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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

SWEET PEPPER, HOT PEPPER, PAPRIKA, CHILI *

UPOV Code(s): CAPSI_ANN

Capsicum annuum L.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from the Netherlands
to be considered by the
Technical Working Party for Vegetables
at its fifty-fourth session, to be held in Brasilia, Brazil,
from 2020-05-11 to 2020-05-15

Disclaimer: this document does not represent UPOV policies or guidance

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Capsicum annuum L.	Sweet Pepper, Hot Pepper, Paprika, Chili	Piment, Poivron	Paprika	Aji, Chile, Pimiento

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), for the latest information.]

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Capsicum annuum* L. including rootstocks and ornamentals.

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: 2,500 seeds

(b) vegetatively propagated varieties: 25 non grafted young plants without fruits, normal plant height, with at least 2 growing points per plant. For testing of resistance characteristics of vegetatively propagated varieties, additional plants may be required.

In the case of seed, the seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority.

2.4 The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.

2.5 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

3. Method of Examination

3.1 Number of Growing Cycles

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

3.1.2 The two independent growing cycles should be in the form of two separate plantings.

3.1.3 The testing of a variety may be conducted when the competent authority can determine with certainty the outcome of the test.

3.2 Testing Place

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 “Examining Distinctness”.

3.3 Conditions for Conducting the Examination

The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 20 plants, which should be divided between at least 2 replicates.

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

3.4.3 When resistance characteristics are used for assessing distinctness, uniformity and stability, records must be taken under conditions of controlled infection and, unless otherwise specified, on at least 20 plants.
In the case of vegetatively propagated varieties, for each of the resistance characteristics 10 additional plants are necessary. In some cases disease resistance tests on vegetatively propagated varieties cannot be performed or should be adapted, because these tests are not fit for vegetatively propagated plants.

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 or Parts of Plants to be Examined

In the case of seed-propagated varieties, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observation made on all plants in the test, disregarding any off-type plants.

In the case of vegetatively propagated varieties, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observation made on all plants in the test, disregarding any off-type plants.

4.1.5 Method of Observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the Table of Characteristics (see document TGP/9 “Examining Distinctness”, Section 4 “Observation of characteristics”):

MG: single measurement of a group of plants or parts of plants
MS: measurement of a number of individual plants or parts of plants
VG: visual assessment by a single observation of a group of plants or parts of plants
VS: visual assessment by observation of individual plants or parts of plants

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

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

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

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

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

4.2 Uniformity

4.2.1 It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines:

4.2.2 These Test Guidelines have been developed for the examination of seed-propagated varieties. For varieties with other types of propagation, the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species" Section 4.5 "Testing Uniformity" should be followed.

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

4.2.4 The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations for hybrid varieties in the General Introduction.

4.2.5 For the assessment of uniformity of self pollinated varieties, single cross hybrids and vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 20 plants, 1 off-type is allowed.

4.3 Stability

4.3.1 In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

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

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: shortened internodes (characteristic 3)
(b) Only for ornamental varieties: Leaf blade: distribution of anthocyanin coloration of lower side (characteristic 13)
(c) Only for ornamental varieties: Leaf blade: intensity of anthocyanin coloration of upper side (characteristic 14)
(d) Only for ornamental varieties: Leaf blade: variegation (characteristic 15)
(e) Flower: anthocyanin coloration in anther (characteristic 22)
(f) Immature fruit: color (characteristic 25)
(g) Fruit: length (characteristic 29)
(h) Fruit: diameter (characteristic 30)
(i) Fruit: ratio length/diameter (characteristic 31)
(j) Fruit: shape in longitudinal section (characteristic 32)
(k) Fruit: color (characteristic 40)
(l) Fruit: capsaicin in placenta (characteristic 47)
(m) Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Tobacco mosaic virus* **-** Pathotype 0 (TMV: 0) (characteristic 53)
(n) Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2 (PMMoV: 1.2) (characteristic 54)
(o) Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2.3 (PMMoV: 1.2.3) (characteristic 55)
(p) Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY) - Pathotype 0 (PVY: 0) (characteristic 56)
(q) Only for vegetable and rootstock varieties: Resistance to *Tomato spotted wilt virus* Pathotype 0 (TSWV: 0) (characteristic 61)

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 “Examining Distinctness”.

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

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1 **2**	**3** **4**	**5** **6**	**7**			
	Name of characteristics in English	**Nom du caractère en français**	**Name des Merkmals auf Deutsch**	**Nombre del carácter en español**		
	states of expression	types d'expression	Ausprägungsstufen	tipos de expresión		

1 Characteristic number

2 (*) Asterisked characteristic – see Chapter 6.1.2

3 Type of expression
QL Qualitative characteristic – see Chapter 6.3
QN Quantitative characteristic – see Chapter 6.3
PQ Pseudo-qualitative characteristic – see Chapter 6.3

4 Method of observation (and type of plot, if applicable)
MG, MS, VG, VS – see Chapter 4.1.5

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

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

7 Not applicable

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

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1.		**QN VG**	**(+) (a)**				
		Plant: habit					
		upright				De Cayenne, Doux très long des Landes, Piquant d'Algérie	1
		semi-upright				Sonar	2
		prostrate					3
2.		**QN MS/VG**	**(+) (a)**				
		Plant: height					
		very short					1
		short				Bravia	3
		medium				HRF	5
		tall				Century	7
		very tall				Brutus	9
3.	**(*)**	**QL VG**	**(+) (a)**				
		Plant: shortened internodes					
		absent				California wonder, De Cayenne	1
		present				Bucano	9
4.		**PQ MS**	**(+) (a)**				
		Only varieties with plant: shortened internodes: present: number of internodes between the first flower and shortened internodes					
		none					1
		one to three					2
		more than three					3

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
5.	**QN MS/VG**	**(+) (a)**				
	Only varieties with plant:: shortened internodes: absent: length of internodes					
	very short				Albaregia	1
	short				Tenor	3
	medium				Florian	5
	long				Corno di toro rosso	7
	very long				Fenice	9
6.	**QN MS/VG**	**(+) (a)**				
	Stem: length					
	short				Bomenta, Corvinus	3
	medium				Bravia, Lamuyo, Nestoss, Remus	5
	long				Lipari, Marconi	7
7.	**QN VG**	**(a)**				
	Stem: intensity of anthocyanin coloration of nodes					
	absent or very weak				Bravia, Nestoss, Remus	1
	weak				California wonder	3
	medium				Lamuyo, Sonar	5
	strong				Piquant d'Algérie	7
	very strong				Smolder	9
8.	**QN VG**	**(a)**				
	Stem: hairiness of nodes					
	absent or very weak				Arlequin	1
	weak				Bravia, Nestoss	3
	medium				Doux très long des Landes, Farnese	5
	strong				Fenice, Solario	7
	very strong				Brutus	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
9.	**QN MS/VG**	**(a)**				
	Leaf blade: length					
	very short				Macska sárga	1
	short				De Cayenne	3
	medium				Marconi	5
	long				Allrounder	7
	very long				Solario	9
10.	**QN MS/VG**	**(a)**				
	Leaf blade: width					
	very narrow				Macska sárga	1
	narrow				De Cayenne	3
	medium				Marconi	5
	broad				Allrounder	7
	very broad				Solario	9
11.	**PQ VG**	**(+)** **(a)**				
	Leaf blade: shape					
	lanceolate				Brutus, De Cayenne	1
	ovate				Balico, Sonar	2
	broad elliptic				Solario	3
12.	**QN VG**	**(a)**				
	Leaf blade: intensity of green color					
	very light					1
	light					3
	medium					5
	dark					7
	very dark					9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
13.	**(*)**	**QN VG**	**(+) (a)**				
		<u>Only for ornamental varieties:</u> Leaf blade: distribution of anthocyanin coloration of lower side					
		absent or very weak					1
		only on veins				Takiama Purple to Red	2
		partially on veins and diffuse					3
		on veins and partially diffuse				Black Pearl, Purple Flash	4
		entirely				TF802	5
14.	**(*)**	**QN VG**	**(+) (a)**				
		<u>Only for ornamental varieties:</u> Leaf blade: intensity of anthocyanin coloration of upper side					
		absent or very weak					1
		weak				Omiyamurasaki, Purple Rain	2
		medium				Calico	3
		strong				Black Pearl	4
		very strong				Purple Flash, Takiama Purple to Red, TF802	5
15.	**(*)**	**QL VG**	**(+) (a)**				
		<u>Only for ornamental varieties:</u> Leaf blade: variegation					
		absent				Omiyamurasaki	1
		present				Calico, Purple Rain	9
16.		**QN VG**	**(a)**				
		Leaf blade: undulation of margin					
		absent or very weak				De Cayenne	1
		weak				Doux très long des Landes	3
		medium				Tenor	5
		strong				Tosca	7
		very strong					9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
17.	**QN VG**	**(a)**				
	Leaf blade: blistering					
	very weak				Brutus	1
	weak				Pusztagold	3
	medium				Bravia, Nestoss	5
	strong				Greygo	7
	very strong				Florian	9
18.	**QN VG**	**(a)**				
	Leaf blade: glossiness					
	very weak					1
	weak				Brutus, Doux très long des Landes	3
	medium				Bravia	5
	strong				Floridor	7
	very strong					9
19.	**QN VG**	**(+)**				
	Time of beginning of flowering					
	early				Brutus	3
	medium				Allrounder, Lamuyo	5
	late				Piquant d'Algérie	7
20.	**PQ VG**	**(+)**				
	Flower: attitude of peduncle					
	predominantly erect				Floridor	1
	predominantly semi-drooping				Bravia	2
	predominantly drooping				Brutus, Lamuyo	3
21.	**QN VG**					
	Flower: color					
	white					1
	light purple					2
	medium purple					3
	dark purple					4

		English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
22.	**(*)**	**QL**	**VG**	**(+)**					
		Flower: anthocyanin coloration in anther							
		absent						Bravia	1
		present						Brutus, Lamuyo	9
23.		**QL**	**VG**	**(+)**					
		<u>Only for ornamental varieties</u>: Flower: anthocyanin coloration in filament							
		absent						AG33	1
		present						Morningput	9
24.		**QL**	**VS**	**(+)**					
		Male sterility							
		absent						California wonder	1
		partially							2
		present						Angelito	3
25.	**(*)**	**PQ**	**VG**		**(b)**				
		Immature fruit: color							
		whitish yellow						Bravia	1
		yellowish green						Sweet banana	2
		green						California wonder, Syrto	3
		purple						Lilo	4
26.		**QN**	**VG**		**(b)**				
		<u>Only varieties with immature fruit: color green or purple:</u> Immature fruit: intensity of color							
		light						Cornus, Syrto	3
		medium						Allrounder	5
		dark						Impala	7
		very dark						Black Bullet, Hitman	9

		English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
27.		**QL**	**VG**	**(+)**	**(b)**				
		<u>Only varieties with other than immature fruit color purple:</u> Immature fruit: anthocyanin coloration							
		absent or weak						Lamuyo	1
		medium							2
		strong						Sweet banana	3
28.		**PQ**	**VG**		**(c)**				
		Fruit: attitude							
		erect						Pusztagold	1
		horizontal						PAZ szentesi	2
		drooping						De Cayenne, Lamuyo	3
29.	**(*)**	**QN**	**MS/VG**	**(+)**	**(c)**				
		Fruit: length							
		very short						Cherry Bomb, PAZ szentesi	1
		short						Ophelia, Smolder	3
		medium						California wonder	5
		long						Bravia, De Cayenne	7
		very long						Corno di toro rosso, Sweet banana	9
30.	**(*)**	**QN**	**MS/VG**	**(+)**	**(c)**				
		Fruit: diameter							
		very narrow						De Cayenne	1
		narrow						Cherry Bomb	3
		medium						Doux italien	5
		broad						Lamuyo, Maduro	7
		very broad						Floridor, Ibleor	9

		English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
31.	**(*)**	**QN**	**MS/VG**	**(+)**	**(c)**				
		Fruit: ratio length/diameter							
		very low						Liebesapfel, PAZ szentesi	1
		low						Bucano	3
		medium						Acorde, Maduro	5
		high						Lamuyo, Vidi	7
		very high						De Cayenne, Spadi	9
32.	**(*)**	**PQ**	**VG**	**(+)**	**(c)**				
		Fruit: shape in longitudinal section							
		oblate						Liebesapfel, PAZ szentesi	1
		circular						Cherry Bomb	2
		heart-shaped						Morrón de conserva 3	3
		square						Maranello, Yolo Wonder	4
		rectangular						Raggio	5
		trapezoidal						Altea	6
		triangular						Bravia	7
		bullet-shaped						Black Bullet, Jalapeño	8
33.		**PQ**	**VG**	**(+)**	**(c)**				
		Fruit: curvature							
		absent						Kappy, Lamuyo	1
		predominantly C-shaped						Sweet banana	2
		predominantly S-shaped						Doux italien	3
34.		**QN**	**VG**	**(+)**					
		Fruit: twisting							
		absent or very weak						California wonder	1
		medium						Bubión	2
		strong						BN8707	3
35.		**PQ**	**VG**	**(+)**	**(c)**				
		Fruit: shape in cross section							
		elliptic						Sweet banana	1
		angular						Solario	2
		circular						Doux très long des Landes	3

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
36.		**QN VG**	**(+) (c)**				
		Fruit: sinuation of pericarp at basal part					
		absent or very weak				Acorde, Smolder	1
		weak				Donat, Kappy	3
		medium				Banán	5
		strong				Hawker	7
		very strong				Doux italien, Gelber Spiral	9
37.		**QN VG**	**(+) (c)**				
		Fruit: sinuation of pericarp excluding basal part					
		absent or very weak				Acorde, Yolo Wonder	1
		weak				Sonar	3
		medium				Rodri	5
		strong				De Cayenne, Doux italien	7
		very strong					9
38.		**PQ VG**	**(c)**				
		Fruit: shape of apex					
		very acute				De Cayenne	1
		moderately acute				Kappone	2
		rounded				Red Tinkerbell	3
		moderately depressed				Maduro	4
		very depressed				Monte	5
39.		**QN VG**	**(+) (c)**				
		Fruit: texture of surface					
		smooth or very slightly wrinkled				Smolder	1
		slightly wrinkled					2
		strongly wrinkled					3
40.	**(*)**	**PQ VG**	**(c)**				
		Fruit: color					
		yellow				Allrounder	1
		orange				Ariane	2
		red				Lamuyo	3
		brown					4
		green				Sweet46	5

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
41.	**QN VG**	**(c)**				
	Fruit: intensity of color					
	light					3
	medium					5
	dark					7
42.	**QN VG**	**(c)**				
	Fruit: glossiness					
	very weak					1
	weak				Macska sárga	3
	medium				Sonar	5
	strong				Doux italien	7
	very strong				Ocelot	9
43.	**QN VG**	**(c)**				
	Fruit: depth of peduncle cavity					
	absent or very shallow				Sweet banana	1
	shallow				Doux italien	3
	medium				Lamuyo, Maduro	5
	deep				Baquero	7
	very deep				Dumbo34	9
44.	**QN VG**	**(+)** **(c)**				
	Fruit: depth of interloculary grooves					
	absent or very shallow				De Cayenne	1
	shallow				Kappone	3
	medium				Lamuyo, Marconi	5
	deep				Round of Hungary	7
45.	**QN MG**	**(c)**				
	Fruit: number of locules					
	predominantly two				De Cayenne	1
	equally two and three				Banán	2
	predominantly three				Century	3
	equally three and four				Lamuyo, Sonar	4
	predominantly four				PAZ szentesi	5

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
46.	**(*)**	**QN VG**	**(c)**				
		Fruit: thickness of flesh					
		very thin				De Cayenne, Macska sárga	1
		thin				Banán, Doux très long des Landes	3
		medium				Lamuyo	5
		thick				Deimos	7
		very thick				Solario	9
47.	**(*)**	**QL VG**	**(+) (c)**				
		Fruit: capsaicin in placenta					
		absent				Sonar, Sweet banana	1
		present				De Cayenne	9
48.		**QL VS**	**(+) (c)**				
		Fruit: seeds					
		absent				Angelito	1
		present				Lamuyo	9
49.		**QN MS/VG**	**(c)**				
		Peduncle: length					
		very short				Jablina	1
		short				Corvinus, Yolo Wonder	3
		medium				Sonar	5
		long				De Cayenne	7
		very long				Farnese, Lipari	9
50.		**QN MS/VG**	**(+) (c)**				
		Peduncle: thickness					
		very thin				De Cayenne, Doux très long des Landes, Macska sárga	1
		thin				Sweet banana	3
		medium				Doux italien	5
		thick				Lamuyo	7
		very thick					9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
51.		**QL VG**	**(+) (c)**				
		Calyx: aspect					
		non enveloping				Lamuyo, Sonar	1
		enveloping				De Cayenne, Sweet banana	2
52.		**QN VG**	**(+)**				
		Time of maturity					
		very early				Macska sárga, Madison	1
		early				Kosmik	3
		medium				Lamuyo, Sonar	5
		late				Doux d'Espagne	7
		very late				Teseo	9
53.	**(*)**	**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to Tobamovirus - *Tobacco mosaic virus* - Pathotype 0 (TMV: 0)					
		absent				Lamu, Pepita, Piquillo	1
		present				Fehérözön, Turia, Yolo Wonder	9
54.	**(*)**	**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2 (PMMoV: 1.2)					
		absent				Fehérözön, Lamu, Turia, Yolo Wonder	1
		present				Candela, Ferrari	9
55.	**(*)**	**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2.3 (PMMoV: 1.2.3)					
		absent				Solario, Yolo Wonder	1
		present				Allrounder	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
56.	**(*)**	**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Potato Y virus* (PVY) - Pathotype 0 (PVY: 0)					
		absent				Ferrari, Piquillo, Yolo Wonder	1
		present				Florida VR2	9
57.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Potato Y virus* (PVY) - Pathotype 1 (PVY: 1)					
		absent				Yolo Wonder, Yolo Y	1
		present				Florida VR2	9
58.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Potato Y virus* (PVY) - Pathotype 1.2 (PVY: 1.2)					
		absent				Florida VR2, Yolo Wonder, Yolo Y	1
		present				Serrano Criollo de Morenos	9
59.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Phytophthora capsici* (Pc)					
		absent				Jupiter, Yolo Wonder	1
		present				Favolor, Solario	9
60.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Cucumber mosaic virus* (CMV)					
		absent				Yolo Wonder	1
		present				Favolor, Solario	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
61.	**(*)**	**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Tomato spotted wilt virus* Pathotype 0 (TSWV: 0)					
		absent				Lamuyo, Yolo Wonder	1
		present				Galileo	9
62.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Xanthomonas campestris* pv. *vesicatoria* (Xcv) - Pathotype 1					
		absent				Yolo Wonder	1
		present				Filidor, San Marco	9
63.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Xanthomonas campestris* pv. *vesicatoria* (Xcv) - Pathotype 2					
		absent				Yolo Wonder	1
		present				Filidor, San Marco	9
64.		**QL VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Xanthomonas campestris* pv. *vesicatoria* (Xcv) - Pathotype 3					
		absent				Yolo Wonder	1
		present				Filidor, San Marco	9
65.		**QL MS/VG**	**(+) (d)**				
		<u>Only for vegetable and rootstock varieties:</u> Resistance to *Meloidogyne incognita*					
		susceptible				Tom4, Yolo Wonder	1
		resistant				Capital, W4	9

8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

Characteristics containing the following key in the Table of Characteristics should be examined as indicated below:

(a) Observations on plant, stem and leaves to be made at the time of the first color change of the fruit. Secondly observations on stem and leaves should be made at the middle third of the plant.

(b) Observations should be made before the first color change of the fruit.

(c) Observations should be made at maturity, after the time of the color change.

(d) In case of vegetatively propagated varieties, a separate additional number of plants to be tested is required.

8.2 Explanations for individual characteristics

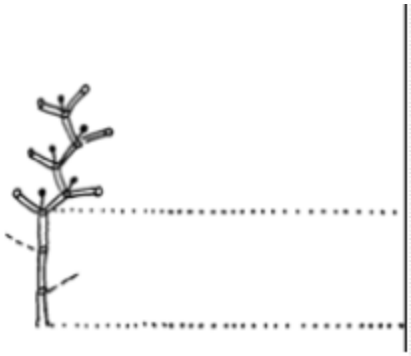
Ad. 1: Plant: habit

Observations only to be made on when plants have their natural habit without being pruned, guided or staked.

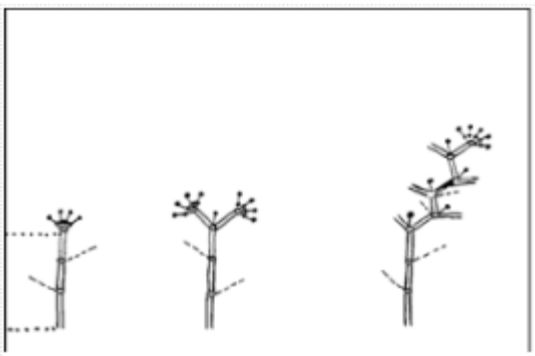
Ad. 2: Plant: height

To be observed after a fruit set on several nodes. Poor fruit set may influence the vigor and thus the height of the plant.

Ad. 3: Plant: shortened internodes



1
absent



9
present

Ad. 4: Only varieties with plant: shortened internodes: present: number of internodes between the first flower and shortened internodes

See Ad. 3

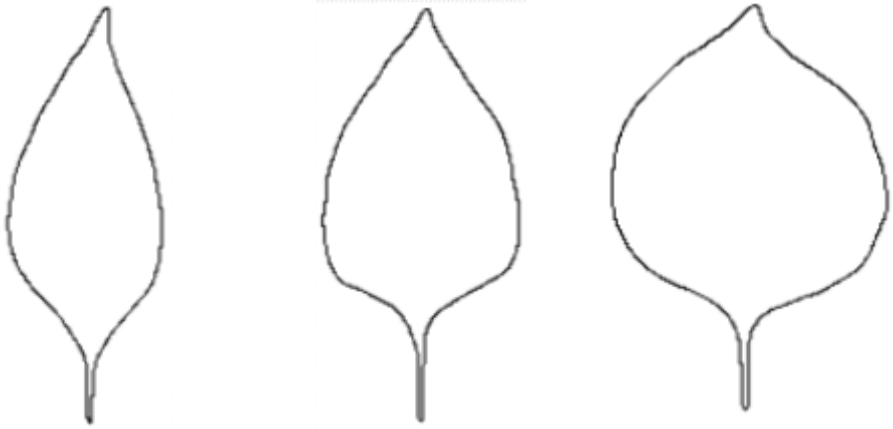
Ad. 5: Only varieties with plant:: shortened internodes: absent: length of internodes

See Ad. 3

Ad. 6: Stem: length

Observations should be made from the cotyledons to the node of the first flower branch.

Ad. 11: Leaf blade: shape



1
lanceolate

2
ovate

3
broad elliptic

Ad. 13: Only for ornamental varieties: Leaf blade: distribution of anthocyanin coloration of lower side

Observations should be made on fresh leaves.

2
only on veins

3
partially on veins and diffuse

4
on veins and partially diffuse

5
entirely

Ad. 14: Only for ornamental varieties: Leaf blade: intensity of anthocyanin coloration of upper side

Observations should be made on fresh leaves.

Ad. 15: Only for ornamental varieties: Leaf blade: variegation

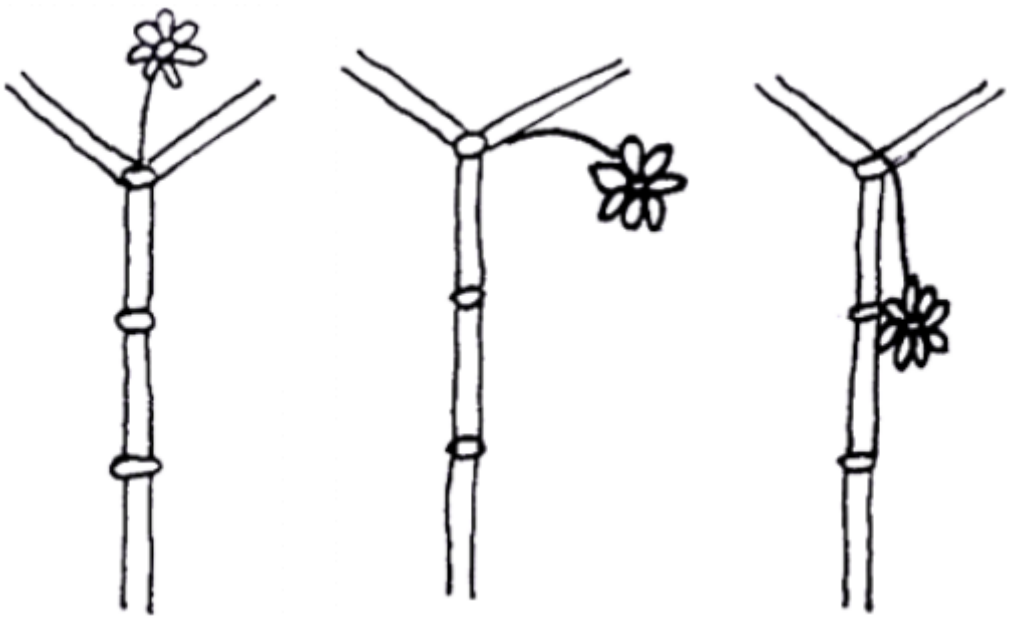
Observations should be made at fresh leaves.

9
present

Ad. 19: Time of beginning of flowering

Observations should be made at the first flower on the second flowering node.

Ad. 20: Flower: attitude of peduncle



1
erect

2
semi-drooping

3
drooping

Ad. 22: Flower: anthocyanin coloration in anther

1
absent

9
present

Ad. 23: Only for ornamental varieties: Flower: anthocyanin coloration in filament

1
absent

9
present

Ad. 24: Male sterility

Observations should be made on the anthers at full flowering. Male sterile flowers do not have pollen.

For a partially male sterile variety the standard segregation ratio for genetically male sterility is 50% fertile plants and 50% sterile plants. (This can sometimes, due to a very small number of plants, statistically deviate up to 30:70/70:30).

1
absent

3
present

Ad. 27: Only varieties with other than immature fruit color purple: Immature fruit: anthocyanin coloration

1
absent

9
present

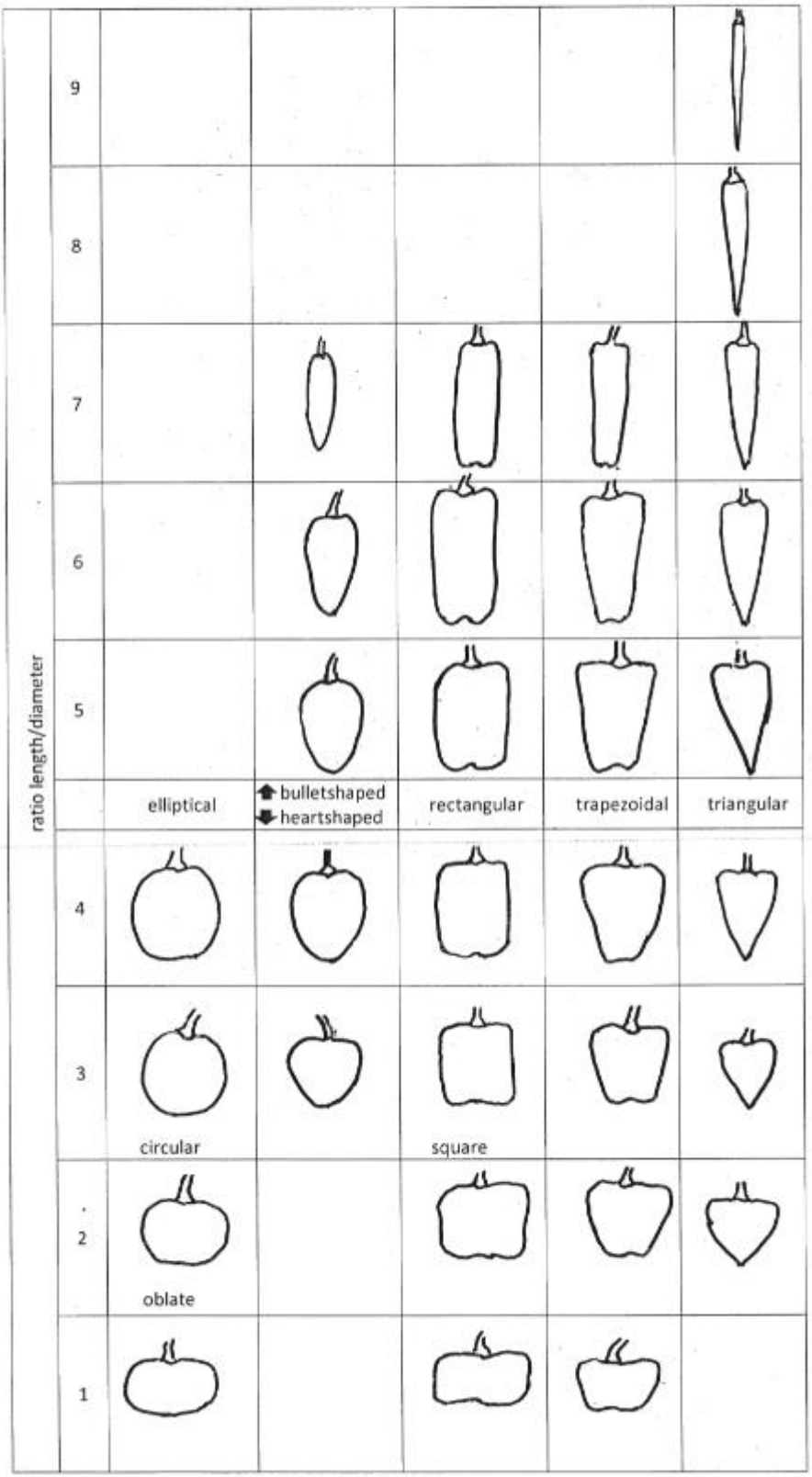
Ad. 29: Fruit: length

The length of the fruit for curved or s-shaped is to be observed following the C- shape or S-shape

Ad. 30: Fruit: diameter

Observations should be made at the widest diameter of the fruit.

Ad. 31: Fruit: ratio length/diameter



Ad. 32: Fruit: shape in longitudinal section

See Ad. 31

Ad. 33: Fruit: curvature

1
straight

2
predominantly curved

3
predominantly sinuate

Ad. 34: Fruit: twisting

1
absent or very weak

2
medium

3
strong

Ad. 35: Fruit: shape in cross section

Observations should be made at level of the placenta.

Ad. 36: Fruit: sinuation of pericarp at basal part

1	3	5	7	9
absent or very weak	weak	medium	strong	very strong

Ad. 37: Fruit: sinuation of pericarp excluding basal part

1	3	5	7	9
absent or very weak	weak	medium	strong	very strong

Ad. 39: Fruit: texture of surface

1
smooth or very slightly wrinkled

2
slightly wrinkled

3
strongly wrinkled

Ad. 44: Fruit: depth of interloculary grooves

Observations should be made in the middle part of the fruit.

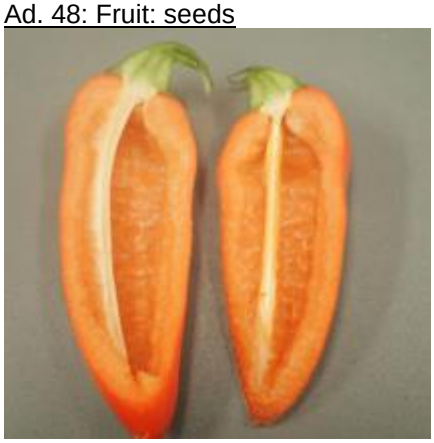
Ad. 47: Fruit: capsaicin in placenta

The presence of capsaicin is observed by tasting the pepper flesh together with the locules, in the placenta area.

Alternative method to assess the capsaicin in placenta:

The dominant gene that regulates the pungency in Capsicum annuum is the Pun-1. The method to detect the dominant allele with the marker MAP1 is described by
M.J. Rodríguez-Maza, Ana Garcés-Claver, S.W. Park, BC. Kang, M.S. Arnedo-Andrés. 2012. A versatile PCR marker for pungency in Capsicum spp. Mol Breeding 30:889-898.
Following the protocol described by the authors, which is freely available on internet, the following alleles are found:
Bp 492 -Dominant allele (Pun-1 present)
Bp 477 -Recessive allele (Pun-1 absent)
Possible results for a variety with the marker MAP1::
492 (homozygous) (Pun-1 present, Capsaicin **9 present**)
492/477 (heterozygous) (Pun-1 present, Capsaicin **9 present**)
477 (homozygous) (Pun-1 absent, Capsaicin **1 absent**)

Ad. 48: Fruit: seeds



1
absent

Ad. 50: Peduncle: thickness

Observations should be made at the middle of the stalk.

Ad. 51: Calyx: aspect

1
non enveloping

2
enveloping

Observations should be made whether or not the calyx is enveloping the fruit including its shoulder.

Ad. 52: Time of maturity

Maturity is reached at the first color change of the fruit.

Ad. 53: Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Tobacco mosaic virus* - Pathotype 0 (TMV: 0)

See Ad. 38
See Ad. 14

1.	Pathogen	Tobamovirus (the genus containing *Tobacco mosaic virus* (TMV), and *Pepper mild mottle virus* (PMMoV))
2.	Quarantine status	No
3.	Host species	Sweet pepper, hot pepper, paprika and chili – *Capsicum annuum* L.
4.	Source of inoculum	GEVES[1] (FR), Naktuinbouw[2] (NL) or INIA[3] (SP)
5.	Isolate	- *Tobacco mosaic virus* pathotype 0 (TMV: 0) strain Vi-6 - *Pepper mild mottle virus* pathotype 1.2 (PMMoV: 1.2) strain nt203 - *Pepper mild mottle virus* pathotype 1.2.3 (PMMoV: 1.2.3) strain Eve The test protocols have been validated in a CPVO co-funded project[4] with these 3 isolates/races
6.	Establishment isolate identity	genetically defined pepper differentials (reference ISF site: http://www.worldseed.org/isf/differential_hosts.html)

(To be updated)

	Pathotype	P0	P1	P1.2	P1.2.3
	Code	TMV: 0 ToMV: 0 TMGMV: 0 BPMoV: 0	TMV: 1 TMGMV: 1 PaMMV: 1	PMMoV: 1.2	PMMoV: 1.2.3
Variety	Gene				
Lamu, Early Calwonder	-	S	S	S	S
Tisana, Yolo Wonder	*L1*	R	S	S	S
Tabasco	*L2*	R	R	S	S
Solario F1, Novi 3, PI159236	*L3*	R	R	R	S
Tom4, PI260429	*L4*	R	R	R	R

S= susceptible; R= resistant; TMV= *Tobacco mosaic virus*; ToMV= *Tomato mosaic virus*; PMMoV= *Pepper mild mottle virus;* TMGMV= *Tobacco mild green mosaic virus*; BPMoV= *Bell pepper mottle virus*; PaMMV= *Paprika mild mottle virus*

7.	Establishment pathogenicity	Test on susceptible plants
8.	Multiplication inoculum	
8.1	Multiplication medium	Regeneration of the virus of plant material before inoculum preparation.
8.2	Multiplication variety	On susceptible pepper variety, Tobamovirus pathotypes may be multiplied on varieties which are selective for each particular pathotype. For TMV, because tomato and tobacco *Nicotiana tabacum* cv. Samsun have large leaves and can produce a lot of inoculum, they are recommended for the multiplication of TMV: 0.
8.3	Plant stage at inoculation	see 10.3
8.4	Inoculation medium	see 10.1
8.5	Inoculation method	see 10.4
8.6	Harvest of inoculum	Symptomatic fresh leaves
8.7	Check of harvested inoculum	option: on young leaves of *Nicotiana tabacum* “Xanthi”, check for local lesions after 5-7 days at 20-25°C.

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[4] Harmores 2 CPVO project (http://www.cpvo.europa.eu/main/en/home/documents-and-publications/technical-projects-reports)

8.8	Shelflife/viability inoculum	fresh > 1 day in fridge, desiccated > 1 year in fridge or juice > 1 year in freezer
9.	Format of the test	
9.1	Number of plants per genotype	At least 20 plants
9.2	Number of replicates	-
9.3	Control varieties	TMV: 0: - Susceptible controls: Lamu, Pepita, Piquillo - Resistant controls: Fehérözön, Yolo Wonder PMMoV: 1.2: - Susceptible controls: Fehérözön, Lamu, Yolo Wonder - Resistant controls: Ferrari, Novi 3 PMMoV: 1.2.3: - Susceptible controls: Ferrari, Yolo Wonder - Resistant controls: Friendly, Tom 4 For PMMoV: 1.2.3, it is advised to choose Ferrari as susceptible control because it is resistant to PMMoV: 1.2 or to add the differentials in tests to confirm the pathotype.
9.4	Test design	add non-inoculated plants
9.5	Test facility	Climate room or greenhouse
9.6	Temperature	20-25°C
9.7	Light	12 hours or longer
9.8	Season	-
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	1 g leaf with symptoms with 10 mL PBS or similar buffer or dilution of juice in water. Homogenize, add carborundum to buffer
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	TMV: 0, cotyledons to first leaf stage PMMoV: 1.2 and PMMoV: 1.2.3, cotyledon stage
10.4	Inoculation method	rubbing with the virus suspension
10.5	First observation	TMV:0: 4-7 days post-inoculation for observation of local necrosis. PMMoV: 1.2 and PMMoV: 1.2.3: 4-7 days post-inoculation for observation of local necrotic lesions which can lead to cotyledon drop. After this date these necrosis can hardly be seen on fallen cotyledons
10.6	Second observation	TMV: 0: two weeks post-inoculation for observation of symptoms of susceptibility. PMMoV: 1.2 and PMMoV: 1.2.3: two weeks post-inoculation for observation of symptoms of susceptibility.
10.7	Final observations	TMV: 0: three weeks post-inoculation. PMMoV: 1.2 and PMMoV: 1.2.3: three weeks post-inoculation. For TMV:0, PMMoV: 1.2 and PMMoV: 1.2.3, two of these three observations may be sufficient; the third notation is optional for observation of evolution of symptoms (depending on symptoms on controls or heterogeneous behaviour)
11.	Observations	
11.1	Method	Visual

11.2	Observation scale	TMV: 0: - Susceptibility: mosaic (aucuba in case of aucuba strain as Vi-6), growth reduction, death of plants. - Resistance: local necrotic lesions which can lead to leave drop, systemic necrosis, vein necrosis, stem necrosis. PMMoV: 1.2 and PMMoV: 1.2.3: - Susceptibility: mosaic (green), growth reduction. - Resistance: local necrotic lesions which can lead to cotyledon drop, systemic necrosis
11.3	Validation of test	evaluation of variety resistance should be calibrated with results of resistant and susceptible controls
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	absent ..... [1] susceptible, see 11.2 present ..... [9] resistant, see 11.2
13.	Critical control points	For TMV: 0, plants with no symptoms at all have to be interpreted as escapes of inoculation. Recommended dates of notation should be adapted depending of expression of symptoms on controls. Environmental conditions can have an effect on the expression of symptoms over time. In this case a third notation could be necessary.

Ad. 54: Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2 (PMMoV: 1.2)

See Ad. 53

Ad. 55: Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2.3 (PMMoV: 1.2.3)

See Ad. 53

Ad. 56: Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY) - Pathotype 0 (PVY: 0)

1.	Pathogen	*Potato Y virus* (PVY)
2.	Quarantine status	No
3.	Host species	Sweet pepper, hot pepper, paprika and chili – *Capsicum annuum* L
4.	Source of inoculum	GEVES[5] (FR), Naktuinbouw[6] (NL) or INIA[7] (SP)
5.	Isolate	For PVY: 0 strain zb6 (the test protocol has been validated in a CPVO co-funded project[8] with this isolate/race). PVY race 1 PVY race 2
6.	Establishment isolate identity	genetically defined pepper controls (extract from ISF table ISF web site: http://www.worldseed.org/cms/medias/file/TradeIssues/DiseasesResistance/Differentials/Pepper-potyviruses_Aug2013.pdf

Variety	pvr gene present	PVY: 0	PVY: 1	PVY: 1.2
Early Cal Wonder, Yolo Wonder	pvr 0	S	S	S
PI152225	pvr 1	R	R	R
Yolo Y	pvr1[1] (pvr 2[1])	R	S	S
Florida VR2	pvr1[2] (pvr 2[2])	R	R	S
Florida VR4, Del Rey Bell, Agronomico 10	pvr3	R	R	R
Serrano Criollo de Morelos 334	pvr4	R	R	R

S= susceptible; R= resistant

7.	Establishment pathogenicity	Test on susceptible plants
8.	Multiplication inoculum	
8.1	Multiplication medium	Regeneration of the virus on plant material before inoculum preparation
8.2	Multiplication variety	On susceptible pepper variety, PVY races may be multiplied on varieties which are selective for each particular race. For PVY: 0, because tobacco *Nicotiana tabacum* cv. *Xanthi-nc* have large leaves and can produce a lot of inoculum and have a faster multiplication, it is recommended for the multiplication.
8.3	Plant stage at inoculation	see 10.3
8.4	Inoculation medium	see 10.1
8.5	Inoculation method	see 10.4
8.6	Harvest of inoculum	Symptomatic fresh leaves
8.7	Check of harvested inoculum	option: on *Nicotiana tabacum* cv. *Xanthi-nc,* check mosaic presence and local lesion absence (contamination by Tobamovirus) after 5-7 days.
8.8	Shelflife/viability inoculum	fresh > 1 day, desiccated > 1 year. Because problem of stability of PVY: 0, shipments are recommended to be done with fresh infected leaves
9.	Format of the test	
9.1	Number of plants per genotype	At least 20 plants
9.2	Number of replicates	-

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[8] Harmores 2 CPVO project (http://www.cpvo.europa.eu/main/en/home/documents-and-publications/technical-projects-reports)

9.3	Control varieties	PVY: 0: - Susceptible controls: Ferrari, Piquillo,Yolo Wonder - Resistant controls: Andalus, Vidi, Yolo Y PVV: 1: - Susceptible controls: Yolo Wonder, Yolo Y - Resistant controls: Florida VR2 PVY: 1.2: - Susceptible controls: Florida VR2, Yolo Wonder, Yolo Y - Resistant controls: Serrano Criollo de Morelos
9.4	Test design	add non inoculated plants
9.5	Test facility	Climate room or greenhouse. In case of test in greenhouse during period of low daylight, shadow should not be used
9.6	Temperature	18-25°C
9.7	Light	12 hours or longer
9.8	Season	-
9.9	Special measures	For PVY: 0, it is advised to choose Yolo Y as resistant control or to add the differentials in tests to be able to observe a possible contamination by PVY: 1 or 1.2
10.	Inoculation	
10.1	Preparation inoculum	1 g leaf with symptoms with 4 mL PBS with carborundum (80mg) and activated carbon (80mg) or similar buffer, homogenize
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	PVY: 0: cotyledons stage PVY: 1 and 1.2: cotyledon stage or first pointing leaf stage
10.4	Inoculation method	rubbing with the virus suspension
10.5	Final observations	Three weeks post-inoculation
11.	Observations	
11.1	Method	Visual
11.2	Observation scale	Susceptibility: mosaic (can be very light/faint), growth reduction, vein banding and vein necrosis. Resistance: no symptoms
11.3	Validation of test	evaluation of variety resistance should be calibrated with results of resistant and susceptible controls.
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	absent ..... [1] susceptible, see 11.2 present ..... [9] resistant, see 11.2
13.	Critical control points	Recommended dates of notation should be adapted depending of expression of symptoms on controls.

Ad. 57: Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY) - Pathotype 1 (PVY: 1)

See Ad. 56

Ad. 58: Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY) - Pathotype 1.2 (PVY: 1.2)

See Ad. 56

Ad. 59: Only for vegetable and rootstock varieties: Resistance to *Phytophthora capsici* (Pc)

1.	Pathogen	*Phytophthora capsici* (Pc)
2.	Quarantine status	no
3.	Host species	*Capsicum annuum*
4.	Source of inoculum	Naktuinbouw (NL) - INRA GAFL (FR)
5.	Isolate	moderately aggressive (e.g. strain 101)
6.	Establishment isolate identity	on standards Jupiter, Yolo Wonder (susceptible), Favolor (moderately resistant), Solario, Phyo 636 (resistant)
7.	Establishment pathogenicity	in biotest on plants
8.	Multiplication inoculum	
8.1	Multiplication medium	V8 juice-agar (1%) or 10% V8A or PDA+
8.2	Multiplication variety	-
8.3	Plant stage at inoculation	-
8.4	Inoculation medium	10% V8A or PDA+
8.5	Inoculation method	see 10.4
8.6	Harvest of inoculum	-
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	10% V8A 3 months, PDA+ 2 months
9.	Format of the test	
9.1	Number of plants per genotype	at least 20 (2 untreated plants)
9.2	Number of replicates	e.g. 1
9.3	Control varieties	Jupiter, Yolo Wonder (susceptible), Favolor (moderately resistant), Solario (resistant)
9.4	Test design	-
9.5	Test facility	glasshouse
9.6	Temperature	22°C d/n
9.7	Light	at least 12h
9.8	Season	-
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	growing on Petri dishes
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	first flower bud
10.4	Inoculation method	stem is cut just below point of first branching, a 4mm- agar plug is placed carefully on the wound and covered with aluminum foil
10.5	First observation	7 days post inoculation
10.6	Second observation	14 days post inoculation
10.7	Final observations	21 days post inoculation
11.	Observations	
11.1	Method	visual, comparative or measurement of stem necrosis length; for repeated measurements, the stem is marked with permanent ink
11.2	Observation scale	
	[1] absent	e.g. length increase > 0.8 cm/week
	[9] present (moderately resistant)	e.g. length increase ≥ 0.5 cm ≤ 0.8 cm/week
	[9] present (highly resistant)	e.g. length increase < 0.5 cm/week
11.3	Validation of test	on standards
11.4	Off-types	maximum 1 on 20 plants
12.	Interpretation of data in terms of UPOV characteristic states	QL Based on the stem necrosis increase compared to the standards. [1] susceptible: Jupiter, Yolo Wonder [9] moderately resistant: Favolor [9] resistant: Solario
13.	Critical control points	absence of differential interactions between host and pathogen

Ad. 60: Only for vegetable and rootstock varieties: Resistance to *Cucumber mosaic virus* (CMV)

1.	Pathogen	*Cucumber mosaic virus* (CMV)
2.	Quarantine status	no
3.	Host species	*Capsicum annuum*
4.	Source of inoculum	INRA GAFL (FR)
5.	Isolate	e.g. 'Fulton'
6.	Establishment isolate identity	-
7.	Establishment pathogenicity	-
8.	Multiplication inoculum	
8.1	Multiplication medium	living plant
8.2	Multiplication variety	e.g. *Vinca rosea*
8.3	Plant stage at inoculation	-
8.4	Inoculation medium	0.03 M PBS + 0.1% DIECA
8.5	Inoculation method	rubbing with carborundum
8.6	Harvest of inoculum	1 g on 4 ml buffer
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	-
9.	Format of the test	
9.1	Number of plants per genotype	50
9.2	Number of replicates	e.g. 1
9.3	Control varieties	Yolo Wonder (susceptible), Ducato (moderately resistant), Alby, Favolor (resistant)
9.4	Test design	-
9.5	Test facility	-
9.6	Temperature	20-22°C
9.7	Light	12h
9.8	Season	-
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	-
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	cotyledon, before emergence of first leaf (12-13 days after sowing)
10.4	Inoculation method	rubbing cotyledons with carborundum, followed by 48h darkness
10.5	First observation	10 days post inoculation
10.6	Second observation	15 days post inoculation
10.7	Final observations	21 days post inoculation
11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	
	[1] susceptible	many local lesion, mosaic
	[9] moderately resistant	intermediate symptoms
	[9] highly resistant	few local lesions, no or light symptoms
11.3	Validation of test	on standards
11.4	Off-types	maximum 1 on 20 plants
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	-

Ad. 61: Only for vegetable and rootstock varieties: Resistance to *Tomato spotted wilt virus* Pathotype 0 (TSWV: 0)

1.	Pathogen	*Tomato spotted wilt virus*, Pathotype 0 (TSWV: 0)
2.	Quarantine status	yes
3.	Host species	*Capsicum annuum*
4.	Source of inoculum	GEVES (FR), Naktuinbouw (NL), INIA (ES)
5.	Isolate	e.g. LYE 51 or Br-01
6.	Establishment isolate identity	-
7.	Establishment pathogenicity	on susceptible plant or *Nicotiana benthamiana, N. rustica*
8.	Multiplication inoculum	
8.1	Multiplication medium	living plant
8.2	Multiplication variety	Yolo Wonder or *N. benthamiana*, *N. rustica*
8.3	Plant stage at inoculation	cotyledons fully developed or at “first leaf” pointed stage or 1-3 leaves
8.4	Inoculation medium	ice-cold buffer suspension or 0.03 M PBS + optional addition of 0.1% sodium sulfite freshly added
8.5	Inoculation method	rubbing with carborundum
8.6	Harvest of inoculum	-
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	stability in ice cold suspension ca. 15-20 minutes
9.	Format of the test	
9.1	Number of plants per genotype	at least 20
9.2	Number of replicates	e.g. 1
9.3	Control varieties	Lamuyo, Yolo Wonder (susceptible), Galileo, Jackal, Jackpot, Prior (resistant)
9.4	Test design	-
9.5	Test facility	growth chamber or insect proof glasshouse
9.6	Temperature	18-20°C or 20-22°C
9.7	Light	12 h
9.8	Season	all seasons, but winter reduce the risk of thrips infestation
9.9	Special measures	biohazard sign on compartment for countries with a TSWV quarantine status
10.	Inoculation	
10.1	Preparation inoculum	-
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	cotyledons fully developed / at “first leaf” pointed stage or 1-3 leaves
10.4	Inoculation method	rubbing with carborundum, then apply shading or darkness for 24h option: repeat the inoculation 2-3 days later to reduce accidental escapes
10.5	First observation	5-6 days to10 - 15 days post inoculation
10.6	Second observation	10-11 days post inoculation to 15 - 21 days post inoculation
10.7	Final observations	21 days post inoculation
11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	
	[1] absent	mosaic on young leaf, some leaf malformation
	[9] present	necrosis or only mechanical damage
11.3	Validation of test	on standards
11.4	Off-types	maximum 1 on 20 plants
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	Monitor and control the presence of thrips. TSWV is transmitted by thrips (*Thrips tabaci* and *Frankliniella occidentalis*.). TSWV has a broad host range. After a few multiplication the virus could be ineffective. New isolates can be obtained from practice by harvesting fruits of L4 pepper varieties infected naturally with TSWV. The fruits are kept at -70°C temperature. The presence of other viruses must be checked before using this material.

Ad. 62: Only for vegetable and rootstock varieties: Resistance to *Xanthomonas campestris* pv. *vesicatoria* (Xcv) - Pathotype 1

1.	Pathogen	*Xanthomonas campestris pv. vesicatoria* (Xcv)
2.	Quarantine status	-
3.	Host species	*Capsicum annuum*
4.	Source of inoculum	natural; to be taken from any source of infection in the field
5.	Isolate	expected reactions on resistant standard varieties
6.	Establishment isolate identity	on differentials

Differential	Pathotype 1	Pathotype 2	Pathotype 3
Early California Wonder	S	S	S
Early California Wonder-10R (gene Bs1)	S	R	S
Early California Wonder-20R (gene Bs2)	R	R	R
Early California Wonder-30R (gene Bs3)	R	S	S
PI 235047 (gene Bs4)	R	S	R

7.	Establishment pathogenicity	-
8.	Multiplication inoculum	
8.1	Multiplication medium	a bacterial growth medium, e.g. LPGA
8.2	Multiplication variety	-
8.3	Plant stage at inoculation	-
8.4	Inoculation medium	-
8.5	Inoculation method	-
8.6	Harvest of inoculum	48h culture
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	-
9.	Format of the test	
9.1	Number of plants per genotype	at least 20
9.2	Number of replicates	e.g. 1
9.3	Control varieties	Fehérözön, Yolo Wonder (susceptible), Emiro, Filidor, Gotico, San Marco, Solanor (resistant)
9.4	Test design	-
9.5	Test facility	-
9.6	Temperature	20-26°C day/night
9.7	Light	30.000 lux suggested, 16h/day
9.8	Season	-
9.9	Special measures	80% RH
10.	Inoculation	
10.1	Preparation inoculum	harvest cells from LPGA plate after 48 h growing
10.2	Quantification inoculum	10^7 -10^8 cells per ml (Stronger reaction with the higher concentration.)
10.3	Plant stage at inoculation	6-8 true leaves
10.4	Inoculation method	infiltration into abaxial surface of the interveinal region on either side of the midrib of a fully expanded leaf in 13-20mm diameter spots
10.5	First observation	2-5 days post inoculation
10.6	Second observation	6-8 days post inoculation
10.7	Final observations	10-14 days post inoculation
11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	
	[1] absent	water soaking near infiltration site
	[9] present	necrotic reaction at infiltration site
11.3	Validation of test	on standards
11.4	Off-types	maximum 1 on 20 plants
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	-

Ad. 63: Only for vegetable and rootstock varieties: Resistance to *Xanthomonas campestris* pv. *vesicatoria* (Xcv) - Pathotype 2

See Ad. 62

Ad. 64: Only for vegetable and rootstock varieties: Resistance to *Xanthomonas campestr*is pv. *vesicatoria* (Xcv) - Pathotype 3

See Ad. 62

Ad. 65: Only for vegetable and rootstock varieties: Resistance to *Meloidogyne incogniita*

To be provided

9. Literature

10. Technical Questionnaire

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	Application date: (not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Botanical name	*Capsicum annuum* L.
1.2 Common name	Sweet Pepper, Hot Pepper, Paprika, Chili

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	
Breeder (if different from applicant)	

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

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

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4.2 Method of propagating the variety

4.2.1 Other [ ]

(Please provide details)

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

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
5.1 (2)	**Plant: height**		
	very short		1 [ ]
	very short to short		2 [ ]
	short	Bravia	3 [ ]
	short to medium		4 [ ]
	medium	HRF	5 [ ]
	medium to tall		6 [ ]
	tall	Century	7 [ ]
	tall to very tall		8 [ ]
	very tall	Brutus	9 [ ]
5.2 (3)	**Plant: shortened internodes**		
	absent	California wonder, De Cayenne	1 [ ]
	present	Bucano	9 [ ]
5.3 (13)	**<u>Only for ornamental varieties:</u> Leaf blade: distribution of anthocyanin coloration of lower side**		
	absent or very weak		1 [ ]
	only on veins	Takiama Purple to Red	2 [ ]
	partially on veins and diffuse		3 [ ]
	on veins and partially diffuse	Black Pearl, Purple Flash	4 [ ]
	entirely	TF802	5 [ ]
5.4 (14)	**<u>Only for ornamental varieties:</u> Leaf blade: intensity of anthocyanin coloration of upper side**		
	absent or very weak		1 [ ]
	weak	Omiyamurasaki, Purple Rain	2 [ ]
	medium	Calico	3 [ ]
	strong	Black Pearl	4 [ ]
	very strong	Purple Flash, Takiama Purple to Red, TF802	5 [ ]

	Characteristics	Example Varieties	Note
5.5 (15)	**<u>Only for ornamental varieties:</u> Leaf blade: variegation**		
	absent	Omiyamurasaki	1 [ ]
	present	Calico, Purple Rain	9 [ ]
5.6 (22)	**Flower: anthocyanin coloration in anther**		
	absent	Bravia	1 [ ]
	present	Brutus, Lamuyo	9 [ ]
5.7 (24)	**Male sterility**		
	absent	California wonder	1 [ ]
	partially		2 [ ]
	present	Angelito	3 [ ]
5.8 (25)	**Immature fruit: color**		
	whitish yellow	Bravia	1 [ ]
	yellowish green	Sweet banana	2 [ ]
	green	California wonder, Syrto	3 [ ]
	purple	Lilo	4 [ ]
5.9 (26)	**<u>Only varieties with immature fruit: color green or purple:</u> Immature fruit: intensity of color**		
	light	Cornus, Syrto	3 [ ]
	medium	Allrounder	5 [ ]
	dark	Impala	7 [ ]
	very dark	Black Bullet, Hitman	9 [ ]
5.10 (28)	**Fruit: attitude**		
	erect	Pusztagold	1 [ ]
	horizontal	PAZ szentesi	2 [ ]
	drooping	De Cayenne, Lamuyo	3 [ ]

	Characteristics	Example Varieties	Note
5.11 (29)	**Fruit: length**		
	very short	Cherry Bomb, PAZ szentesi	1 [ ]
	very short to short		2 [ ]
	short	Ophelia, Smolder	3 [ ]
	short to medium		4 [ ]
	medium	California wonder	5 [ ]
	medium to long		6 [ ]
	long	Bravia, De Cayenne	7 [ ]
	long to very long		8 [ ]
	very long	Corno di toro rosso, Sweet banana	9 [ ]
5.12 (30)	**Fruit: diameter**		
	very narrow	De Cayenne	1 [ ]
	very narrow to narrow		2 [ ]
	narrow	Cherry Bomb	3 [ ]
	narrow to medium		4 [ ]
	medium	Doux italien	5 [ ]
	medium to strong		6 [ ]
	broad	Lamuyo, Maduro	7 [ ]
	strong to very strong		8 [ ]
	very broad	Floridor, Ibleor	9 [ ]
5.13 (32)	**Fruit: shape in longitudinal section**		
	oblate	Liebesapfel, PAZ szentesi	1 [ ]
	circular	Cherry Bomb	2 [ ]
	heart-shaped	Morrón de conserva 3	3 [ ]
	square	Maranello, Yolo Wonder	4 [ ]
	rectangular	Raggio	5 [ ]
	trapezoidal	Altea	6 [ ]
	triangular	Bravia	7 [ ]
	bullet-shaped	Black Bullet, Jalapeño	8 [ ]

	Characteristics	Example Varieties	Note
5.14 (37)	**Fruit: sinuation of pericarp excluding basal part**		
	absent or very weak	Acorde, Yolo Wonder	1 [ ]
	very weak to weak		2 [ ]
	weak	Sonar	3 [ ]
	weak to medium		4 [ ]
	medium	Rodri	5 [ ]
	medium to strong		6 [ ]
	strong	De Cayenne, Doux italien	7 [ ]
	strong to very strong		8 [ ]
	very strong		9 [ ]
5.15 (40)	**Fruit: color**		
	yellow	Allrounder	1 [ ]
	orange	Ariane	2 [ ]
	red	Lamuyo	3 [ ]
	brown		4 [ ]
	green	Sweet46	5 [ ]
5.16 (41)	**Fruit: intensity of color**		
	light		3 [ ]
	light to medium		4 [ ]
	medium		5 [ ]
	medium to dark		6 [ ]
	dark		7 [ ]
5.17 (43)	**Fruit: depth of peduncle cavity**		
	absent or very shallow	Sweet banana	1 [ ]
	very shallow to shallow		2 [ ]
	shallow	Doux italien	3 [ ]
	shallow to medium		4 [ ]
	medium	Lamuyo, Maduro	5 [ ]
	medium to deep		6 [ ]
	deep	Baquero	7 [ ]
	deep to very deep		8 [ ]
	very deep	Dumbo34	9 [ ]

	Characteristics	Example Varieties	Note
5.18 (45)	**Fruit: number of locules**		
	predominantly two	De Cayenne	1 [ ]
	equally two and three	Banán	2 [ ]
	predominantly three	Century	3 [ ]
	equally three and four	Lamuyo, Sonar	4 [ ]
	predominantly four	PAZ szentesi	5 [ ]
5.19 (47)	**Fruit: capsaicin in placenta**		
	absent	Sonar, Sweet banana	1 [ ]
	present	De Cayenne	9 [ ]
5.20 (48)	**Fruit: seeds**		
	absent	Angelito	1 [ ]
	present	Lamuyo	9 [ ]
5.21 (53)	**Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Tobacco mosaic virus* - Pathotype 0 (TMV: 0)**		
	absent	Lamu, Pepita, Piquillo	1 [ ]
	present	Fehérözön, Turia, Yolo Wonder	9 [ ]
5.22 (54)	**Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2 (PMMoV: 1.2)**		
	absent	Fehérözön, Lamu, Turia, Yolo Wonder	1 [ ]
	present	Candela, Ferrari	9 [ ]
5.23 (55)	**Only for vegetable and rootstock varieties: Resistance to Tobamovirus - *Pepper mild mottle virus* - Pathotype 1.2.3 (PMMoV: 1.2.3)**		
	absent	Solario, Yolo Wonder	1 [ ]
	present	Allrounder	9 [ ]
5.24 (56)	**Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY) - Pathotype 0 (PVY: 0)**		
	absent	Ferrari, Piquillo, Yolo Wonder	1 [ ]
	present	Florida VR2	9 [ ]
5.25 (61)	**Only for vegetable and rootstock varieties: Resistance to *Tomato spotted wilt virus* Pathotype 0 (TSWV: 0)**		
	absent	Lamuyo, Yolo Wonder	1 [ ]
	present	Galileo	9 [ ]

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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	Characteristic(s) in which your candidate variety differs	Describe the expression of the characteristic(s) for the	Describe the expression of the characteristic(s) for **your**
Example			

Comments:

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]7. Additional information which may help in the examination of the variety

7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

Yes [ ] No [ ]

(If yes, please provide details)

7.2 Are there any special conditions for growing the variety or conducting the examination?

Yes [ ] No [ ]

(If yes, please provide details)

7.3 Other information

7.3.1 Resistance to pests and diseases (please specify Pathotypes/races/strains if possible)

		absent	present	not teste
(a)	Only for vegetable and rootstock varieties: Resistance to *Potato Y virus* (PVY)	[ ]	[ ]	[ ]
	(1) Pathotype 1 (char. 57)	[ ]	[ ]	[ ]
	(2) Pathotype 1.2 (char. 58)	[ ]	[ ]	[ ]
(b)	Only for vegetable and rootstock varieties: Resistance to *Phytophthora capsici* (Pc) (char. 59)	[ ]	[ ]	[ ]
(c)	Only for vegetable and rootstock varieties: Resistance to *Cucumber mosaic virus* (CMV) (char. 60)	[ ]	[ ]	[ ]
(d)	Only for vegetable and rootstock varieties: Resistance to *Xanthomonas campestris pv. vesicatoria* (Xcv)	[ ]	[ ]	[ ]
	(1) Pathotype 1 (char. 62)	[ ]	[ ]	[ ]
	(2) Pathotype 2 (char. 63)	[ ]	[ ]	[ ]
	(3) Pathotype 3 (char. 64)	[ ]	[ ]	[ ]
(e)	Only for vegetable and rootstock varieties: Resistance to *Meloidogyne incognita*	[ ]	[ ]	[ ]
(f)	Others (please specify)			

7.3.2 Special conditions for the examination of the variety

Main use
- Strictly ornamental use [ ]
- Vegetable use [ ]
- Rootstock [ ]

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

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8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to (b) is yes, please attach a copy of the authorization.

9. Information on plant material to be examined or submitted for examination

9.1 The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc.

9.2 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to:

(a)	Microorganisms (e.g. virus, bacteria, phytoplasma)	Yes [ ]	No [ ]
(b)	Chemical treatment (e.g. growth retardant, pesticide)	Yes [ ]	No [ ]
(c)	Tissue culture	Yes [ ]	No [ ]
(d)	Other factors	Yes [ ]	No [ ]

Please provide details for where you have indicated “yes”.

.....

10. I hereby declare that, to the best of my knowledge, the information provided in this form is correct:

Applicant’s name

Signature Date

[End of document]