1
		present	présente	vorhanden	presente	Montfavet H 63.5, Roma	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>20.</b>	<b>VG/ MS</b>	<b><u>Only varieties with peduncle abscission layer present:</u></b>	<b><u>Seulement les variétés avec assise d'abscission :</u></b>	<b><u>Nur Sorten mit Blütenstiel: Bruchstellen vorhanden:</u></b>	<b><u>Sólo para variedades con abscisión: Pedicelo:</u></b>		
		<b>Pedicel: length</b>	<b>Pédicelle : longueur</b>	<b>Blütenstandstiel: Länge</b>			
<b>QN</b>	short	court	kurz	corta	Cerise, Ferline, Montfavet H 63.18, Rossol	3	
	medium	moyen	mittel	media	Dario, Primosol	5	
	long	long	lang	larga	Erlidor, Ramy, Ranco	7	
<b>21.</b>	<b>VG</b>	<b>Fruit: green shoulder (before maturity)</b>	<b>Fruit : collet vert (avant maturité)</b>	<b>Frucht: grüne Schulter (vor der Reife)</b>	<b>Fruto: hombro verde (antes de madurez)</b>		
<b>QL</b>	<b>(b)</b>	absent	absent	fehlend	ausente	Felicia, Rio Grande, Trust	1
		present	présent	vorhanden	presente	Daniela, Montfavet H 63.5	9
<b>22.</b>	<b>VG</b>	<b>Fruit: extent of green shoulder (before maturity)</b>	<b>Fruit : extension du collet vert (avant maturité)</b>	<b>Frucht: Größe der grünen Schulter (vor der Reife)</b>	<b>Fruto: tamaño del hombro verde (antes de madurez)</b>		
<b>QN</b>	<b>(b)</b>	very small	très petit	sehr klein	muy pequeño	Daniela	1
		small	petit	klein	pequeño	Ballet, Cristy, Firestone, Siluet	3
		medium	moyen	mittel	medio	Erlidor, Foxy, Montfavet H 63.5	5
		large	grand	groß	grande	Cobra, Delisa, Epona, Manific	7
<b>23.</b>	<b>VG</b>	<b>Fruit: intensity of green color of shoulder (before maturity)</b>	<b>Fruit : intensité de la couleur verte du collet (avant maturité)</b>	<b>Frucht: Intensität der Grünfärbung der Schulter (vor der Reife)</b>	<b>Fruto: intensidad del color verde del hombro (antes de madurez)</b>		
<b>QN</b>	<b>(b)</b>	light	claire	hell	clara	Ballet, Daniela, Juboline	3
		medium	moyenne	mittel	media	Montfavet H 63.5, Siluet	5
		dark	foncée	dunkel	oscura	Ayala, Erlidor, Xenon	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>24. VG</b> (* (+)	<b>Fruit: intensity of green color excluding shoulder (before maturity)</b>	<b>Fruit : intensité de la couleur verte à l'exclusion du collet (avant maturité)</b>	<b>Frucht: Intensität der Grünfärbung ohne Schulter (vor der Reife)</b>	<b>Fruto: intensidad del color verde excepto el hombro (antes de madurez)</b>		
<b>QN</b>	<b>(b)</b> very light	très claire	sehr hell	muy clara	Clarée	1
	light	claire	hell	clara	Capello, Daniela, Duranto, Durinta, Trust	3
	medium	moyenne	mittel	media	Marmande, Rody	5
	dark	foncée	dunkel	oscura	Ayala, Centella, Tatiana, Uragano	7
	very dark	très foncée	sehr dunkel	muy oscura	Verdi	9
<b>25. VG</b> (+)	<b>Fruit: green stripes (before maturity)</b>	<b>Fruit : stries vertes (avant maturité)</b>	<b>Frucht: grüne Flammung (vor der Reife)</b>	<b>Fruto: rayas verdes (antes de madurez)</b>		
<b>QL</b>	<b>(b)</b> absent	absentes	fehlend	ausente	Daniela	1
	present	présentes	vorhanden	presente	Green Zebra, Tigerella	9
<b>26. VG</b> (* (+)	<b>Fruit: size</b>	<b>Fruit : taille</b>	<b>Frucht: Größe</b>	<b>Fruto: tamaño</b>		
<b>QN</b>	<b>(c)</b> very small	très petit	sehr klein	muy pequeño	Cerise, Sweet 100	1
	small	petit	klein	pequeño	Early Mech, Europeel, Roma	3
	medium	moyen	mittel	medio	Alphamech, Diego	5
	large	grand	groß	grande	Carmello, Ringo	7
	very large	très grand	sehr groß	muy grande	Erlidor, Lydia, Muril	9
<b>27. VG/MS</b> (* (+)	<b>Fruit: ratio length/diameter</b>	<b>Fruit : rapport longueur/diamètre</b>	<b>Frucht: Verhältnis Länge/Durchmesser</b>	<b>Fruto: relación longitud/diámetro</b>		
<b>QN</b>	<b>(c)</b> very compressed	très comprimé	stark zusammengedrückt	muy comprimida	Campbell 28, Marmande VR	1
	moderately compressed	modérément comprimé	mäßig zusammengedrückt	moderadamente comprimida	Alicia	3
	medium	moyen	mittel	media	Early Mech, Peto Gro	5
	moderately elongated	modérément allongé	mäßig langgezogen	moderadamente alargada	Rimone, Rio Grande	7
	very elongated	très allongé	stark langgezogen	muy alargada	Elko, Macero II	9



	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>28.</b>	<b>VG</b>	<b>Fruit: shape in longitudinal section</b>	<b>Fruit : forme en section longitudinale</b>	<b>Frucht: Form im Längsschnitt</b>	<b>Fruto: forma en sección longitudinal</b>		
(*) (+)							
<b>PQ</b>	(c)	flattened	nettement aplatie	abgeflacht	aplanada	Campbell 28, Marmande VR	1
		oblate	aplatie	breitrund	achatada	Montfavet H 63.4, Montfavet H 63.5	2
		circular	ronde	kreisförmig	circular	Cerise, Moneymaker	3
		oblong	oblongue	rechteckig	oblonga	Early Mech, Peto Gro	4
		cylindric	cylindrique	zylindrisch	cilíndrica	Hypeel 244, Macero II, San Marzano 2	5
		elliptic	elliptique	elliptisch	elíptica	Alcaria, Castone	6
		cordate	cordiforme	herzförmig	cordada	Valenciano	7
		ovate	ovale	eiförmig	oval	Dualrow, Soto	8
		obovate	obovale	verkehrt eiförmig	oboval	Duquesa, Estelle Rimone, Rio Grande	9
		pyriform	pyriforme	birnenförmig	piriforme	Europeel	10
		obcordate	obcordiforme	verkehrt herzförmig	obcordada	Cuore del Ponente, Magno	11
<b>29.</b>	<b>VG</b>	<b>Fruit: ribbing at peduncle end</b>	<b>Fruit : côtes au niveau de l'attache pédonculaire</b>	<b>Frucht: Rippung am Stielende</b>	<b>Fruto: acostillado en la zona peduncular</b>		
(*) (+)							
<b>QN</b>	(c)	absent or very weak	absentes ou très faibles	fehlend oder sehr gering	ausente o muy débil	Calimero, Cerise	1
		weak	faibles	gering	débil	Early Mech, Hypeel 244, Melody, Peto Gro, Rio Grande	3
		medium	moyennes	mittel	medio	Montfavet H 63.4, Montfavet H 63.5	5
		strong	fortes	stark	fuerte	Campbell 1327, Carmello, Count	7
		very strong	très fortes	sehr stark	muy fuerte	Costeluto Fiorentino, Ingrid, Marmande VR	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>30.</b>	<b>VG</b>	<b>Fruit: depression at peduncle end</b>	<b>Fruit : dépression à l'attache pédonculaire</b>	<b>Frucht: Einsenkung am Stielende</b>	<b>Fruto: depresión en la zona peduncular</b>		
(+)							
<b>QN</b>	(c)	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Europeel, Heinz 1706, Rossol, Sweet Baby	1
		weak	faible	gering	débil	Futura, Melody	3
		medium	moyenne	mittel	media	Carmello, Count, Fandango, Saint-Pierre	5
		strong	forte	stark	fuerte	Ballon Rouge, Marmande VR	7
<b>31.</b>	<b>VG/ MS</b>	<b>Fruit: size of peduncle scar</b>	<b>Fruit : taille de la cicatrice pédonculaire</b>	<b>Frucht: Größe des Stielansatzes</b>	<b>Fruto: tamaño de la cicatriz peduncular</b>		
(+)							
<b>QN</b>	(c)	very small	très petite	sehr klein	muy pequeña	Cerise, Heinz 1706, Sweet Baby	1
		small	petite	klein	pequeña	Early Mech, Peto Gro, Rio Grande	3
		medium	moyenne	mittel	media	Montfavet H 63 4, Montfavet H 63 5	5
		large	grande	groß	grande	Apla, Campbell 1327, Carmello, Fandango, Flora Dade	7
		very large	très grande	sehr groß	muy grande	Marmande VR	9
<b>32.</b>	<b>VG/ MS</b>	<b>Fruit: size of blossom scar</b>	<b>Fruit : taille de la cicatrice pistillaire</b>	<b>Frucht: Größe des Blütenansatzes</b>	<b>Fruto: tamaño de la cicatriz pistilar</b>		
(+)							
<b>QN</b>	(c)	very small	très petite	sehr klein	muy pequeña	Cerise, Early Mech, Europeel, Heinz 1706, Peto Gro, Rio Grande	1
		small	petite	klein	pequeña	Montfavet H 63.4, Montfavet H 63.5	3
		medium	moyenne	mittel	media	Alphamech, Apla, Carmello, Floradade	5
		large	grande	groß	grande	Campbell 1327, Count, Marmande VR, Saint-Pierre	7
		very large	très grande	sehr groß	muy grande	Rozova Magia	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>33.</b>	<b>VG</b>	<b>Fruit: shape at blossom end</b>	<b>Fruit : forme au sommet</b>	<b>Frucht: Form am Blütenende</b>	<b>Fruto: forma del extremo distal</b>		
(+)							
<b>QN</b>	(c)	indented	déprimée	eingesenkt	hundida	Marmande VR, Super Mech	1
		indented to flat	déprimée à aplatie	eingesenkt bis flach	hundida a plana		2
		flat	aplatie	flach	plana	Montfavet H 63.4, Montfavet H 63.5	3
		flat to pointed	aplatie à pointue	flach bis spitz	plana a puntiaguda	Cal J, Early Mech, Peto Gro	4
		pointed	pointue	spitz	puntiaguda	Europeel, Heinz 1706, Hypeel 244, Roma VF	5
<b>34.</b>	<b>VG/ MS</b>	<b>Fruit: diameter of core in cross section in relation to total diameter</b>	<b>Fruit : diamètre du cœur en coupe transversale par rapport au diamètre total</b>	<b>Frucht: Herzdurchmesser im Querschnitt im Verhältnis zum Gesamtdurchmesser</b>	<b>Fruto: diámetro del corazón en corte transversal en relación con el diámetro total</b>		
(+)							
<b>QN</b>	(c)	very small	très petite	sehr klein	muy pequeño	Cerise	1
		small	petite	klein	pequeño	Early Mech, Europeel, Heinz 1706, Peto Gro, Rio Grande, Rossol	3
		medium	moyenne	mittel	medio	Montfavet H 63.4, Montfavet H 63.5	5
		large	grande	groß	grande	Apla, Campbell 1327, Carmello, Count, Fandango, Floradade	7
		very large	très grande	sehr groß	muy grande	Marmande VR, Valenciano	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>35.</b>	<b>VG</b>	<b>Fruit: thickness of pericarp</b>	<b>Fruit : épaisseur du péricarpe</b>	<b>Frucht: Dicke des Perikarps</b>	<b>Fruto: espesor del pericarpio</b>		
(+)							
<b>QN</b>	(c)	very thin	très mince	sehr dünn	muy delgado	Cerise	1
		thin	mince	dünn	delgado	Marmande VR	3
		medium	moyen	mittel	medio	Carmello, Europeel, Floradade, Heinz 1706, Montfavet H 63.5	5
		thick	épais	dick	grueso	Cal J, Daniela, Ferline, Peto Gro, Rio Grande	7
		very thick	très épais	sehr dick	muy grueso	Myriade, Rondex	9
<b>36.</b>	<b>VG/ MS</b>	<b>Fruit: number of locules</b>	<b>Fruit : nombre de loges</b>	<b>Frucht: Anzahl Kammern</b>	<b>Fruto: número de lóculos</b>		
(*)							
(+)							
<b>QN</b>	(c)	only two	seulement deux	nur zwei	sólo dos	Early Mech, Europeel, San Marzano,	1
		two and three	deux et trois	zwei und drei	dos y tres	Alphamech, Futuria	2
		three and four	trois et quatre	drei und vier	tres y cuatro	Montfavet H 63.5	3
		four, five or six	quatre, cinq ou six	vier, fünf oder sechs	cuatro, cinco o seis	Raïssa, Tradiro	4
		more than six	plus de six	mehr als sechs	más de seis	Marmande VR	5
<b>37.</b>	<b>VG</b>	<b>Fruit: color (at maturity)</b>	<b>Fruit : couleur (à maturité)</b>	<b>Frucht: Farbe (bei Reife)</b>	<b>Fruto: color (en la madurez)</b>		
(*)							
(+)							
<b>PQ</b>	(c)	cream	crème	cremefarben	crema	Jazon, White Mirabell	1
		yellow	jaune	gelb	amarillo	Goldene Königin, Yellow Pear	2
		orange	orange	orange	anaranjado	Sungold	3
		pink	rose	rosa	rosa	Aichi First	4
		red	rouge	rot	rojo	Daniela, Ferline, Montfavet H 63.5	5
		brown	brunâtre	braun	marrónáceo	Ozyrys	6
		green	vert	grün	verde	Green Grape, Green Zebra	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
<b>38.</b>	<b>VG</b>	<b>Fruit: color of flesh (at maturity)</b>	<b>Fruit : couleur de la chair (à maturité)</b>	<b>Frucht: Fleischfarbe (bei Reife)</b>	<b>Fruto: color de la pulpa (en la madurez)</b>		
<b>(*)</b>							
<b>(+)</b>							
<b>PQ</b>	<b>(c)</b>	cream	crème	cremefarben	crema	Jazon	1
		yellow	jaune	gelb	amarillo	Jubilée	2
		orange	orange	orange	anaranjado	Sungold	3
		pink	rose	rosa	rosa	Regina	4
		red	rouge	rot	rojo	Ferline, Saint-Pierre	5
		brown	brunâtre	braun	marrón	Ozyrys	6
		green	verte	grün	verde	Green Grape, Green Zebra	7
<b>39.</b>	<b>VG</b>	<b>Fruit: glossiness of skin</b>	<b>Fruit : brillance de la peau</b>	<b>Frucht: Glanz der Schale</b>	<b>Fruto: brillo de la epidermis</b>		
<b>QN</b>	<b>(c)</b>	weak	faible	gering	débil	Josefina	1
		medium	moyenne	mittel	medio	Roncardo	2
		strong	forte	stark	fuerte	Mecano	3
<b>40.</b>	<b>VG</b>	<b>Fruit: color of epidermis</b>	<b>Fruit : couleur de l'épiderme</b>	<b>Frucht: Farbe der Epidermis</b>	<b>Fruto: color de la epidermis</b>		
<b>(+)</b>							
<b>QL</b>	<b>(c)</b>	colorless	incolore	farblos	incoloro	Fruits, House Momotaro	1
		yellow	jaune	gelb	amarillo	Black Cherry, Daniela, Kurikoma	2
<b>41.</b>	<b>VG</b>	<b>Fruit: firmness</b>	<b>Fruit : fermeté</b>	<b>Frucht: Festigkeit</b>	<b>Fruto: firmeza</b>		
<b>(*)</b>							
<b>(+)</b>							
<b>QN</b>	<b>(c)</b>	very soft	très mou	sehr weich	muy blando	Marmande VR	1
		soft	mou	weich	blando	Trend	3
		medium	moyen	mittel	medio	Cristina	5
		firm	ferme	fest	firme	Fernova, Konsul, Tradiro	7
		very firm	très ferme	sehr fest	muy firme	Daniela, Karat, Lolek	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>42.</b>	<b>VG</b>	<b>Fruit: shelf-life</b>	<b>Fruit : durée de conservation</b>	<b>Frucht: Haltbarkeit</b>	<b>Fruto: vida de anaquel</b>	
(+)						
<b>QN</b>	very short	très courte	sehr kurz	muy corta	Marmande VR	1
	short	courte	kurz	corta	Rambo	3
	medium	moyenne	mittel	media	Durinta	5
	long	longue	lang	larga	Daniela	7
	very long	très longue	sehr lang	muy larga	Ernesto	9
<b>43.</b>	<b>MS</b>	<b>Time of flowering</b>	<b>Époque de floraison</b>	<b>Zeitpunkt der Blüte</b>	<b>Época de floración</b>	
(+)						
<b>QN</b>	early	précoce	früh	precoz	Feria, Primabel	3
	medium	moyenne	mittel	media	Montfavet H 63.5, Prisca	5
	late	tardive	spät	tardía	Manific, Saint-Pierre	7
<b>44.</b>	<b>MG</b>	<b>Time of maturity</b>	<b>Époque de maturité</b>	<b>Zeitpunkt der Reife</b>	<b>Época de madurez</b>	
(*) (+)						
<b>QN</b>	very early	très précoce	sehr früh	muy precoz	Dolcevita, Sungold, Sweet Baby	1
	early	précoce	früh	precoz	Bianca, Rossol, Shiren	3
	medium	moyenne	mittel	media	Gourmet, UC 82B	5
	late	tardive	spät	tardía	Arletta, Durinta	7
	very late	très tardive	sehr spät	muy tardía	Daniela	9
<b>45.</b>	<b>VG</b>	<b>Sensitivity to silvering</b>	<b>Sensibilité à l'argenture</b>	<b>Empfindlichkeit für Silberblattbildung</b>	<b>Sensibilidad al plateado</b>	
(+)						
<b>QL</b>	insensitive	insensible	fehlend	insensible	Marathon, Quest, Sano, Tradiro	1
	sensitive	sensible	vorhanden	sensible	Belliro, Paradiso, Sonatine	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>46.</b>	<b>VG</b>	<b>Resistance to</b>	<b>Résistance à</b>	<b>Resistenz gegen</b>	<b>Resistencia a</b>	
(*)		<i>Meloidogyne</i>	<i>Meloidogyne</i>	<i>Meloidogyne</i>	<i>Meloidogyne</i>	
(+)		<i>incognita</i> (Mi)	<i>incognita</i> (Mi)	<i>incognita</i> (Mi)	<i>incognita</i> (Mi)	
<b>QN</b>	susceptible	sensible	anfällig	sensible	Casaque Rouge	1
	moderately resistant	modérément résistante	mäßig resistent	moderadamente resistente	Campeon, Madyta, Vinchy	2
	highly resistant	fortement résistante	stark resistent	muy resistente	Anabel, Anahu	3
<b>47.</b>	<b>VG</b>	<b>Resistance to</b>	<b>Résistance à</b>	<b>Resistenz gegen</b>	<b>Resistencia a</b>	
(*)		<i>Verticillium</i> sp.	<i>Verticillium</i> sp.	<i>Verticillium</i> sp.	<i>Verticillium</i> sp.	
(+)		(Va and Vd)	(Va et Vd)	(Va und Vd)	(Va y Vd)	
	<b>– Race 0</b>	<b>– Pathotype 0</b>	<b>– Pathotyp 0</b>	<b>– Raza 0</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Anabel, Marmande verte	1
	present	présente	vorhanden	presente	Daniela, Marmande VR	9
<b>48.</b>	<b>VG</b>	<b>Resistance to</b>	<b>Résistance à</b>	<b>Resistenz gegen</b>	<b>Resistencia a</b>	
(+)		<i>Fusarium</i>	<i>Fusarium</i>	<i>Fusarium</i>	<i>Fusarium</i>	
		<i>oxysporum</i> f. sp.	<i>oxysporum</i> f. sp.	<i>oxysporum</i> f. sp.	<i>oxysporum</i> f. sp.	
		<i>lycopersici</i> (Fol)	<i>lycopersici</i> (Fol)	<i>lycopersici</i> (Fol)	<i>lycopersici</i> (Fol)	
<b>48.1</b>	<b>VG</b>	<b>– Race 0 (ex 1)</b>	<b>– Pathotype 0 (ex 1)</b>	<b>– Pathotyp 0 (ex 1)</b>	<b>– Raza 0 (ex 1)</b>	
(*)						
<b>QL</b>	absent	absente	fehlend	ausente	Marmande verte	1
	present	présente	vorhanden	presente	Anabel, Marporum, Marsol	9
<b>48.2</b>	<b>VG</b>	<b>– Race 1 (ex 2)</b>	<b>– Pathotype 1 (ex 2)</b>	<b>– Pathotyp 1 (ex 2)</b>	<b>– Raza 1 (ex 2)</b>	
(*)						
<b>QL</b>	absent	absente	fehlend	ausente	Marmande verte	1
	present	présente	vorhanden	presente	Motelle, Walter	9
<b>48.3</b>	<b>VG</b>	<b>– Race 2 (ex 3)</b>	<b>– Pathotype 2 (ex 3)</b>	<b>– Pathotyp 2 (ex 3)</b>	<b>– Raza 2 (ex 3)</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Marmande verte, Motelle	1
	present	présente	vorhanden	presente	Alliance, Florida, Ivanhoé, Tributes	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>49.</b>	<b>VG</b>	<b>Resistance to <i>Fusarium oxysporum</i> f. sp. <i>radicis-lycopersici</i> (Forl)</b>	<b>Résistance à <i>Fusarium oxysporum</i> f. sp. <i>radicis-lycopersici</i> (Forl)</b>	<b>Resistenz gegen <i>Fusarium oxysporum</i> f. sp. <i>radicis-lycopersici</i> (Forl)</b>	<b>Resistencia a <i>Fusarium oxysporum</i> f. sp. <i>radicis-lycopersici</i> (Forl)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Motelle	1
	present	présente	vorhanden	presente	Momor	9
<b>50.</b>	<b>VG</b>	<b>Resistance to <i>Fulvia fulva</i> (Ff) (ex <i>Cladosporium fulvum</i>)</b>	<b>Résistance à <i>Fulvia fulva</i> (Ff) (ex <i>Cladosporium fulvum</i>)</b>	<b>Resistenz gegen <i>Fulvia fulva</i> (Ff) (ex <i>Cladosporium fulvum</i>)</b>	<b>Resistencia a <i>Fulvia fulva</i> (Ff) (ex <i>Cladosporium fulvum</i>)</b>	
(+)						
<b>50.1</b>	<b>VG</b>	<b>– Race 0</b>	<b>– Pathotype 0</b>	<b>– Pathotyp 0</b>	<b>– Raza 0</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Angela, Estrella, Sonatine, Sonato, Vemone	9
<b>50.2</b>	<b>VG</b>	<b>– Group A</b>	<b>– Groupe A</b>	<b>– Gruppe A</b>	<b>– Grupo A</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Angela, Estrella, Sonatine, Sonato	9
<b>50.3</b>	<b>VG</b>	<b>– Group B</b>	<b>– Groupe B</b>	<b>– Gruppe B</b>	<b>– Grupo B</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Angela, Estrella, Sonatine, Sonato, Vemone	9
<b>50.4</b>	<b>VG</b>	<b>– Group C</b>	<b>– Groupe C</b>	<b>– Gruppe C</b>	<b>– Grupo C</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Angela, Estrella, Sonatine	9
<b>50.5</b>	<b>VG</b>	<b>– Group D</b>	<b>– Groupe D</b>	<b>– Gruppe D</b>	<b>– Grupo D</b>	
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Estrella, Sonatine, Vemone	9



	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>50.6</b>	<b>VG – Group E</b>	<b>– Groupe E</b>	<b>– Gruppe E</b>	<b>– Grupo E</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Jadviga, Rhianna, Sonatine	9
<b>51.</b>	<b>VG Resistance to (+) Tomato mosaic virus (ToMV)</b>	<b>Résistance au virus de la mosaïque de la tomate (ToMV)</b>	<b>Resistenz gegen das Tomatenmosaik- virus (ToMV)</b>	<b>Resistencia al virus del mosaico del tomate (ToMV)</b>		
<b>51.1</b>	<b>VG – Strain 0</b>	<b>– Souche 0</b>	<b>– Pathotyp 0</b>	<b>– Cepa 0</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Mobaci, Mocimor, Moperou	9
<b>51.2</b>	<b>VG – Strain 1</b>	<b>– Souche 1</b>	<b>– Pathotyp 1</b>	<b>– Cepa 1</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Mocimor, Moperou	9
<b>51.3</b>	<b>VG – Strain 2</b>	<b>– Souche 2</b>	<b>– Pathotyp 2</b>	<b>– Cepa 2</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Mobaci, Mocimor	9
<b>52.</b>	<b>VG Resistance to (+) <i>Phytophthora infestans</i> (Pi)</b>	<b>Résistance à <i>Phytophthora infestans</i> (Pi)</b>	<b>Resistenz gegen <i>Phytophthora infestans</i> (Pi)</b>	<b>Resistencia a <i>Phytophthora infestans</i> (Pi)</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Heinz 1706, Saint Pierre	1
	present	présente	vorhanden	presente	Fline, Heline, Pieraline, Pyros	9
<b>53.</b>	<b>VG Resistance to (+) <i>Pyrenochaeta lycopersici</i> (PI)</b>	<b>Résistance à <i>Pyrenochaeta lycopersici</i> (PI)</b>	<b>Resistenz gegen <i>Pyrenochaeta lycopersici</i> (PI)</b>	<b>Resistencia a <i>Pyrenochaeta lycopersici</i> (PI)</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Montfavet H 63.5	1
	present	présente	vorhanden	presente	Kyndia, Moboglan, Pyrella	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>54.</b>	<b>VG</b>	<b>Resistance to <i>Stemphylium</i> spp. (Ss)</b>	<b>Résistance à <i>Stemphylium</i> spp. (Ss)</b>	<b>Resistenz gegen <i>Stemphylium</i> spp. (Ss)</b>	<b>Resistencia a <i>Stemphylium</i> spp. (Ss)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Motelle	9
<b>55.</b>	<b>VG</b>	<b>Resistance to <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst)</b>	<b>Résistance à <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst)</b>	<b>Resistenz gegen <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst)</b>	<b>Resistencia a <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Monalbo	1
	present	présente	vorhanden	presente	Ontario 7710	9
<b>56.</b>	<b>VG</b>	<b>Resistance to <i>Ralstonia solanacearum</i> (Rs)</b>	<b>Résistance à <i>Ralstonia solanacearum</i> (Rs)</b>	<b>Resistenz gegen <i>Ralstonia solanacearum</i> (Rs)</b>	<b>Resistencia a <i>Ralstonia solanacearum</i> (Rs)</b>	
(+)						
	<b>- Race 1</b>	<b>- Pathotype 1</b>	<b>- Pathotyp 1</b>	<b>- Raza 1</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Floradel	1
	present	présente	vorhanden	presente	Caraiño	9
<b>57.</b>	<b>VG</b>	<b>Resistance to Tomato yellow leaf curl virus (TYLCV)</b>	<b>Résistance au virus des feuilles jaunes en cuillère de la tomate (TYLCV)</b>	<b>Resistenz gegen gelbes Tomatenblattrollvirus (TYLCV)</b>	<b>Resistencia al virus del rizado amarillo de la hoja del tomate (TYLCV)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Montfavet H 63.5	1
	present	présente	vorhanden	presente	Anastasia, Mohawk, TY 20	9
<b>58.</b>	<b>VG</b>	<b>Resistance to Tomato spotted wilt virus (TSWV)</b>	<b>Résistance au virus de la tache bronzée de la tomate (TSWV)</b>	<b>Resistenz gegen das Tomatenbronzenfleckenvirus (TSWV)</b>	<b>Resistencia al virus del bronceado del tomate (TSWV)</b>	
(+)						
	<b>- Race 0</b>	<b>- Pathotype 0</b>	<b>- Pathotyp 0</b>	<b>- Raza 1</b>		
<b>QL</b>	absent	absente	fehlend	ausente	Montfavet H 63.5	1
	present	présente	vorhanden	presente	Lisboa	9
<b>59.</b>	<b>VG</b>	<b>Resistance to <i>Leveillula taurica</i> (Lt)</b>	<b>Résistance à <i>Leveillula taurica</i> (Lt)</b>	<b>Resistenz gegen <i>Leveillula taurica</i> (Lt)</b>	<b>Resistencia a <i>Leveillula taurica</i> (Lt)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Montfavet H 63.5	1
	present	présente	vorhanden	presente	Atlanta	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>60.</b>	<b>VG</b>	<b>Resistance to <i>Oidium</i> <i>neolycopersici</i> (On) (ex <i>Oidium</i> <i>lycopersicum</i> (Ol))</b>	<b>Résistance à <i>Oidium</i> <i>neolycopersici</i> (On) (ex <i>Oidium</i> <i>lycopersicum</i> (Ol))</b>	<b>Resistenz gegen <i>Oidium</i> <i>neolycopersici</i> (On) (ex <i>Oidium</i> <i>lycopersicum</i> (Ol))</b>	<b>Resistencia a <i>Oidium</i> <i>neolycopersici</i> (On) (ex <i>Oidium</i> <i>lycopersicum</i> (Ol))</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Montfavet H 63.5	1
	present	présente	vorhanden	presente	Romiro	9
<b>61.</b>	<b>VG</b>	<b>Resistance to Tomato torrado virus (ToTV)</b>	<b>Résistance au virus tomato torrado (ToTV)</b>	<b>Resistenz gegen Tomato Torrado Virus (ToTV)</b>	<b>Resistencia al virus del torrado del tomate (ToTV)</b>	
(+)						
<b>QL</b>	absent	absente	fehlend	ausente	Daniela	1
	present	présente	vorhanden	presente	Matias	9

## 8. Explanations on the Table of Characteristics

### 8.1 *Explanations covering several characteristics*

Characteristics containing the following key in the second column of 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 before deterioration of the leaves.
- (b) Observations should be made on the plant before maturity (see Ad. 44).
- (c) Observations should be made on fruits at maturity (see Ad. 44) 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



1  
absent



9  
present

## Ad. 2: Plant: growth type

### Determinate (1):

This type produces a fix number of trusses on each stem. 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 inflorescence 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. 4. Stem: anthocyanin coloration

Most of the varieties are classed 1 to 5. Expression of anthocyanin is influenced by day temperature. Under greenhouse conditions, the variation is rather low.

## Ad. 5: Only varieties with plant growth type indeterminate: Stem: length of internode

The length of the internode should be observed/measured 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 1<sup>st</sup> and 4<sup>th</sup> trusses. 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 growth type indeterminate: Plant: height

The height of the plant should be measured 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 petiole).



3  
semi-erect



5  
horizontal



7  
semi-drooping



9  
drooping

Ad. 10: Leaf: type of blade

Pinnate leaf: primary leaflets do not bear secondary leaflets

Bipinnate leaf: primary leaflets again are pinnate, so they bear secondary leaflets



1  
pinnate



2  
bipinnate

Ad. 11: Leaf: size of leaflets

The size of leaflet should be observed in the middle of the leaf.

Ad. 13: Leaf: glossiness

The glossiness of the leaf should be observed in the middle of the plant.

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.

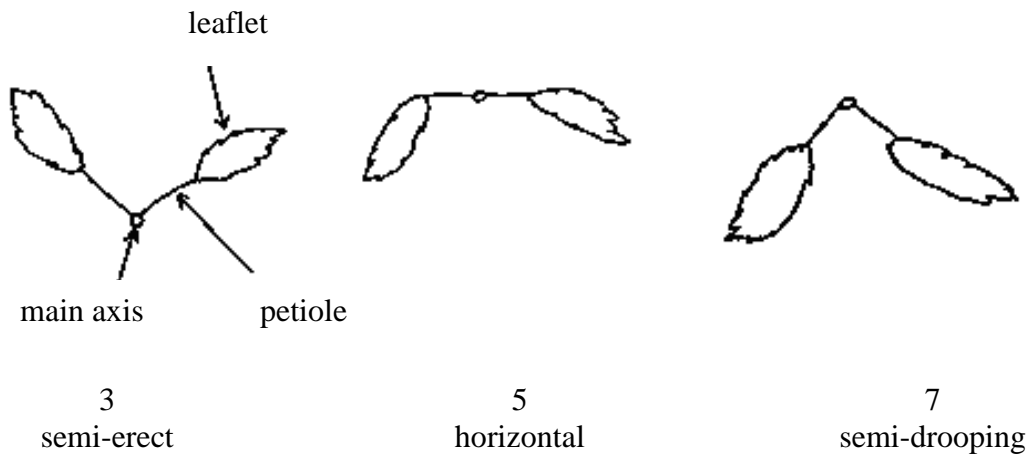


blistering



creasing

Ad. 15: Leaf: attitude of petiole of leaflet in relation to main axis



The attitude should be observed in the middle third of the plant.



Ad. 16: Inflorescence: type

The number of uniparous and multiparous trusses on the second and third truss of 10 plants should be counted. When the ratio of uniparous to multiparous is 40-60 percent, the expression of the characteristic should correspond to note "2".



uniparous

multiparous (biparous)



multiparous (triparous)

Ad. 18: Flower: pubescence of style

Some varieties with pubescence of style "present" may have only rare and small hairs at the base of the style

Ad. 19: Peduncle: abscission layer



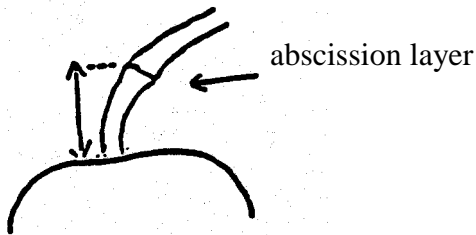
1  
absent



9  
present

Varieties which have only a collar instead of an abscission layer are heterozygous for the gene which controls the presence of the joint. These varieties are considered jointless and the abscission layer is considered absent.

Ad. 20: Only varieties with peduncle abscission layer present: Pedicel: length



Ad. 21: Fruit: green shoulder (before maturity)

The gene for green shoulder might not be clearly expressed in some conditions, which is why it is important to have the example variety 'Daniela' to observe the expression of these characteristics.



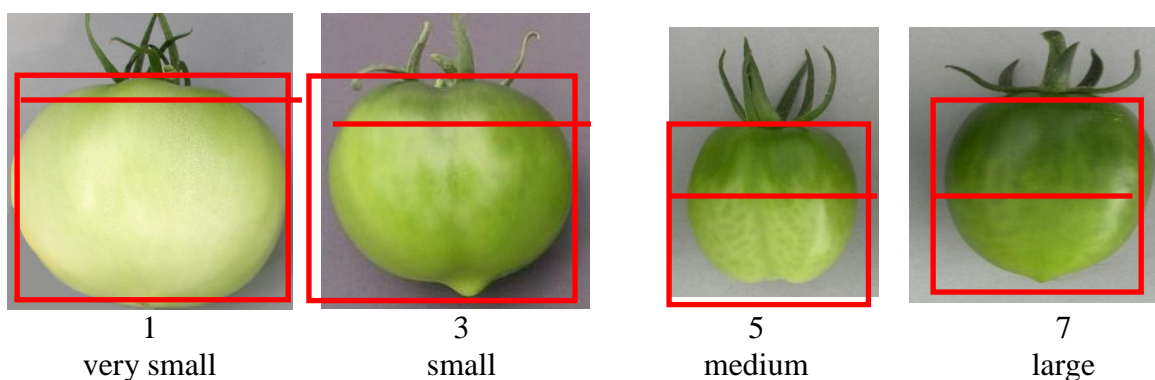
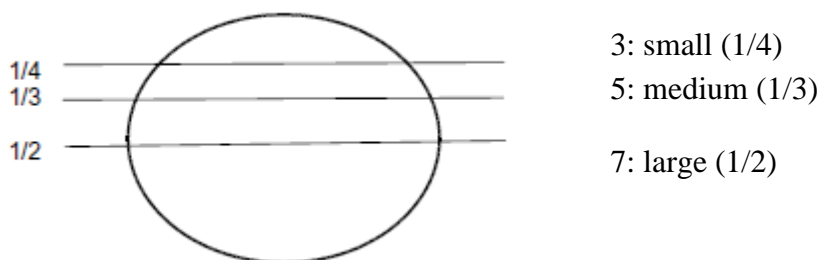
1  
absent



9  
present

Ad. 22: Fruit: extent of green shoulder (before maturity)

The gene for green shoulder might not be clearly expressed in some conditions, which is why it is important to have the example variety 'Daniela' to observe the expression of these characteristics.



Ad. 23: Fruit: intensity of green color of shoulder (before maturity)

Ad. 24: Fruit: intensity of green color excluding shoulder (before maturity)

Intensity of green color of shoulder and intensity of green color excluding shoulder have to be observed on the same scale. This means that the note for intensity of green color of shoulder should be higher than the note for intensity of green color excluding shoulder, or in exceptional cases the same if the difference in intensity is very small. The gene for green shoulder might not be clearly expressed in some conditions, which is why it is important to have the example variety 'Daniela' to observe the expression of these characteristics.

Ad. 25: Fruit: green stripes (before maturity)

The green stripes should be observed before maturity, *excluding* the green shoulder.








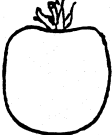
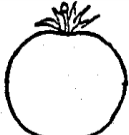
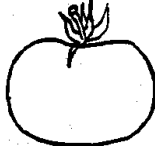



1  
absent



9  
present

Ad. 28: Fruit: shape in longitudinal section

		← broadest part →				
		(below middle)	at middle	(above middle)		
narrow (elongated) → width (ratio length/width) ← broad (compressed)	 10 pyriform	 8 ovate	 (parallel) 5 cylindrical	 (rounded) 6 elliptic	 9 obovate	 7 cordate
	 11 obcordate	 (parallel) 4 oblong	 (rounded) 3 circular			
			 2 oblate			
			 1 flattened			

The apex is considered to be the part that is farthest from the peduncle end.

Ad. 29: Fruit: ribbing at peduncle end



1  
absent or very weak

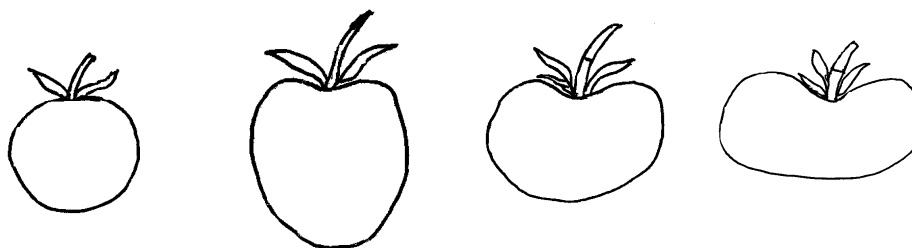
3  
weak

5  
medium

7  
strong

9  
very strong

Ad. 30: Fruit: depression at peduncle end



1  
absent or  
very weak

3  
weak

5  
medium

7  
strong

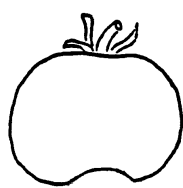
Ad. 31: Fruit: size of peduncle scar

The size of the peduncle scar has to be observed as an absolute characteristic, i.e. irrespective of the size of the fruit. The peduncle should be removed and the green ring observed (not the full scar).

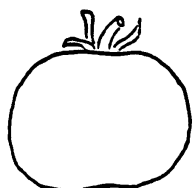
Ad. 32: Fruit: size of blossom scar

The size of the blossom scar has to be observed as an absolute characteristic, i.e. irrespective of the size of the fruit.

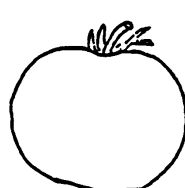
Ad. 33: Fruit: shape at blossom end



1  
indented



2  
indented to flat



3  
flat



4  
flat to  
pointed



5  
pointed



1  
indented

3  
flat

5  
pointed

Ad. 34: Fruit: diameter of core in cross section (in relation to total diameter)



1  
very small



3  
small



5  
medium



7  
large



9  
very large

Ad. 35: Fruit: thickness of pericarp

The absolute thickness of the pericarp should be observed, i.e. irrespective of the size of the fruit.

Ad. 36: Fruit: number of locules

This characteristic is assessed by making cross sections of representative shaped and sized fruits but excluding the first and last fruits from the truss.



1  
only two



2  
two and three



3  
three and four



4  
four, five or six



5  
more than six

Ad. 37: Fruit: color (at maturity)

The color at maturity has to be observed after a full change of color, when placenta is found clearly in the cross section.



Ad. 38: Fruit: color of flesh (at maturity)

The color of flesh should be observed at maturity (see Ad. 44).

Ad. 40: Fruit: color of epidermis

The color of the epidermis should be observed after the epidermis has been peeled off the fruit.

Ad. 41: Fruit: firmness

Method

Harvesting stage: fruits should be harvested when they are completely coloured.

Determining firmness: determine by hand the firmness of the fruits compared to the standard varieties.

Ad. 42: Fruit: shelf-life

The length of shelf life is estimated by the number of weeks that the fruit remains commercially viable on the shelf.

Twenty fruits per plot (2 per plant) are picked from the 4th, 5th or 6th cluster in similar stages of exterior ripening (when green color disappears in half of whole fruit). Fruits are stored in boxes in single layers. The boxes can be stored one on top on another if they permit the air to circulate between them. The storage place does not need to be climatically controlled, but must have similar conditions to those in which the trial was performed, but not in direct sunshine. An observation is made every 7 days, noting the firmness of fruits, taking care not to damage them, and removing those accidentally damaged or rotten. The observation is made to determine when the firmness of fruits becomes no longer commercially viable (the firmness is lower than or equal to Note 3 “soft” in characteristics 40). The length of shelf life is calculated by the number of weeks between picking of fruits and the time that the firmness becomes no longer commercially viable.

The observations can be completed in the 8th week if some varieties still remain.

Ad. 43: Time of flowering

For staked varieties, this characteristic is assessed by observing the flowering date of the third flower on the second [and third] 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 vigor and the plantation quality.

The date of flowering is recorded by the plot average, truss by truss.

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 plants, this characteristic cannot be easily observed due to the branching of the plant.

#### Ad. 44: Time of maturity

This characteristic is assessed by observing the date of maturity of the first fully ripe fruit on the second truss, plant by plant. It is recommended not to record the time of maturity on the first truss, as the expression on the first truss is more influenced by the seed vigor and the plantation quality.

The date of maturity is recorded by the plot average, truss by truss.

This characteristic can be observed as described on all types of tomato varieties, irrespective whether the plants are staked or non-staked.

#### Ad. 45: Sensitivity to silvering

##### Method:

Evaluation: Evaluation is done on fully-grown plants

Execution of test: As silvering only occurs under specific growing conditions, these conditions have to be present during growth

Sowing: Under short day conditions (November/December in Northern Europe). Normal planting in the soil or in an artificial medium in the greenhouse

Temperature: day temperature maximum 18°C

Light: normal daylight

Growing method: no special method necessary

Duration of test: 4 - 5 months

Number of plants tested: minimum of 20

Observation of the expression: A visual survey has to be made on the presence of leaves that show signs of silvering

Standard varieties: expression absent: Marathon, Sano  
expression present: Sonatine

It is to be noted that this characteristic may not be observable under “sunny” climates

Ad. 46: Resistance to *Meloidogyne incognita* (Mi)

- |   |   |
|---|---|
| 1. Pathogen .....   | <i>Meloidogyne incognita</i>  |
| 3. Host species .....   | <i>Solanum lycopersicum</i>   |
| 4. Source of inoculum .....   | Naktuinbouw <sup>1</sup> (NL) or GEVES <sup>2</sup> (FR)  |
| 5. Isolate .....  | non-resistance breaking   |
| 6. Establishment isolate identity .....   | use rootstock or tomato standards   |
| 7. Establishment pathogenicity .....  | use susceptible rootstock or tomato standard  |
| 8. Multiplication inoculum  |   |
| 8.1 Multiplication medium .....   | living plant  |
| 8.2 Multiplication variety .....  | preferably resistant to powdery mildew  |
| 8.3 Plant stage at inoculation.....   | see 10.3  |
| 8.5 Inoculation method.....   | see 10.4  |
| 8.6 Harvest of inoculum.....  | root systems are cut with scissors into pieces of about 1 cm length   |
| 8.7 Check of harvested inoculum .....   | visual check for presence of root knots   |
| 8.8 Shelf life/viability inoculum.....  | 1 day   |
| 9. Format of the test   |   |
| 9.1 Number of plants per genotype ....  | 20 plants   |
| 9.2 Number of replicates .....  | 1 replicate   |
| 9.3 Control varieties   |   |
| Susceptible .....   | Clairvil, Casaque Rouge   |
| Moderately resistant .....  | Campeon, Madyta, Vinchy   |
| Highly resistant .....  | Anabel, Anahu, Anahu x Casaque Rouge  |
| 9.4 Test design .....   | include standard varieties  |
| 9.5 Test facility .....   | greenhouse or climate room  |
| 9.6 Temperature .....   | not over 28° C  |
| 9.7 Light .....   | at least 12 h per day   |
| 10. Inoculation   |   |
| 10.1 Preparation inoculum .....   | small pieces of diseased root mixed with soil mix soil and infested root pieces                                       |
| 10.2 Quantification inoculum.....   | soil: root ratio = 8:1, or depending on experience  |
| 10.3 Plant stage at inoculation .....   | seed, or cotyledons   |
| 10.4 Inoculation method .....   | plants are sown in infested soil or contamination of soil after sowing when plantlets are at cotyledon stage          |
| 10.7 Final observations .....   | 28 to 45 days after inoculation   |
| 11. Observations  |   |
| 11.1 Method .....   | root inspection   |
| 11.2 Observation scale .....  | symptoms:<br>galling, root malformation,<br>growth reduction, plant death   |
| 11.3 Validation of test .....   | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls on standards |
| 12. Interpretation of test results in comparison with control varieties:  |   |
| To consider that resistant varieties may have a few plants with a few galls. These are not considered as off-types. |   |
| absent (susceptible) .....  | [1] growth strongly reduced, high gall count  |
| intermediate<br>(moderately resistant).....   | [2] medium growth reduction, medium gall count  |
| present (highly resistant).....   | [3] present; no growth reduction, no galls  |
| 13. Critical control points:  |   |
| Avoid rotting of roots; high temperature causes breakdown of resistance.  |   |

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Ad. 47: Resistance to *Verticillium* sp. (Va and Vd)

1. Pathogen ..... *Verticillium dahliae* or *Verticillium albo-atrum*  
3. Host species ..... *Solanum lycopersicum*  
4. Source of inoculum ..... Naktuinbouw<sup>3</sup> (NL) and GEVES<sup>4</sup> (FR)  
5. Isolate ..... Race 0 (e.g. strain Toreilles 4-1-4-1)  
8. Multiplication inoculum  
8.1 Multiplication medium ..... Potato Dextrose Agar, Agar Medium “S” of Messiaen  
8.4 Inoculation medium ..... water (for scraping agar plates) or Czapek Dox broth  
(3-7 d-old aerated culture at 20-25°C, in darkness)  
8.6 Harvest of inoculum ..... filter through double muslin cloth  
8.7 Check of harvested inoculums . spore count; adjust to 10<sup>6</sup> per ml  
8.8 Shelf life/viability inoculums ... 1 d at 4°C  
9. Format of the test  
9.1 Number of plants per genotype 35 seeds for 24 plants  
9.2 Number of replicates ..... 1 replicate  
9.3 Control varieties  
Susceptible ..... Flix, Marmande verte, Clarion, Santonio, Anabel  
Resistant ..... Monalbo, Elias, Monalbo x Marmande verte, Daniela,  
Marmande VR  
9.4 Test design ..... 20 plants inoculated at least, 2 blanks at least  
9.5 Test facility ..... greenhouse or climate room  
9.6 Temperature ..... optimal 20-25°C, 20-22°C after inoculation  
9.7 Light ..... 12 h or longer  
10. Inoculation  
10.1 Preparation inoculums ..... aerated, liquid culture (8.4)  
10.2 Quantification inoculums ..... count spores, adjust to 10<sup>6</sup> per ml  
10.3 Plant stage at inoculation ..... cotyledon to 3rd leaf  
10.4 Inoculation method ..... roots are immersed for 4 to 15 min in spore suspension.  
10.7 Final observations ..... 14-33 d after inoculation  
11. Observations  
11.1 Method ..... visual  
11.2 Observation scale ..... growth retardation, wilting, chlorosis, and vessel  
browning  
11.3 Validation of test ..... evaluation of variety resistance should be calibrated with  
results of resistant and susceptible controls.  
12. Interpretation of test results in comparison with control varieties  
absent ..... [1] severe symptoms  
present ..... [9] no or mild symptoms  
13. Critical control points:  
All symptoms may be present in resistant varieties, but the severity will be distinctly less than  
in susceptible varieties. Usually resistant varieties will show significantly less growth  
retardation than susceptible varieties.

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Ad. 48: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)

1. Pathogen ..... *Fusarium oxysporum* f. sp. *lycopersici*
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... Naktuinbouw<sup>5</sup> (NL) and GEVES<sup>6</sup> (FR)
5. Isolate ..... Race 0 (ex 1) (e.g. strains Orange 71 or PRI 20698 or Fol 071 1 (ex 2) (e.g. strains 4152 or PRI40698 or RAF 70 and 2 (ex 3)  
individual strains may vary in pathogenicity
6. Establishment isolate identity..... use differential varieties (see 9.3)
7. Establishment pathogenicity ..... on susceptible tomato varieties
8. Multiplication inoculum
- 8.1 Multiplication medium ..... Potato Dextrose Agar, Medium “S” of Messiaen
- 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... spore count; adjust to 10<sup>6</sup> per ml
- 8.8 Shelf-life/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
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties for the test with race 0 (ex 1)
- Susceptible ..... Marmande, Marmande verte, Resal
- Resistant for race 0 only ..... Marporum, Larissa, “Marporum x Marmande verte”, Marsol, Anabel
- Resistant for race 0 and 1 ..... Motelle, Gourmet, Mohawk
- Control varieties for the test with race 1 (ex 2)
- Susceptible ..... Marmande verte, Cherry Belle, Roma
- Resistant for race 0 only ..... Marporum, Ranco
- Resistant for race 0 and 1 ..... Tradiro, Odisea
- Remark: ..... Ranco is slightly less resistant than Tradiro
- Control varieties for the test with race 2 (ex 3)
- Susceptible for race 0, 1 and 2 ..... Marmande verte, Motelle, Marporum
- Resistant for race 0, 1 and 2 ..... Tributes, Murdoch, Marmande verte x Florida
- 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)  
20-24°C (mild test, with severe isolate)
- 9.7 Light ..... 12 hours per day or longer
- 9.8 Season..... all seasons
- 9.9 Special measures ..... slightly acidic peat soil is optimal;  
keep soil humid but avoid water stress

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<sup>6</sup> GEVES; [Valerie.GRIMAULT@geves.fr](mailto:Valerie.GRIMAULT@geves.fr)

## 10. Inoculation

10.1 Preparation inoculums..... aerated Messiaen or PDA or Agar Medium S of Messiaen or

Czapek Dox culture or scraping of plates

10.2 Quantification inoculums ..... pore count, adjust to  $10^6$  spores per ml, lower concentration for a very aggressive isolate

10.3 Plant stage at inoculation..... 10-18 d, cotyledon to first leaf

10.4 Inoculation method..... roots and hypocotyls are immersed in spore suspension for 5-15 min; trimming of roots is an option

10.7 Final observations ..... 14-21 days after inoculation

## 11. Observations

11.1 Method ..... visual

11.2 Observation scale ..... symptoms:  
growth retardation, wilting, yellowing,  
vessel browning extending above cotyledon

11.3 Validation of test..... evaluation of variety resistance should be calibrated with results of resistant and susceptible controls. Standards near borderline R/S will help to compare between labs.

## 12. Interpretation of test results in comparison with control varieties

absent..... [1] severe symptoms

present ..... [9] mild or no symptoms

## 13. Critical control points

Test results may vary slightly in inoculum pressure due to differences in isolate, spore concentration, soil humidity and temperature.

Ad. 49: Resistance to *Fusarium oxysporum* f. sp. *radicis-lycopersici* (Forl)

1. Pathogen ..... *Fusarium oxysporum* f. sp. *radicis-lycopersici*  
 3. Host species..... *Solanum lycopersicum*  
 4. Source of inoculum ..... Naktuinbouw<sup>7</sup> (NL) and GEVES<sup>8</sup> (FR)  
 5. Isolate  
 7. Establishment pathogenicity..... symptoms on susceptible tomato Multiplication inoculum  
 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 10<sup>6</sup> per ml  
 8.8 Shelf life/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  
 9.2 Number of replicates ..... 1 replicate  
 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 10<sup>6</sup> 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 pinpoint and necrotic lesions on  
 stems  
 11.3 Validation of test ..... evaluation of variety resistance should be calibrated with  
 results of resistant and susceptible controls  
 12. Interpretation of test results in comparison with control varieties  
 absent..... [1] symptoms  
 present ..... [9] no symptoms  
 13. Critical control points:  
 Temperature should never exceed 27°C during the test period; frequent renewal of races may be  
 needed because of loss of pathogenicity

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Ad. 50: Resistance to *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)

1. Pathogen..... *Fulvia fulva* (ex *Cladosporium fulvum*)
3. Host species..... *Solanum lycopersicum*
4. Source of inoculum ..... Naktuinbouw<sup>9</sup> (NL) or GEVES<sup>10</sup> (FR)
5. Isolate ..... Race group 0, A, B, C, D, and E
6. Establishment isolate identity..... with genetically defined differentials from GEVES (FR)  
A breaks Cf-2, B Cf-4, C Cf-2&4, D Cf-5, E Cf-2&4&5
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 Shelf life/viability inoculum..... 4 hours, keep cool
9. Format of the test
- 9.1 Number of plants per genotype ..... more than 20 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Monalbo, Moneymaker
- Resistant for race 0..... Angela, Estrella, Sonatine, Sonato, Vemone, Vagabond,  
IVT 1149, Vagabond × IVT 1149, IVT 1154
- Resistant for race group A ..... Angela, Estrella, Sonatine, Sonato
- Resistant for race group B ..... Angela, Estrella, Sonatine, Sonato, Vemone
- Resistant for race group C ..... Angela, Estrella, Sonatine
- Resistant for race group D ..... Estrella, Sonatine, Vemone
- Resistant for race group E ..... Sonatine, Jadviga, Rhianna, IVT 1154
- 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
- 9.9 Special measures ..... depending on facility and weather, there may be a need to raise the humidity  
e.g. humidity tent closed 3-4 days after inoculation and after this, 66% until 80% closed during 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 10<sup>5</sup> 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
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 test results in comparison with control varieties
- absent..... [1] symptoms
- present..... [9] no symptoms
- Excessively high humidity may cause rugged brown spot on all leaves. These are not to be considered as off-types.
13. Critical control points:  
Ff spores have a variable size and morphology. Small spores are also viable.  
Fungal plates will gradually become sterile after 6-10 weeks. Store good culture at -80°C.  
For practical purposes, it is not possible to keep plants longer than 14 days inside a tent.

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<sup>10</sup> GEVES; Valerie.GRIMAULT@geves.fr



### Ad. 51: Resistance to Tomato mosaic virus (ToMV)

1. Pathogen.....	Tomato mosaic virus
3. Host species .....	<i>Solanum lycopersicum</i>
4. Source of inoculum .....	Naktuinbouw <sup>11</sup> (NL) or GEVES <sup>12</sup> (FR)
5. Isolate.....	Strain 0 (e.g. isolate INRA Avignon 6-5-1-1) 1 and 2
6. Establishment isolate identity .....	genetically defined tomato standards Mobaci (Tm1), Moperou (Tm2), Momor (Tm2 <sup>2</sup> )
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 <i>Nicotiana tabacum</i> “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 plants
9.2 Number of replicates.....	1 replicate
9.3 Control varieties	
Susceptible .....	Marmande, Monalbo
Resistant for ToMV: 0 and 2.....	Mobaci
Resistant for ToMV: 0 and 1 .....	Moperou
Resistant with necrosis.....	“Monalbo x Momor”
Resistant.....	Gourmet
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/30ml)
10.3 Plant stage at inoculation .....	cotyledons or 2 leaves
10.4 Inoculation method .....	gentle rubbing
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
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 test results in comparison with control varieties	
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

Note: Strain INRA Avignon 6-5-1-1 is recommended for ToMV: 0. This strain causes a striking yellow Aucuba mosaic.

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Ad. 52: Resistance to *Phytophthora infestans* (Pi)

- |   |  |
|---|--|
| 1. Pathogen .....   | <i>Phytophthora infestans</i>  |
| 3. Host species .....   | <i>Solanum lycopersicum</i>  |
| 4. Source of inoculum .....   | -  |
| 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 Shelf life/viability inoculum .....                                 | 4 h after chilling at 8-10°C   |
| 9. Format of the test   |  |
| 9.1 Number of plants per genotype ..                                    | 20 plants  |
| 9.2 Number of replicates .....  | 1 replicate  |
| 9.3 Control varieties   |  |
| Susceptible .....   | Saint Pierre, Heinz 1706   |
| Resistant .....   | Pieraline, Heline, Pyros, “Pieraline x Pieralbo”, Fline  |
| Remark .....  | heterozygote varieties may have a slightly lower level of expression of resistance.                      |
| 9.5 Test facility .....   | glasshouse   |
| 9.6 Temperature .....   | 18°C   |
| 9.7 Light .....   | after inoculation darkness during 24 hours, thereafter 10 hour darkness per 24 hours                     |
| 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<br>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 10 <sup>4</sup> 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 |
| 12. Interpretation of test results in comparison with control varieties |  |
| absent .....  | [1] severe symptoms  |
| present .....   | [9] no or mild symptoms  |
| 13. Critical control points:  |  |
| Resistance is only well-expressed in the adult plant.                   |  |

Ad. 53: Resistance to *Pyrenochaeta lycopersici* (Pl)

- |   |  |
|---|--|
| 1. Pathogen .....   | <i>Pyrenochaeta lycopersici</i>  |
| 3. Host species.....  | <i>Solanum lycopersicum</i>  |
| 4. Source of inoculum .....   | -  |
| 5. Isolate .....  | -  |
| 7. Establishment pathogenicity.....                                     | biotest  |
| 8. Multiplication inoculum  |  |
| 8.1 Multiplication medium .....   | V8 Agar  |
| 8.2 Multiplication variety .....  | susceptible tomato variety   |
| 8.3 Plant stage at inoculation.....                                     | seed   |
| 8.4 Inoculation medium.....   | mixture of soil, e.g. (70%), sand (20%) and inoculum (10.1) (10%) or soil mixed with diseased roots cut to small pieces                      |
| 8.5 Inoculation method.....   | sowing, or transplanting at fruit maturity   |
| 8.6 Harvest of inoculum .....   | diseased roots are harvested after 2-4 months  |
| 8.7 Check of harvested inoculum .....                                   | visual inspection of lesions on roots  |
| 8.8 Shelf-life/viability inoculum .....                                 | the fungus will not die quickly, but may lose its pathogenicity within a week after isolation on an agar medium                              |
| 9. Format of the test   |  |
| 9.1 Number of plants per genotype ..                                    | 20 plants  |
| 9.2 Number of replicates .....  | 1 replicate  |
| 9.3 Control varieties   |  |
| Susceptible .....   | Montfavet H 63.5   |
| Resistant .....   | Kyndia, Moboglan, Pyrella  |
| 9.5 Test facility.....  | greenhouse or climate cell   |
| 9.6 Temperature.....  | day 24°C, night 14°C   |
| 9.7 Light .....   | 12 h minimum   |
| 10. Inoculation   |  |
| 10.1 Preparation inoculum .....   | e.g. double-autoclaved mixture of soil with 10% oatmeal added e.g. Incubate for 10-14 d at 20°C with occasional, repeated turning            |
| 10.3 Plant stage at inoculation.....                                    | 6 weeks  |
| 10.4 Inoculation method.....  | transplanting into mixture of soil, sand and inoculum (8.4) or soil mixed with diseased roots cut to small pieces or naturally infected soil |
| 10.7 Final observations.....  | 6-8 weeks after transplanting (flowering plant)  |
| 11. Observations  |  |
| 11.1 Method .....   | visual   |
| 11.2 Observation scale .....  | symptoms: brown lesions on roots   |
| 11.3 Validation of test .....   | evaluation of variety resistance should be calibrated with results of resistant and susceptible controls                                     |
| 12. Interpretation of test results in comparison with control varieties |  |
| absent .....  | [1] symptoms   |
| present.....  | [9] no symptoms  |
| 13. Critical control points:  |  |
- The fungus loses its pathogenicity quickly after isolation on an agar medium. It is advisable to keep the isolate alive on living plants.

Ad. 54: Resistance to *Stemphylium* spp. (Ss)

1. Pathogen ..... *Stemphylium* spp. e.g. *Stemphylium solani*  
3. Host species ..... *Solanum lycopersicum*  
4. Source of inoculum ..... GEVES<sup>13</sup> (FR)  
5. Isolate ..... -  
7. Establishment pathogenicity ..... biotest  
8. Multiplication inoculum  
8.1 Multiplication medium ..... PDA (12 hours per day under near-ultraviolet light to induce sporulation) or V8  
9. Format of the test  
9.1 Number of plants per genotype at least 20 plants  
9.2 Number of replicates ..... 1 replicate  
9.3 Control varieties  
Susceptible ..... Monalbo  
Resistant ..... Motelle, F1 Motelle x Monalbo  
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% 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 Tween  
The spore suspension is sieved through a double layer of muslin.  
10.2 Quantification inoculum .....  $5.10^3 - 10^5$  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 ..... symptoms:  
necrotic lesions on cotyledons and leaves;  
yellowing of leaves  
11.3 Validation of test ..... evaluation of variety resistance should be calibrated with results of resistant and susceptible controls  
12. Interpretation of test results in comparison with control varieties  
absent [1] symptoms (11.2)  
present [9] no symptoms, or less than resistant standard  
13. Critical control points:  
8.1 and 10.1

Note: 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*.

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Ad. 55: Resistance to *Pseudomonas syringae* pv. *tomato* (Pst)

1. Pathogen ..... *Pseudomonas syringae* pv. *tomato*
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... GEVES<sup>14</sup> (FR) or Naktuinbouw<sup>15</sup> (NL)
5. Isolate
6. Establishment isolate identity
7. Establishment pathogenicity ..... biotest
8. Multiplication inoculum
- 8.1 Multiplication medium ..... King's B agar medium, darkness
- 8.2 Multiplication variety ..... susceptible variety
- 8.4 Inoculation medium ..... water
- 8.8 Shelf life/viability inoculum ..... plates become old after 10 days
9. Format of the test
- 9.1 Number of plants per genotype at least 20 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Monalbo
- Resistant ..... Ontario 7710, "Monalbo x Ontario 7710", Tradiro, Hypeel 45
- 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. Plate should be less than 2-4 days old.
- 10.2 Quantification inoculum ..... dilution plating, density 10<sup>6</sup> 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 < 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 test results in comparison with control varieties
- absent ..... [1] bacterial speck
- present ..... [9] no symptoms or pinpoint lesions
13. Critical control points:  
Strains may lose virulence in storage

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<sup>14</sup> GEVES; Valerie.GRIMAULT@geves.fr

<sup>15</sup> Naktuinbouw; resistentie@naktuinbouw.nl

Ad. 56: Resistance to *Ralstonia solanacearum*, race 1 (Rs)

1. Pathogen ..... *Ralstonia solanacearum* (ex *Pseudomonas solanacearum*)
2. Quarantine status ..... yes
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum
5. Isolate ..... 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 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Floradel
- Resistant ..... Caraibo
- 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 ..... density  $10^7$  colony forming units per ml
- 10.3 Plant stage at inoculation ..... three to four well-developed leaves (3 weeks)
- 10.4 Inoculation method
- 10.7 Final observations ..... 3 weeks after inoculation
11. Observations ..... in intermediate resistance 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 test results in comparison with control varieties
- absent ..... [1] symptoms
- present ..... [9] no symptoms, or less than resistant standard
13. Critical control points:  
*Ralstonia solanacearum* has a quarantine status in some countries and is on the EPPO alert list.

Ad. 57: Resistance to Tomato yellow leaf curl virus (TYLCV)

- 1. Pathogen ..... Tomato yellow leaf curl virus
- 2. Quarantine status ..... yes
- 3. Host species ..... *Solanum lycopersicum*
- 4. Source of inoculum ..... -
- 5. Isolate ..... -
- 8. Multiplication inoculum
- 8.6 Harvest of inoculum ..... symptomatic leaves may be stored at -70°C
- 9. Format of the test
- 9.1 Number of plants per genotype 20 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Montfavet H 63.5
- Resistant ..... TY 20, Anastasia, Mohawk
- 9.5 Test facility ..... field with natural disease pressure
- 9.9 Special measures ..... prevent spread of white-flies
- 10. Inoculation
- 10.3 Plant stage at inoculation ..... 6-12 weeks (adult plants)
- 10.4 Inoculation method ..... vector (Bemisia white-flies carrying TYLCV)
- 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 test results in comparison with control varieties
  - 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 is on the EPPO alert list. Some TYLCV resistant varieties may be susceptible to the closely related virus Tomato yellow leaf curl Sardinia virus (TYLCSV).

Ad. 58: Resistance to Tomato spotted wilt virus (TSWV)

1. Pathogen ..... Tomato spotted wilt virus
2. Quarantine status ..... yes (see note below)
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... Naktuinbouw<sup>16</sup> (NL), GEVES<sup>17</sup> (FR)
5. Isolate ..... race 0, preferably a thrips-transmission deficient variant
7. Establishment pathogenicity ..... biotest
8. Multiplication inoculum
- 8.6 Harvest of inoculum ..... symptomatic leaves may be stored at -70°C
9. Format of the test
- 9.1 Number of plants per genotype 20 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Monalbo, Momor, Montfavet H 63.5
- Resistant ..... Tsunami, Bodar, Mospomor, Lisboa
- 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 carborundum on cotyledons, inoculum suspension < 10° C
- 10.7 Final observations ..... 7-21 days after inoculation
11. Observations
- 11.1 Method ..... visual
- 11.2 Observation scale ..... symptoms: top mosaic, bronzing, various malformations, necrosis
- 11.3 Validation of test ..... evaluation of variety resistance should be calibrated with results of resistant and susceptible controls
12. Interpretation of test results in comparison with control varieties
- absent ..... [1] symptoms
- present ..... [9] no symptoms
13. Critical control points:  
TSWV has a quarantine status in some countries. 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.

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<sup>17</sup> GEVES; Valerie.GRIMAULT@geves.fr



Ad. 59: Resistance to *Leveillula taurica* (Lt)

1. Pathogen ..... *Leveillula taurica*
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... no long term storage method is available
5. Isolate
8. Multiplication inoculum
- 8.1 Multiplication medium ..... detached leaves of a susceptible host plant
9. Format of the test
- 9.1 Number of plants per genotype 20 plants
- 9.2 Number of replicates ..... 1 replicate
- 9.3 Control varieties
- Susceptible ..... Monalbo, Montfavet H 63.5
- Resistant ..... Atlanta
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 harvest
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 test results in comparison with control varieties
  - absent ..... [1] symptoms
  - present ..... [9] no symptoms, or less than resistant standard
13. Critical control points:  
Check cleistothecia under microscope to confirm presence of *Leveillula* and not another powdery mildew.

Ad. 60: Resistance to *Oidium neolyopersici* (On)

- |   |  |
|---|--|
| 1. Pathogen .....   | <i>Oidium neolyopersici</i> (Powdery mildew)   |
| 3. Host species .....   | <i>Solanum lycopersicum</i>  |
| 4. Source of inoculum .....   |  |
| 5. Isolate .....  | see remark under 13  |
| 7. Establishment pathogenicity .....                                    | biotest  |
| 8. Multiplication inoculum  |  |
| 8.1 Multiplication medium .....   | plant  |
| 8.3 Plant stage at inoculation .....                                    | 3 weeks  |
| 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 plants  |
| 9.2 Number of replicates .....  | 1 replicate  |
| 9.3 Control varieties   |  |
| Susceptible .....   | Momor, Montfavet H 63.5  |
| Resistant .....   | Atlanta, 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 .....                                      | 10 <sup>4</sup> 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 test results in comparison with control varieties |  |
| 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. neolyopersici* 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. neolyopersici* exist.

Ad. 61: Resistance to Tomato torrado virus (ToTV)

1. Pathogen ..... Tomato torrado virus
2. Quarantine status ..... in regions with temperate climate
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... -
5. Isolate ..... -
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 plants
  - 9.2 Number of replicates ..... 1 replicate
  - 9.3 Control varieties
    - Susceptible ..... Daniela
    - Resistant tomato ..... 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 test results in comparison with control varieties
  - 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

Note: Patents pending on part of the method: WO2006/085749 and WO2008/150158 and equivalents. Use solely for DUS purposes and for the development of variety descriptions by UPOV and authorities of UPOV members, courtesy to De Ruiter Seeds R&D B.V./Monsanto Invest N.V.

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10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
		Application date: (not to be filled in by the applicant)
<b>TECHNICAL QUESTIONNAIRE</b> to be completed in connection with an application for plant breeders' rights		
1. Subject of the Technical Questionnaire		
1.1 Botanical name	<input type="text" value="Solanum lycopersicum L."/>	
1.2 Common name	<input type="text" value="Tomato"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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#4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

- (i) Inbred line
- (ii) Hybrid
- (iii) Open-pollinated variety
- (iv) Other (provide details)

Variety resulting from:

4.1.1 Crossing

- (a) controlled cross   
(please state parent varieties)

(.....) x (.....)  
female parent male parent

- (b) partially known cross   
(please state known parent variety(ies))

(.....) x (.....)  
female parent male parent

- (c) unknown cross

- 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)

.....

# Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE

Page {x} of {y}

Reference Number:

#### 4.2 Method of propagating the variety

##### 4.2.1 Seed-propagated varieties

- (a) Self-pollination [ ]
- (b) Cross-pollination [ ]
- (i) population [ ]
- (ii) synthetic variety [ ]
- (c) Hybrid [ ]
- (d) Other [ ]
- (please provide details)

##### 4.2.2 Vegetatively propagated varieties

- (a) cuttings [ ]
- (b) *in vitro* propagation [ ]
- (c) other (state method) [ ]

- 4.2.3 Other [ ]
- (please provide details)



TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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
<b>5.1 Plant: growth type</b> (2)		
determinate	Campbell 1327, Prisca	1 [ ]
indeterminate	Marmande VR, Saint-Pierre, San Marzano 2	2 [ ]
<b>5.2 Leaf: type of blade</b> (10)		
pinnate	Mikado, Pilot, Red Jacket	1 [ ]
bipinnate	Lukullus, Saint-Pierre	2 [ ]
<b>5.3 Peduncle: abscission layer</b> (19)		
absent	Aledo, Bandera, Count, Lerica	1 [ ]
present	Montfavet H 63.5, Roma	9 [ ]
<b>5.4 Fruit: green shoulder (before maturity)</b> (21)		
absent	Felicia, Rio Grande, Trust	1 [ ]
present	Daniela, Montfavet H 63.5	9 [ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
Characteristics	Example Varieties	Note
<b>5.5 Fruit: size (26)</b>		
very small	Cerise, Sweet 100	1 [ ]
very small to small		2 [ ]
small	Early Mech, Europeel, Roma	3 [ ]
small to medium		4 [ ]
medium	Alphamech, Diego	5 [ ]
medium to large		6 [ ]
large	Carmello, Ringo	7 [ ]
large to very large		8 [ ]
very large	Erlidor, Lydia, Muril	9 [ ]
<b>5.6 Fruit: shape in longitudinal section (28)</b>		
flattened	Campbell 28, Marmande VR	1 [ ]
oblate	Montfavet H 63.4, Montfavet H 63.5	2 [ ]
circular	Cerise, Moneymaker	3 [ ]
oblong	Early Mech, Peto Gro	4 [ ]
cylindric	Hypeel 244, Macero II, San Marzano 2	5 [ ]
elliptic	Alcaria, Castone	6 [ ]
cordate	Valenciano	7 [ ]
ovate	Dualrow, Soto	8 [ ]
obovate	Duquesa, Estelle Rimone, Rio Grande	9 [ ]
pyriform	Europeel	10 [ ]
obcordate	Cuore del Ponente, Magno	11 [ ]



TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
Characteristics	Example Varieties	Note
<b>5.7 Fruit: number of locules</b> <b>(36)</b>		
only two	Early Mech, Europeel, San Marzano	1 [ ]
two and three	Alphamech, Futuria	2 [ ]
three and four	Montfavel H 63.5	3 [ ]
four, five or six	Raïssa, Tradiro	4 [ ]
more than six	Marmande VR	5 [ ]
<b>5.8 Fruit: color (at maturity)</b> <b>(37)</b>		
cream	Jazon, White Mirabell	1 [ ]
yellow	Goldene Königin, Yellow Pear	2 [ ]
orange	Sungold	3 [ ]
pink	Aichi First	4 [ ]
red	Daniela, Ferline, Montfavel H 63.5	5 [ ]
brown	Ozyrys	6 [ ]
green	Green Grape, Green Zebra	7 [ ]
<b>5.9 Resistance to <i>Meloidogyne incognita</i> (Mi)</b> <b>(46)</b>		
susceptible	Casaque Rouge	1 [ ]
moderately resistant	Campeon, Madyta, Vinchy	2 [ ]
highly resistant	Anabel, Anahu	3 [ ]
<b>5.10 Resistance to <i>Verticillium</i> sp. (Va and Vd) –Race 0</b> <b>(47)</b>		
absent	Anabel, Marmande verte	1 [ ]
present	Daniela, Marmande VR	9 [ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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Characteristics	Example Varieties	Note
<b>5.11 Resistance to <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i> (Fol) Race 0</b> (48.1) (ex 1)		
absent	Marmande verte	1 [ ]
present	Anabel, Marporum, Marsol	9 [ ]
<b>5.12 Resistance to <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i> (Fol) Race 1</b> (48.2) (ex 2)		
absent	Marmande verte	1 [ ]
present	Mottelle, Walter	9 [ ]
<b>5.13 Resistance to Tomato mosaic virus (ToMV) – Strain 0</b> (51.1)		
absent	Monalbo	1 [ ]
present	Mobaci, Mocimor, Moperou	9 [ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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 <b>similar</b> variety(ies)	Describe the expression of the characteristic(s) for <b>your</b> candidate variety
Daniela	Fruit: green shoulder	present	absent

Comments:



TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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	absent	present	not tested
h) <i>Pseudomonas syringae</i> pv. <i>tomato</i> (char. 55)	[ ]	[ ]	[ ]
i) <i>Ralstonia solanacearum</i> race 1 (char. 56)	[ ]	[ ]	[ ]
j) Tomato yellow leaf curl virus (char. 57)	[ ]	[ ]	[ ]
k) Tomato spotted wilt virus (char. 58)	[ ]	[ ]	[ ]
l) <i>Leveillula taurica</i> (char. 59)	[ ]	[ ]	[ ]
m) <i>Oidium neolycopersici</i> (char. 60)	[ ]	[ ]	[ ]
n) Tomato torrado virus (char. 61)	[ ]	[ ]	[ ]
o) Others (please specify)			
<b>7.3.2 Special conditions for the examination of the variety</b>			
(i) Type of culture			
- under glass	[ ]		
- in the open	[ ]		
(ii) Main use			
- fresh market or garden	[ ]		
- industrial processing (indicate type)	[ ]		
- pot plant	[ ]		
- other	[ ]		

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.	



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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	<input type="text"/>		
Signature	<input type="text"/>	Date	<input type="text"/>

[End of document]