



EUROPEAN UNION

COMMUNITY PLANT VARIETY OFFICE

PROTOCOL FOR DISTINCTNESS, UNIFORMITY AND STABILITY TESTS

***Lycopersicon esculentum* Mill.**

TOMATO

UPOV Species Code: LYCOP_ESC

Adopted on 21/03/2007

I - SUBJECT OF THE PROTOCOL

The protocol describes the technical procedures to be followed in order to meet the Council Regulation (EC) No. 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on general UPOV Document TG/1/3 and UPOV Guideline TG/44/10 dated 04/04/2001 for the conduct of tests for Distinctness, Uniformity and Stability. This protocol applies to varieties of ***Lycopersicum esculentum*** Mill.

II - SUBMISSION OF SEED AND OTHER PLANT MATERIAL

1. The Community Plant Variety Office (CPVO) is responsible for informing the applicant of :

- the closing date for the receipt of plant material;
- the minimum amount and quality of plant material required;
- the Examination Office to which material is to be sent.

A sub-sample of the material submitted for test will be held in the variety collection as the definitive sample of the candidate variety.

The applicant is responsible for ensuring compliance with any customs and plant health requirements.

2. Final dates for receipt of documentation and material by the Examination Office :

The final dates for receipt of requests, technical questionnaires and the final date or submission period for plant material will be decided by the CPVO and each Examination Office chosen.

The Examination Office is responsible for immediately acknowledging the receipt of requests for testing, and technical questionnaires. Immediately after the closing date for the receipt of plant material the Examination Office should inform the CPVO whether acceptable plant material has been received or not. However if unsatisfactory plant material is submitted the CPVO should be informed as soon as possible.

3. Plant material requirements

The current quality and quantity requirements as well as the final dates for submission of the plant material are available on the CPVO website (www.cpvo.europa.eu) and are published in the CPVO gazette 'S2'.

Quality of seed:	Should not be less than the standards laid down for certified seed in Annex II of Council Directive 2002/55/EC.
Seed Treatment:	The plant material must not have undergone any treatment unless the CPVO and the Examination Office allow or request such treatment. If it has been treated, full details of the treatment must be given.
Special requirements:	-
Labelling of sample:	- Species - File number of the application allocated by the CPVO - Breeder's reference - Examination reference - Name of applicant - The phrase "On request of the CPVO".

III - CONDUCT OF TESTS

1. Variety collection

A variety collection will be maintained for the purpose of establishing distinctness of the candidate varieties in test. A variety collection may contain both living material and descriptive information. A variety will be included in a variety collection only if plant material is available to make a technical examination.

Pursuant to Article 7 of Council Regulation (EC) No. 2100/94, the basis for a collection should be the following:

- varieties listed or protected at the EU level or at least in one of the EEA Member States;
- varieties protected in other UPOV Member States;
- any other variety in common knowledge.

The composition of the variety collection in each Examination Office depends on the environmental conditions in which the Examination Office is located.

Variety collections will be held under conditions which ensure the long term maintenance of each accession. It is the responsibility of Examination Offices to replace reference material which has deteriorated or become depleted. Replacement material can only be introduced if appropriate tests confirm conformity with the existing reference material. If any difficulties arise for the replacement of reference material Examination Offices must inform the CPVO. If authentic plant material of a variety cannot be supplied to an Examination Office the variety will be removed from the variety collection.

2. Material to be examined

Candidate varieties will be directly compared with other candidates for Community plant variety rights tested at the same Examination Office, and with appropriate varieties in the variety collection. When necessary an Examination Office may also include other candidates and varieties. Examination Offices should therefore make efforts to co-ordinate the work with other offices involved in DUS testing of tomato. There should be at least an exchange of technical questionnaires for each candidate variety, and during the test period, Examination Offices should notify each other and the CPVO of candidate varieties which are likely to present problems in establishing distinctness. In order to solve particular problems Examination Offices may exchange plant material.

3. Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in Annex 1. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted. In the latter case, the CPVO should be informed. In addition the existence of some other regulation e.g. plant health, may make the observation of the characteristic impossible.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation (EC) No.1239/95, to insert additional characteristics and their expressions in respect of a variety.

4. Grouping of varieties

The varieties and candidates to be compared will be divided into groups to facilitate the assessment of distinctness. Characteristics which are suitable for grouping purposes are those which are known from experience not to vary, or to vary only slightly, within a variety and which in their various states of expression are fairly evenly distributed throughout the collection. In the case of continuous grouping characteristics overlapping states of expression between adjacent groups is required to reduce the risks of incorrect allocation of candidates to groups. The characteristics used for grouping could be the following:

- a) Plant: growth type (characteristic 2)
- b) Leaf: division of blade (characteristic 10)
- c) Peduncle: abscission layer (characteristic 21)
- d) Fruit: size (characteristic 23)
- e) Fruit: shape in longitudinal section (characteristic 25)
- f) Fruit: number of locules (characteristic 34)
- g) Fruit: green shoulder (before maturity) (characteristic 35)
- h) Fruit: colour at maturity (characteristic 39)

- i) Resistance to *Meloidogyne incognita* (characteristic 45)
- j) Resistance to *Verticillium dahliae* (characteristic 46)
- k) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* Race 0 (ex 1) (characteristic 47.1)
- l) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* Race 1 (ex 2) (characteristic 47.2)
- m) Resistance to Tomato Mosaic Virus – Strain 0 (characteristic 50.1)

5. Trial designs and growing conditions

The minimum duration of tests will normally be two independent growing cycles. For vegetatively propagated varieties, the duration of the testing may be reduced to one growing cycle if the results on distinctness and uniformity are conclusive. Tests will be carried out under conditions ensuring normal growth. The size of the plots will be such that plants or parts of plants may be removed for measuring and counting without prejudice to the observations which must be made up to the end of the growing period.

The test design is as follows:

Each test should include a total of 20 plants which should be divided between two or more replicates.

All observations determined by measurement or counting should be made on 20 plants or parts of 20 plants.

6. Special tests

In accordance with Article 83(3) of Council Regulation (EC) No. 2100/94 an applicant may claim either in the Technical Questionnaire or during the test that a candidate variety has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, a special test may be undertaken providing that a technically acceptable test procedure can be devised.

Special tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters listed in the protocol.

7. Standards for decisions

a) **Distinctness**

A candidate variety will be considered to be distinct if it meets the requirements of Article 7 of Council Regulation (EC) No. 2100/94.

b) Uniformity

A population standard of 1% and an acceptance probability of at least 95% should be applied.

A candidate will be considered to be sufficiently uniform if the number of off-types does not exceed the number of plants as indicated in the table below.

Table of maximum numbers of off-types allowed for uniformity standards

Number of plants	off-types allowed
6-35	1

c) Stability

A candidate will be considered to be sufficiently stable when there is no evidence to indicate that it lacks uniformity.

IV - REPORTING OF RESULTS

After each recording season the results will be summarised and reported to the CPVO in the form of a UPOV model interim report in which any problems will be indicated under the headings distinctness, uniformity and stability. Candidates may meet the DUS standards after two growing periods but in some cases three growing periods may be required. When tests are completed the results will be sent by the Examination Office to the CPVO in the form of a UPOV model final report.

If it is considered that the candidate complies with the DUS standards, the final report will be accompanied by a variety description in the format recommended by UPOV. If not the reasons for failure and a summary of the test results will be included with the final report.

The CPVO must receive from the Examination Office interim reports and final reports by the date agreed between the CPVO and the Examination Office.

Interim reports and final examination reports shall be signed by the responsible member of the staff of the Examination Office and shall expressly acknowledge the exclusive rights of disposal of CPVO.

V - LIAISON WITH THE APPLICANT

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

The interim report and the final report shall be sent by the Examination Office to the CPVO.

ANNEXES TO FOLLOW

ANNEX I

PAGE

Table of characteristics	10
Explanations and methods	23

Legend:

Note:

For the CPVO numbered characteristics, all characteristics in the table are compulsory; notwithstanding, in the case of disease resistance characteristics, only those resistances marked with an asterisk (*) in the CPVO column are compulsory. The asterisks in the UPOV numbered characteristics are there for information purposes and denote those characteristics which should always be observed when a UPOV guideline is utilised.

In general for the assessment of resistance characteristics, the facilities of other Examination Offices or specialised institutions might be used, subject to previous arrangements. Some characteristics may be discarded: if there are already phytosanitary restrictions.

(+) See explanations on the Table of characteristics

Types of expression of characteristics:

QL – Qualitative characteristic

QN – Quantitative characteristic

PQ – Pseudo-qualitative characteristic

Type of 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

When a method of observation is attributed to a certain characteristic, the first differentiation is made depending if the action taken is a visual observation (V) or a measurement (M).

The second differentiation deals with the number of observations the expert attributes to each variety, thus the attribution of either G or S.

If a single observation of a group consisting of an undefined number of individual plants is appropriate to assess the expression of a variety, we talk about a visual observation or a measurement made on a group of plants, thus we attribute the letter G (either VG or MG). If the expert makes more than one observation on that group of plants, the decisive part is that we have at the end only one data entry per variety which means that we have to deal with G (e.g. measurement of plant length on a plot – MG, visual observation of green colour of leaves on a plot – VG).

If it is necessary to observe a number of individual plants to assess the expression of a variety, we should attribute the letter S (thus either VS or MS). Single plant data entries are kept per variety for further calculations like the variety mean (e.g. measurement of length of ears – MS, visual observation of growth habit of single plants in grasses – VS). The number of individual plants to be observed in such cases is stated in section III.5.

Literature	44
------------------	----

ANNEX II

Technical Questionnaire

ANNEX I

TABLE OF CHARACTERISTICS TO BE USED IN DUS TESTS AND PREPARATION OF DESCRIPTIONS

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
1.	1.	QL	Seedling: anthocyanin coloration of hypocotyl		
	(*)	VG	absent		1
			present	Montfayet H 63.4	9
2. (+) G	2.	QL	Plant: growth type		
	(+)	VG	determinate	Campbell 1327, Prisca	1
	(*)		indeterminate	Marmande VR, Saint-Pierre, San Marzano 2	2
3.	3.	QN	<u>Only determinate growth type varieties:</u> Plant: number of inflorescences on main stem (side shoots to be removed)		
		VG	few	Campbell 1327	3
			medium	Montfayet H 63.4	5
			many	Prisca	7
4. (+)	4. (+)	QN	Stem: anthocyanin coloration of upper third		
		VG	absent or very weak		1
			weak	Montfayet H 63.5	3
			medium	Rondello	5
			strong	Grinta, Nemato	7
			very strong		9
5. (+)	5. (+)	QN	<u>Only indeterminate growth type varieties:</u> Stem: length of internode (between 1st and 4th inflorescence)		
		VG/MS	short	Trend, Dombito, Manific, Paso	3
			medium	Montfayet H 63.5	5
			long	Berdy, Calimero	7

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
6.		QN	<u>Only indeterminate growth type varieties: Plant: height</u>		
(+)		VG	very short	Cherry Belle	1
			short	Carson	3
			medium	Brooklyn	5
			long	Classy	7
			very long	Minired, Daydream	9
7.	6.	QN	Leaf: attitude (in middle third of plant)		
	(*)	VG	semi-erect	Allround, Drakar, Vitador	3
			horizontal	Triton, Aromata	5
			semi-drooping	Montfayet H 63.5	7
8.	7.	QN	Leaf: length		
	(*)	VG/MG	short	Nelson, Red Robin, Tiny Tim	3
			medium	Lorena	5
			long	Montfayet H 63.5	7
9.	8.	QN	Leaf: width		
	(*)	VG/MG	narrow	Marmande VR, Tiny Tim, Red Robin	3
			medium		5
			broad	Saint-Pierre	7
10.	9.	QN	Leaf: division of blade		
	(*)	VG	pinnate	Pilot, Red Jacket, Mikado	1
G			bipinnate	Lukullus, Saint-Pierre	2
11.	10.	QN	Leaf: size of leaflets (in middle of leaf)		
(+)	(+)	VG	very small	Minitom	1
			small	Tiny Tim	3
			medium	Marmande VR, Royesta	5
			large	Daniela, Hynema	7
			very large	Dombo	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
12.	11.	QN	Leaf: intensity of green colour		
		VG	light	Macero II, Rossol, Poncette	3
			medium	Lucy	5
			dark	Allround, Lorena, Red Robin, Daniela	7
13.	12.	QN	Leaf: glossiness (in middle third of plant)		
		VG	weak	Daniela	3
			medium	Marmande VR	5
			strong	Guindilla	7
14.	13.	QN	Leaf: blistering (in middle third of plant)		
		VG	weak	Daniela	3
			medium	Marmande VR	5
			strong	Delfine, Tiny Tim	7
15.	14.	QN	Leaf: size of blisters (in middle third of plant)		
		VG	small	Husky Cherrie Red	3
			medium	Marmande VR	5
			large	Daniela, Egéris	7
16.	15.	QN	Leaf: attitude of petiole of leaflet in relation to main axis (in middle third of plant)		
		VG	semi-erect	Blizzard, Marmande VR	3
			horizontal	Sonatine	5
			semi-drooping	Montfavet H63.5	7
17.	16.	QN	Inflorescence: type (2nd and 3rd truss)		
		VG	mainly uniparous	Dynamo	1
			intermediate	Harzfeuer	2
			mainly multiparous	Marmande VR	3

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
18.	17.	QL	Flower: fasciation (1st flower of inflorescences)		
		VG	absent	Monalbo, Moneymaker	1
			present	Marmande VR	9
19.	18.	QL	Flower: pubescence of style		
		VG	absent	Campbell 1327	1
			present	Saint-Pierre	9
20.	19.	QL	Flower: colour		
		VG	yellow	Marmande VR	1
			orange	Pericherry	2
21.	20.	QN	Peduncle: abscission layer		
		VG	absent	Aledo, Bandera, Count, Lerica	1
		G	present	Montfavet H 63.5, Roma	9
22.	21.	QN	<u>Only for varieties with abscission layers:</u> Peduncle: length (from abscission layer to calyx)		
		VG/MS	short	Cerise, Montfavet H 63.18, Rossol, Ferline	3
			medium	Dario, Primosol	5
			long	Erlidor, Ramy, Ranco	7
23.	22.	QN	Fruit: size		
		VG	very small	Cerise, Sweet 100	1
			small	Early Mech, Europeel, Roma	3
			medium	Alphamech, Diego	5
			large	Carmello, Ringo	7
		G	very large	Erlidor, Lydia, Muril	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
24.	23.	QN	Fruit: ratio length/width		
	(*)	VG/MS	very small	Campbell 28, Marmande VR	1
			small	Alicia	3
			medium	Early Mech, Peto Gro	5
			large	Rio Grande, Rimone	7
			very large	Macero II, Elko	9
25.	24.	PQ	Fruit: shape in longitudinal section		
(+)	(+)	VG	flattened	Campbell 28, Marmande VR	1
	(*)		slightly flattened	Montfavet H 63.5, Montfavet H 63.4	2
			circular	Cerise, Moneymaker	3
			rectangular	Early Mech, Peto Gro	4
			cylindrical	Hypeel 244, Macero II, San Marzano 2	5
			elliptic	Alcaria, Castone	6
			heart-shaped	Valenciano	7
			obovate	Barbara	8
			ovate	Rimone, Rio Grande	9
G			pear-shaped	Europeel	10
26.	25.	QN	Fruit: ribbing at peduncle end		
	(*)	VG	absent or very weak	Calimero, Cerise	1
			weak	Early Mech, Hypeel 244, Melody, Peto Gro, Rio Grande	3
			medium	Montfavet H 63.4, Montfavet H 63.5	5
			strong	Campbell 1327, Carmello, Count	7
			very strong	Costoluto Fiorentino, Marmande VR	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
27.	26.	QL	Fruit: cross section		
		VG	not round	Ranco, San Marzano	1
			round	Cerise, Ferline, Rondello	2
28.	27.	QN	Fruit: depression at peduncle end		
(+)	(+)	VG	absent or very weak	Europeel, Heinz 1706, Rossol, Sweet Baby	1
			weak	Futura, Melody	3
			medium	Carmello, Count, Fandango, Saint-Pierre	5
			strong	Ballon Rouge, Marmande VR	7
			very strong		9
29.	28.	QN	Fruit: size of peduncle scar		
		VG	very small	Cerise, Heinz 1706, Sweet Baby	1
			small	Early Mech, Peto Gro, Rio Grande	3
			medium	Montfavet H 63 4, Montfavet H 63 5	5
			large	Apla, Campbell 1327, Carmello, Fandango, Flora Dade	7
			very large	Marmande VR	9
30.	29.	QN	Fruit: size of blossom scar		
		VG	very small	Cerise, Early Mech, Europeel, Heinz 1706, Peto Gro, Rio Grande	1
			small	Montfavet H 63.4, Montfavet H 63.5	3
			medium	Alphamech, Apla, Carmello, Floradade	5
			large	Campbell 1327, Count, Marmande VR, Saint-Pierre	7
			very large		9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
31.	30.	QN	Fruit: shape at blossom end		
(+)	(+)	VG	indented	Marmande VR, Super Mech	1
			indented to flat		2
			flat	Montfavet H 63.4, Montfavet H 63.5	3
			flat to pointed	Cal J, Early Mech, Peto Gro	4
			pointed	Europeel, Heinz 1706, Hypeel 244, Roma VF	5
32.	31.	QN	Fruit: size of core in cross section (in relation to total diameter)		
		VG/MS	very small	Cerise	1
			small	Early Mech, Europeel, Heinz 1706, Peto Gro, Rio Grande, Rossol	3
			medium	Montfavet H 63.4, Montfavet H 63.5	5
			large	Apla, Campbell 1327, Carmello, Count, Fandango, Floradade	7
			very large	Marmande VR, Valenciano	9
33.	32.	QN	Fruit: thickness of pericarp		
		VG	thin	Marmande VR	3
			medium	Carmello, Europeel, Floradade, Heinz 1706, Montfavet H 63.5	5
			thick	Cal J, Ferline, Peto Gro, Rio Grande, Daniela	7
34.	33.	QN	Fruit: number of locules		
	(*)	VG	only two	Early Mech, Europeel, San Marzano	1
			two or three	Alphamech, Futuria	2
			three or four	Montfavet H 63.5	3
			four, five or six	Raïssa, Tradiro	4
G			more than six	Marmande VR	5

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
35. G	34. (*)	QL	Fruit: green shoulder (before maturity)		
		VG	absent	Rio Grande, Felicia, Trust	1
			present	Montfavit H 63.5, Daniela	9
36.	35. (*)	QN	Fruit: extent of green shoulder (before maturity)		
		VG	small	Cristy, Firestone	3
			medium	Erlidor, Foxy, Montfavit H 63.5	5
			large	Cobra, Delisa, Epona, Manific	7
37.	36. (*)	QN	Fruit: intensity of green colour of shoulder (before maturity)		
		VG	light	Juboline	3
			medium	Montfavit H 63.5	5
			dark	Erlidor, Xenon, Ayala	7
38.	37. (*)	QN	Fruit: intensity of green colour (before maturity)		
		VG	light	Capello, Duranto, Trust	3
			medium	Rody	5
			dark	Ayala, Tatiana, Uragano	7
39. G	38. (*)	PQ	Fruit: colour at maturity		
		VG	cream	Jazon, White Mirabell	1
			yellow	Goldene Königin, Yellow Pear	2
			orange	Sungold	3
			pink	House Momotaro	4
			red	Daniela, Ferline, Montfavit H 63.5	5
			brownish	Ozyrys	6

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
40.	39. (*)	PQ	Fruit: colour of flesh (at maturity)		
		VG	cream	Jazon	1
			yellow	Jubilée	2
			orange	Sungold	3
			pink	Regina	4
			red	Ferline, Saint-Pierre	5
			brownish	Ozyrys	6
41. (+)	40. (+) (*)	QN	Fruit: firmness		
		VG	very soft	Marmande VR	1
			soft	Trend	3
			medium	Cristina	5
			firm	Fernova, Konsul, Tradiro	7
			very firm	Daniela, Karat, Lolek	9
42. (+)	42. (+)	QN	Time of flowering		
		MG	early	Feria, Primabel	3
			medium	Montfavet H 63.5, Prisca	5
			late	Manific, Saint-Pierre	7
43.	43. (*)	QN	Time of maturity		
		MG	very early	Sungold, Sweet Baby, Dolcevita	1
			early	Feria, Rossol	3
			medium	Montfavet H 63.5	5
			late	Manific, Saint-Pierre	7
			very late	Daniela	9
44. (+)	45. (+)	QL	Sensitivity to silvering		
		VG	insensitive	Marathon, Sano	1
			sensitive	Sonatine	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
45.	46.	QN	Resistance to <i>Meloidogyne incognita</i>		
(+)	(+)	VG	susceptible	Casaque Rouge, Clairvil	1
(*)			intermediate resistant	Vinchy, Madyta	2
G			resistant	Anabel, Anahu	3
46.	47.	QL	Resistance to <i>Verticillium dahliae</i>- Race 0		
(*)	(*)				
(+)	(+)	VG	absent	Anabel, Marmande verte	1
G			present	Clairvil, Marmande VR	9
47.	48.		Resistance to <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i>		
(+)	(+)				
47.1	48.1	QL	- Race 0 (ex 1)		
(*)	(*)	VG	absent	Marmande verte	1
G			present	Anabel, Marporum, Marsol	9
47.2	48.2	QL	- Race 1 (ex 2)		
(*)	(*)	VG	absent	Marmande verte	1
G			present	Motelle, Walter	9
47.3		QL	- Race 2 (ex 3)		
		VG	absent	Marmande verte, Motelle	1
			present	Florida, Alliance, Ivanohé, Tributes	9
48.	49.	QL	Resistance to <i>Fusarium oxysporum</i> f. sp. <i>radicis lycopersici</i>		
(+)	(+)	VG	absent	Motelle	1
			present	Momor	9
49.	50.		Resistance to <i>Cladosporium fulvum</i>		
(+)	(+)				
49.1	50.1	QL	- Race 0		
		VG	absent	Monalbo	1
			present	Angela, Estrella, Sonatine, Sonato, Vemone	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
49.2	50.2	QL	- Group A		
		VG	absent	Monalbo	1
			present	Angela, Estrella, Sonatine, Sonato	9
49.3	50.3	QL	- Group B		
		VG	absent	Monalbo	1
			present	Angela, Estrella, Sonatine, Sonato, Vemone	9
49.4	50.4	QL	- Group C		
		VG	absent	Monalbo	1
			present	Angela, Estrella, Sonatine,	9
49.5	50.5	QL	- Group D		
		VG	absent	Monalbo	1
			present	Estrella, Sonatine, Vemone	9
49.6	50.6	QL	- Group E		
		VG	absent	Monalbo	1
			present	Sonatine	9
50. (+)	51. (+)		Resistance to Tomato Mosaic Virus		
50.1	51.1	QL	- Strain 0		
(*)	(*)	VG	absent	Monalbo	1
G			present	Mobaci, Mocimor, Moperou	9
50.2	51.2	QL	- Strain 1		
		VG	absent	Monalbo	1
			present	Mocimor, Moperou	9
50.3	51.3	QL	- Strain 2		
		VG	absent	Monalbo	1
			present	Mobaci, Mocimor	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
51.	52.	QL	Resistance to <i>Phytophthora infestans</i>		
(+)	(+)	VG	absent	Heinz 1706, Saint Pierre	1
			present	Heline, Pieraline, Pyros	9
52.	53.	QL	Resistance to <i>Pyrenochaeta lycopersici</i>		
(+)	(+)	VG	absent	Montfavet H 63.5	1
			present	Kyndia, Moboglan, Pyrella	9
53.	54.	QL	Resistance to <i>Stemphylium</i> spp.		
(+)	(+)	VG	absent	Monalbo	1
			present	Motelle	9
54.	55.	QL	Resistance to <i>Pseudomonas syringae</i> pv. tomato		
(+)	(+)	VG	absent	Monalbo	1
			present	Ontario 7710	9
55.	56.	QL	Resistance to <i>Ralstonia solanacearum</i> - Race 1		
(+)	(+)	VG	absent	Floradel	1
			present	Caraïbo	9
56.	57.	QL	Resistance to Tomato Yellow Leaf Curl Virus		
(+)	(+)	VG	absent	Montfavet H 63.5	1
			present	TY 20, Anastasia, Mohawk	9
57.	58.	QL	Resistance to Tomato Spotted Wilt Virus – race 0		
(+)	(+)	VG	absent	Montfavet H 63.5	1
			present	Lisboa	9
58.	59.	QL	Resistance to <i>Leveillula taurica</i>		
(+)	(+)	VG	absent	Montfavet H 63.5	1
			present	Atlanta	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
59.	60.	QL	Resistance to <i>Oidium lycopersicum</i>		
(+)	(+)	VG	absent	Montfavet H 63.5	1
			present	Romiro	9

EXPLANATIONS AND METHODS

Ad. 2: Plant: growth type

The growth type is predominantly controlled by one monoallelic gene (self-pruning +/- self-pruning)

Determinate (1): This type is predominantly controlled by the recessive allele, self-pruning – (Sp-). This type produces a limited number of trusses. The number of trusses is different among plants and is influenced by agroclimatic conditions. In this type, the number of leaves or internodes between inflorescence varies from one to three. In the terminal truss, the stem ends with an inflorescence and no lateral shoots are produced.

This type includes some “semi-determinate” varieties which do not have three leaves or internodes consistently between inflorescences, and show semi-determinate growth, for example, with the termination of the stem prolongation above 9th inflorescence (e.g. ‘Prisca’ type) or at higher than 20th inflorescence (e.g. Early Pack type).

Indeterminate (2): This type is predominantly controlled by the dominant allele, self-pruning + (Sp +). In this type, three leaves or internodes are generally observed between inflorescences. Each truss produces three buds: the terminal bud is transformed into a lateral shoot which produces next three buds and carries on the prolongation of stem. Plants of this type grow with the continuous repeat of this growth pattern.

It should be noted that 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’).

Marmande and Costoluto Fiorentino types might be considered to be categorised into an intermediate class between indeterminate and determinate, but they always have three leaves or internodes between inflorescences. They should therefore be categorised into the indeterminate type.

Ad. 4. Stem: anthocyanin coloration of upper third

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, except for varieties with Tm2 allele which is linked to anthocyanin of the stem (especially at the internode).

Ad. 6: Only indeterminate growth type varieties: Plant: height

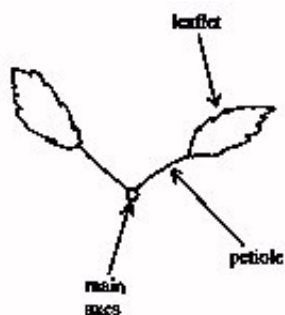
To be observed after a fruit set on 5 nodes

Ad. 11: Leaf: size of leaflets (in middle of leaf)

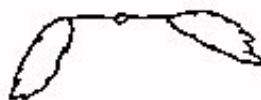
leaflet in middle of leaf



Ad. 16: Leaf: attitude of petiole of leaflet in relation to main axis



3
semi-erect



5
horizontal

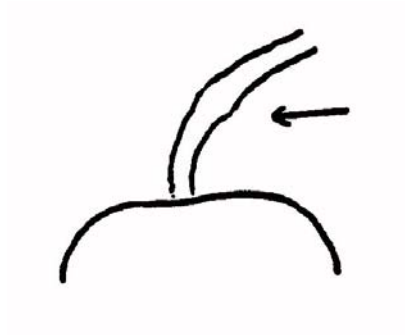


7
semi-drooping

Ad. 19: Flower: pubescence of style

Some non-hairy varieties can present some rare and small hairs at the base of the style.

Ad. 21: Peduncle abscission layer



1
absent



9
present

Some varieties which have only a collar instead of an abscission layer (heterozygous for the gene which controls the presence of the joint) are considered as jointless (“absent (1)”).

Ad. 22: Only for varieties with abscission layers: Peduncle: length (from abscission layer to calyx)

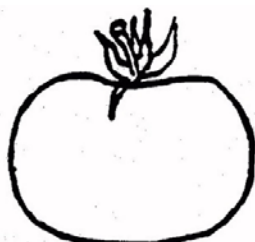


ssion layer

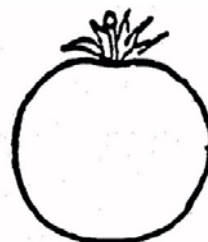
Ad. 25: Fruit: shape in longitudinal section



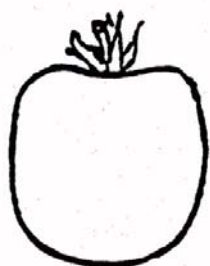
1
flattened



2
slightly flattened



3
circular



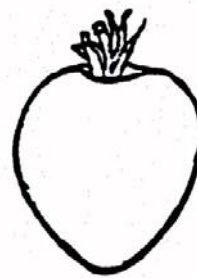
4
rectangular



5
cylindrical



6
elliptic



7
heart-shaped



8
obovate

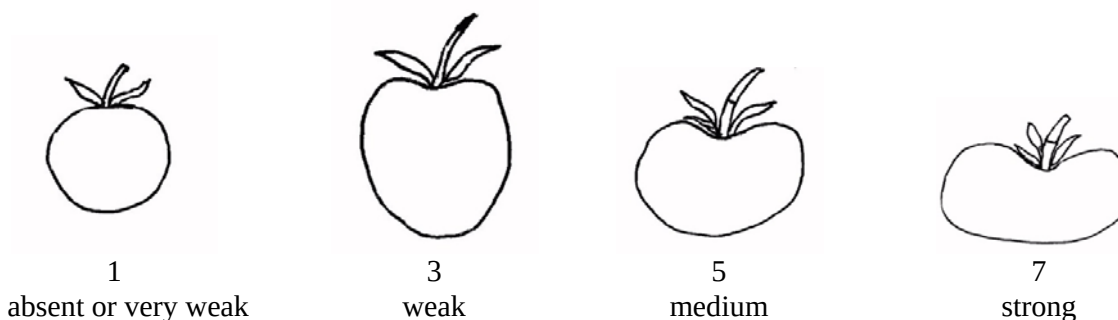


9
ovate

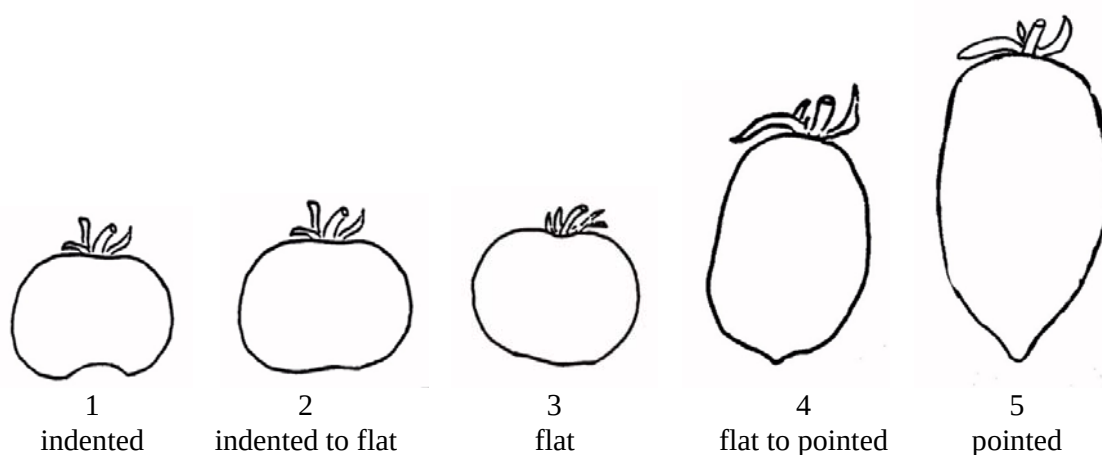


10
pear-shaped

Ad. 28: Fruit: depression at peduncle end



Ad. 31: Fruit: shape at blossom end



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: 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 vigour 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 crops, this characteristic cannot be observed due to the branching of the plant.

Ad. 44: 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

Ad. 45: Resistance to *Meloidogyne incognita*

Method

Maintenance of strain

Type of medium: on roots of susceptible varieties (grown in the greenhouse)

Special conditions avoid rotting of roots

Execution of test

Temperature: not over 28° C

Growing method: in the greenhouse

Method of inoculation: plants are sown in infested soil

Duration of test

- from sowing to inoculation:inoculation before sowing,
- from inoculation to reading:30 to 45 days

Number of plants tested: 10 to 20

Remarks: avoid rotting of roots avoid high temperature

Notation: number of root knots and root deformation

Standard varieties: susceptible: CLAIRVIL, CASAQUE ROUGE
intermediate resistant: MADYTA, F1 ANAHU x MONALBO
resistant: ANABEL, ANAHU

Ad. 46: Resistance to *Verticillium dahliae*

Method

Maintenance of strains

Race 0 represented by strain Toreilles 4-1-4-1 is used. Race 0 is the common race defined by its ability to infect plants with the Ve gene.

Long term storage of strains: conidia suspended in glycerol solution at -80°C.

Strain can be subcultured on PDA or S of Messiaen media.

Execution of test

Growth stage of plants

Plants are grown in greenhouse or growth chamber. Inoculation can be done from the cotyledon stage (first leaves emerging) to 2 expanded leaves stage.

The following varieties can be used as controls. As a minimum, there should be one resistant and one susceptible control in the test. The heterozygous variety will help interpretation of results in case of aggressive test. Clarion could be interesting to add to susceptible controls as it is less susceptible and could also help to control the aggressiveness of the test. These 2 varieties are optional.

Standard variety Vd:0

Marmande verte, Flix	S
Clarion	s
Monalbo x Marmande verte	RH
Monalbo, Elias	R

R	resistance present; no symptoms
RH	resistance present; sometimes very weak symptoms
s	resistance absent; weak symptoms
S	resistance absent; clear symptoms

Temperature:

Test performed under controlled conditions at 20 to 22°C.

Inoculum:

Verticillium dahliae is grown on liquid Czapek Dox Broth or S of Messiaen media for 3 to 7 days in the dark, at 20 to 25°C with shaking. Spores are harvested and adjusted to 10⁶sp/ml.

Method of inoculation

Plantlets are harvested, roots are cut and soaked for 5 to 15 min in the inoculum suspension. Plantlets are then transplanted in soil.

Duration of test

At least 33 days from sowing to notation.

Number of plants tested:

At least 20 plants.

Notation:

25-30 days after inoculation.

Notation scale and interpretation of results:

R: no symptoms

S: chlorosis in the lower leaves, growth reduced and brown vessels or growth not reduced and brown vessels.

Analysis of results should be calibrated with results on R and S controls.

Ad. 47.1 + 47.2: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* race 0 (ex 1) and race 1 (ex 2)

Method

Maintenance of strains

Long term storage of strains: at -80°C in 20% glycerol.

Race 0 (ex 1) represented by strains Orange 71 or PRI 20698 or Fol 071 and race 1 represented by strains 4152 (more aggressive) or PRI40698 or RAF 70 (less aggressive) are used.

Strains can be multiplied on PDA or S of Messiaen media.

Execution of test

Growth stage of plants

Plants are grown in greenhouse or growth chamber for 10 to 18 days (cotyledons to first leaf stages).

The following varieties are used as controls. Each line will be represented by at least one variety which can be chosen in the varieties indicated; the resistance phenotype to the two pathotypes of Fol is indicated. The heterozygous variety has a resistance phenotype usually weaker than in homozygous lines. This weak resistance can be used to calibrate the borderline between resistance and susceptibility. The heterozygous control for Fol:1 is optional.

<u>Controls for Fol:0 resistance test</u>		
	Fol:0	Fol:1*
Marmande, Marmande verte, Resal	S	S
Marporum x Marmande verte (heterozygous)	R	S
Marporum, Larissa	R	S
Motelle, Gourmet, Mohawk	R	R

* For information

<u>Controls for Fol:1 resistance test</u>		
	Fol:0*	Fol:1
Cherry Belle, Roma, Marmande verte	S	S
Ranco**, Marporum	R	S
Motelle x Marmande verte	R	R
Tradiro, Odisea	R	R

* For information

** For Ranco: weak resistance to Fol0 with many escapes

R = resistance present

S = resistance absent

Temperature:

Test performed in climatic chambers or greenhouse at 24-28°C. In case of aggressive test, temperature can be decreased to 20-24°C.

Inoculum:

Fusarium oxysporum f. sp. *lycopersici* is grown on PDA or S of Messiaen media or in aerated Czapek-Dox liquid cultures for 7 to 10 days. Spores are harvested with a scraper and adjusted to 10⁶ sp/ml for strains grown on media. In case of very aggressive isolate, inoculum concentration can be decreased.

Method of inoculation

Soaking of roots (cutting of roots optional) and of hypocotyls axis for 5 to 15 min in the inoculum suspension and transplantation of inoculated plantlets in soil.

Duration of test

At least 28 days from sowing to notation.

Number of plants tested:

At least 20 plants.

Notation:

At least 21 days after inoculation.

Notation scale:

4 qualitative classes:

- 0: no symptoms,
- 1: external healthy aspect of plant (without growth reduction) with brown vessels (sometimes extending above cotyledons, generally remaining below cotyledons),
- 2: growth reduction and brown vessels above cotyledons,
- 3: dead plant.

Interpretation of scale:

Generally 0 and 1 are considered resistant, 2 and 3 are susceptible but analysis of results should be calibrated with results of R and S controls.

Ad. 48: Resistance to *Fusarium oxysporum* f. sp. *radicis lycopersici*

Method

Maintenance of race

Type of medium: on synthetic medium (according to Messiaen)

Special conditions: fridge 4° C

Execution of test

Growth stage of plants: appearance of third leaf

Temperature: day: 22° C, night: 16° C

Light: 14 hours

Growing method: climatic room

Method of inoculation: soaking of roots and of hypocotyl axis for five minutes in the inoculum. After inoculation, transplantation of plantlets in steam disinfected sand

Duration of test

- from sowing to inoculation: 18 to 20 days
- from inoculation to reading: 10 days

Number of plants tested: 10 to 20 plants

Remarks: need for frequent renewal of races because of loss of pathogeneity

Standard varieties: - susceptible: MOTELLE
- resistant: MOMOR (homozygote)
F1 MOMOR x MOTELLE (heterozygote)
the Frl gene does not completely control the disease in the heterozygous stage.

Ad. 49.1 - 49.5: Resistance to *Cladosporium fulvum*

Method

Maintenance of races

Type of medium: synthetic medium

Special conditions: 20 - 22° C, transplantation of races every six weeks

Execution of test

Growth stage of plants: 3 leaves expanded

Temperature: day: 24° C, night: 16° C

Light: 12 hours

Growing method: in climatic room, highest possible humidity, arresting growth a few days before inoculation by irrigation of roots with ALAR 85 (daminozide).

Method of inoculation:..... spraying of a solution with the fungus on leaves.

Duration of test

- from sowing to inoculation:.....22 to 25 days
- from inoculation to reading:.....20 to 25 days

Number of plants tested: 30 plants

Remarks: the level of expression of symptoms may vary between plants
due to alleles of resistance

Standard varieties:

- susceptible: MONALBO
- resistant : has to be chosen with the concerned alleles
 - cf1: STIRLING CASTLE
 - cf2: VETOMOLD
 - cf3: V 121
 - cf4: PURDUE 135
 - cf5: IVT 1149
 - cf2 cf4: VAGABOND
 - cf2 cf5: F1 “VETOMOLD x IVT 1149”
 - cf2 cf4 cf5: F1 “VAGABOND x IVT 1149”
 - cf6: F 77-38
 - cf9: IVT 1154

Race 0: Angela, Estrella, Sonatine, Sonato, Vemone
Group A: Angela, Estrella, Sonatine, Sonato
Group B: Angela, Estrella, Sonatine, Sonato, Vemone
Group C: Angela, Estrella, Sonatine
Group D: Estrella, Sonatine, Vemone
Group E: Sonatine

Ad.50.1 – 50.3: Resistance to Tomato Mosaic Virus, strains 0, 1 and 2

Method

Maintenance of strains

Strains are long term stored as desiccated leaves below 10°C.

Race 0 represented by isolate INRA Avignon 6-5-1-1 (aucuba mosaic strain) is used.

Virus should be multiplied on the susceptible control before being used for inoculation of the test.

Execution of test

Growth stage of plants

Plants are grown in greenhouse or growth chamber until cotyledons (first leaves emerging) to two expanded leaves have appeared.

Within each test at least one resistant and one susceptible standard variety is included.

The following varieties are used as controls. Each line will be represented by at least one resistance phenotype which can be chosen from the varieties indicated; the resistance phenotype to the 3 pathotypes of ToMV is indicated. Mobaci and Moperou will allow checking the pathotype identity of the virus. Monalbo x Momor will help the interpretation of the distinct resistance phenotype with necrosis.

Controls for ToMV: 0, these varieties were not validated as standard varieties for ToMV: 1 and ToMV: 2:

Variety	Resistance phenotype		
	ToMV:0	ToMV:1	ToMV:2
Marmande, Monalbo	S	S	S
Mobaci	R	S	R
Moperou	R	R	S
Monalbo x Momor	RN	RN	RN
Momor, Gourmet	R	R	R

R = resistance present; no symptoms

RN = resistance present; a variable proportion of plants showing some or extensive necrosis; all other plants have no symptoms.

S = resistance absent; mosaic symptoms

Temperature:

Test performed in climatic chambers or greenhouse at 24 to 26°C. At higher temperatures, resistance can break down.

Inoculum and method of inoculation

Mechanical inoculation by rubbing cotyledons (first leaves emerging) or two expanded leaves with an inoculum solution consisting of symptomatic leaves grinded in a buffer with carborundum added. Leaves can be rinsed after inoculation. Light is important for symptom expression.

Duration of test

24 to 42 days from sowing to notation.

Number of plants tested:

At least 20 plants.

Notation:

12-21 days after inoculation when symptoms are well developed on susceptible control.

Notation scale and interpretation results:

R: without symptoms or with necrosis (necrosis can be observed on plants heterozygous for resistance gene, these plants are noted resistant)

S: mosaic symptoms.

Ad. 51: Resistance to *Phytophthora infestans*

Method

Maintenance of race

Type of medium: on agar medium

Special conditions: 18° C

Execution of test

Growth stage of plants: 10 leaves developed

Temperature: 18° C

Light: after inoculation darkness during 24 hours, thereafter 10 hours
darkness per day

Growing method: climatic room

Method of inoculation: spraying of spore suspension, use race replicated 3 weeks before
inoculation

Duration of test

- from sowing to inoculation: 6 to 7 weeks
- from inoculation to reading: 7 to 8 days

Hygrometry: very high during the first four days after inoculation (cover plants with polyethylene cover)

Remarks: heterozygote varieties can show symptoms of a slightly lower level of expression

Standard varieties: - susceptible: SAINT PIERRE, HEINZ 1706
- resistant: PIERALINE, HELINE, PYROS,
F1 "PIERALINE x PIERALBO"

Ad. 52: Resistance to *Pyrenochaeta lycopersici*

Method

Maintenance of race: method 1: on roots obtained from plants grown in the greenhouse on naturally contaminated soil (or with enforced natural contamination);

 method 2: inoculum grown on sand or mould, mixed with oat-meal and sterilized in the autoclave (artificial infection)

Execution of test:

Growth stage of plants: method 1: on adult plants around fruit maturity
 method 2: 4 to 6 weeks after sowing (first flowering inflorescence)

Temperature: day: 24° C; night: 14° C

Light: 12 hours minimum

Growing method and Method of inoculation:

method 1: plants are planted in contaminated soil mixed with cut contaminated roots
method 2: plants are sown in steam-disinfected sandy mould mixed with inoculum

Duration of test

- from sowing to inoculation: method 1: 6 weeks
 method 2: when sowing

- from inoculation to reading: method 1: 3 to 4 months
 method 2: 4 to 6 weeks

Number of plants tested: 10 as a minimum

Remarks: method 1: is more efficient to clearly separate susceptible from resistant plants
method 2: pathogenicity of the strains has to be tested before inoculation on roots of young plants

Standard varieties: susceptible: MONTFAVET H 63.5
resistant: KYNDIA, MOBOGLAN, PYRELLA

Ad. 53: Resistance to *Stemphylium* spp.

Method

Maintenance of isolate

Type of medium: on synthetic medium

Special conditions: fridge 4° C without light

Execution of test

Growth stage of plants: three leaves expanded

Temperature: constant, day: 24° C, night: 24° C

Light: 12 hours

Growing method: climatic room

Method of inoculation: pulverisation on leaves

Duration of test

- from sowing to inoculation: 20 to 22 days
- from inoculation to reading: 10 days

Number of plants tested: 30 plants

Remarks: production of inoculum on medium V8 under light

Standard varieties: susceptible: MONALBO
resistant: MOTELLE, F1 MOTELLE x MONALBO

Ad. 54: Resistance to *Pseudomonas syringae* pv. tomato

Method

Maintenance of races

Type of medium: on KING B medium

Special conditions: 20 - 22° C in the dark, transplantation every 10 days

Execution of test

Growth stage of plants: three leaves expanded

Temperature: day: 22° C, night: 16° C

Light: 12 hours

Growing method: climatic room in summer, glasshouse in winter

Method of inoculation: pulverisation on leaves

Duration of test

- from sowing to inoculation: 20 to 22 days
- from inoculation to reading: 8 days

Number of plants tested: 30 plants

Remarks: races to be renewed each year

Standard varieties: susceptible: MONALBO
resistant: ONTARIO 7710,
F1 MONALBO x ONTARIO 7710

Ad. 55: Resistance to *Ralstonia solanacearum*, (ex. *Pseudomonas solanacearum*) race 1

Method

Maintenance of race : Two races may affect Tomato: race 1 (active between 25-30° C)
and race 3 (active between 20-23° C)

Type of medium: Freezing at -80° C; culture in PYDAC immersed in oil;
suspension in sterile distilled water

Special conditions: conservation at 15° C in sterile distilled water

Execution of test

Growth stage of plants: three to four well-developed leaves

Temp. (in climatic chamber): day: 26-30° C; night: 25° C

Light: 10 - 12 hours

Growing method: 2 possibilities: ... - in climatic chamber: rapid test
- in the field: long test (applicable in tropical climate only)

Method of inoculation: deposit of at least 2 ml of inoculum, adjusted to 10^7 colonies per ml, at the foot of each plantlet prior to planting

Duration of test

- from sowing to inoculation: 3 to 4 weeks
- from inoculation to reading: - 3 weeks for the fast test
- 2 months for the long test

Number of plants tested: minimum of 30

Remarks: maintain high humidity

Standard varieties: - susceptible: FLORADEL
- resistant: CARAIBO

Ad. 56: Resistance to Tomato Yellow Leaf Curl Virus (TYLCV)

Method

Execution of test: Plants are tested under field crop conditions respecting a period of planting and a place where the disease has been proven to exist. 100% contaminated plants are grown of susceptible local varieties to ensure natural transmission by *Bemisia* insect and repeatability of the results

Growth stage of plants: on adult plants of field crop outside

Method of inoculation: natural inoculation by *Bemisia*

Duration of test

- from sowing to inoculation: 6 weeks minimum
- from inoculation to reading: 2.5 months maximum

Number of plants tested: 20 plants minimum

Remarks:

Standard varieties:..... - susceptible: local varieties
- resistant: TY 20 or accessions from *L. pimpinellifolium* and
from *L. peruvianum*

Ad. 57: Resistance to Tomato Spotted Wilt Virus

Method

Maintenance of races

Type of medium:..... on tomato plants or freezing at -70° C

Special conditions:

Execution of test

Growth stage of plants: one or two leaves expanded

Temperature: day: 20° C, night: 20° C

Light: extra light in winter

Growing method: glasshouse

Method of inoculation:..... mechanical, rubbing with carborundum on cotyledons, inoculum
suspension < 10° C

Duration of test

- from sowing to inoculation: 20 days
- from inoculation to reading: 14 to 20 days

Number of plants tested: 15 to 30 plants

Remarks: be aware of thrips

Standard varieties:..... - susceptible: MONALBO
- resistant: TSUNAMI, BODAR

Ad. 58: Resistance to *Leveillula taurica*

Method

Maintenance of races

Type of medium: tomato plants

Special conditions:

Execution of test

Growth stage of plants: on adult plants of field crop outside

Method of inoculation: natural infection

Duration of test

- from sowing to inoculation: infection possible from planting stage to full grown plants
- from inoculation to reading: before harvest

Number of plants tested: 20 plants

Remarks: Yellow chlorotic spots on upper side of leaves, mycelium on lower side of leaves.
Check cleistothecia under microscope if it really concerns *Leveillula* and not another powdery mildew.

Standard varieties: - susceptible: MONALBO
- resistant: ATLANTA

Ad. 59: Resistance to *Oidium lycopersicum*

Method

Maintenance of races

Type of medium: on tomato plants

Special conditions: climatic room

Execution of test

Growth stage of plants: 3 weeks

Temperature: 24°C during the day; 18°C during the night

Light: 12 hours

Method of inoculation: - by spraying (10^4 conidia/ml) on leaves
- by dredging (uncontrolled inoculum) on leaves

Execution of test

Duration of test

- from sowing to inoculation:.....18 - 20 days
- from inoculation to reading:15 – 18 days

Number of plants tested: 30 plants/lot

Remarks:

Scale of notes: - no sporulation }
 - sporulation without extension } Resistant
 (necrotic points) }

 - moderated sporulation }
 - abundant sporulation } Susceptible

Standard varieties:..... - susceptible: Momor (L. *esculentum*)
- resistant: *L. hirsutum* PI-247087 (accession)

LITERATURE

KJELLBERG, L., 1973: Sortundersökningar av tomat enligt UPOV, Swedish University of Agricultural Sciences, Research Information Centre, Alnarp Trädgård 162, SE.

LATERROT, H., 1973: Sélection de variétés de Tomate résistantes aux Meloidogyne," OEPP/EPPO Bulletin 3(1): 89.92.

DENBY, L. G., WOOLIAM, G. E., 1962: The Development of Verticillium Resistant Strains of Established Tomato Varieties, Canadian Journal Plant Science 42,681-685.

LATERROT, H., 1972: Sélection de tomates résistantes à Fusarium oxysporum f. sp. lycopersici, Phytopathologia Mediterranea, Volume XI, No. 3, p. 154-158.

LATERROT, H., 1981: La lutte génétique contre la Cladosporiose de la Tomate en France, P.H.M. Revue Horticole, No. 214, February 1981.

LATERROT, H., 1973: Résistance de la Tomate au virus de la Mosaïque du Tabac. Difficultés rencontrées pour la Sélection de variétés résistantes, Ann.Amelior.Plantes, 1973, 23(4), 287-313.

LATERROT, H., 1990: Situation de la lutte génétique contre les parasites de la Tomate dans les pays méditerranéens, P.H.M. Revue Horticole, No. 303, January 1990.

LATERROT, H., 1975: Sélection pour la résistance au Mildiou, Phytophthora infestans MONT. DE BARY chez la Tomate, Ann.Amelior.Plantes, 1975, 25(2), 129-149.

LATERROT, H., 1982: L'argenture de la Tomate, P.H.M. Revue Horticole, No. 225, March 1982.

LATERROT, H., 1983: La lutte génétique contre la maladie des racines liégeuses de la Tomate, P.H.M. Revue Horticole, No. 238, June-July 1983.

LATERROT, H. and BLANCARD, D., 1983: Criblage d'une série de lignées et d'hybrides F1 de Tomate pour la résistance à la Stemphyliose, Phytopath. medit. 1983, 22, 188-193.

LATERROT, H. and BLANCARD, D., 1986: Les Stemphyliia rencontrés sur la Tomate, Phytopath. medit. 1986, 25, 140-144.

ANNEX II



European Union
Community Plant Variety Office

TECHNICAL QUESTIONNAIRE

to be completed in connection with an application for Community Plant Variety Rights
Please answer all questions. A question without any answer will lead to a non-attribution
of an application date. In cases where a field / question is not applicable, please state so.

1. **Botanical taxon:** Name of the genus, species or sub-species to which the variety belongs and common name

Lycopersicon esculentum Mill.

TOMATO

2. **Applicant(s):** Name(s) and address(es), phone and fax number(s), Email address, and where appropriate name and address of the procedural representative

3. **Variety denomination**

a) Where appropriate proposal for a variety denomination:

b) Provisional designation (breeder's reference):

4. Information on origin, maintenance and reproduction of the variety

4.1 Breeding, maintenance and reproduction of the variety

Please indicate breeding scheme, parents, other relevant information

(a)

(i) hybrid.....[]

(ii) open-pollinated variety[]

(iii) parent line[]

(b)

(i) seed propagated[]

(ii) vegetatively propagated.....[]

(c) Other information on genetic origin and breeding method..... []

4.2 Geographical origin of the variety: the region and the country in which the variety was bred or discovered and developed

4.3 Shall the information on data relating to components of hybrid varieties including data related to their cultivation be treated as confidential?

[] YES

[] NO

If yes, please give this information on the attached form for confidential information.

If no, please give information on data relating to components of hybrid varieties including data related to their cultivation:

Breeding scheme (indicate female component first)

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in the CPVO Protocol; please mark the state of expression which best corresponds).			
	Characteristics	Example varieties	Note
5.1 (2)	Plant: growth type		
	determinate	Campbell 1327, Prisca	1 []
	indeterminate	Marmande VR, Saint-Pierre, San Marzano 2	2 []
5.2 (10)	Leaf: division of blade		
	pinnate	Pilot, Red Jacket, Mikado	1 []
	bipinnate	Lukullus, Saint-Pierre	2 []
5.3 (21)	Peduncle: abscission layer		
	absent	Aledo, Bandera, Count, Lerica	1 []
	present	Montfavet H 63.5, Roma	9 []
5.3 (23)	Fruit: size		
	very small	Cerise, Sweet 100	1 []
	small	Early Mech, Europeel, Roma	3 []
	medium	Alphamech, Diego	5 []
	large	Carmello, Ringo	7 []
	very large	Erlidor, Lydia, Muril	9 []

Characteristics		Example varieties	Note
5.5 (25)	Fruit: shape in longitudinal section		
	flattened	Campbell 28, Marmande VR	1 []
	slightly flattened	Montfavet H 63.5, Montfavet H 63.4	2 []
	circular	Cerise, Moneymaker	3 []
	rectangular	Early Mech, Peto Gro	4 []
	cylindrical	Hypeel 244, Macero II, San Marzano 2	5 []
	elliptic	Alcaria, Castone	6 []
	heart-shaped	Valenciano	7 []
	obovate	Barbara	8 []
	ovate	Rimone, Rio Grande	9 []
	pear-shaped	Europeel	10 []
5.6 (34)	Fruit: number of locules		
	only two	Early Mech, Europeel, San Marzano	1 []
	two or three	Alphamech, Futuria	2 []
	three or four	Montfavet H 63.5	3 []
	four, five or six	Raïssa, Tradiro	4 []
	more than six	Marmande VR	5 []
5.7 (35)	Fruit: green shoulder (before maturity)		
	absent	Rio Grande, Felicia, Trust	1 []
	present	Montfavet H 63.5, Daniela	9 []
5.8 (39)	Fruit: colour at maturity		
	cream	Jazon, White Mirabell	1 []
	yellow	Goldene Königin, Yellow Pear	2 []
	orange	Sungold	3 []
	pink	House Momotaro	4 []
	red	Daniela, Ferline, Montfavet H 63.5	5 []
	brownish	Ozyrys	6 []

Characteristics		Example varieties	Note
5.9 (45)	Resistance to <i>Meloidogyne incognita</i>		
	susceptible	Casaque Rouge, Clairvil	1 []
	intermediate resistant	Vinchy, Madyta	2 []
	resistant	Anabel, Anahu	3 []
5.10 (46)	Resistance to <i>Verticillium dahliae</i>		
	absent	Anabel, Marmande verte	1 []
	present	Clairbil, Marmande VR	9 []
5.11 (47.1)	Resistance to <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i> Race 0 (ex1)		
	absent	Marmande verte	1 []
	present	Anabel, Marporum, Marsol	9 []
5.12 (47.2)	Resistance to <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i> Race 1 (ex2)		
	absent	Marmande verte	1 []
	present	Motelle, Walter	9 []
5.13 (50.1)	Resistance to Tomato Mosaic Virus – Strain 0		
	absent	Monalbo	1 []
	present	Mobaci, Mocimor, Moperou	9 []
6. Similar varieties and differences from these varieties:			
Denomination of similar variety	Characteristic in which the similar variety is different ¹⁾	State of expression of similar variety	State of expression of candidate variety
_____ ¹⁾ In the case of identical states of expressions of both varieties, please indicate the size of the difference			

7. Additional information which may help to distinguish the variety

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

	absent	present	not tested
a) Sensitivity to silvering (char. 44)	[]	[]	[]
Resistance to :			
b) <i>Fusarium oxysporum</i> f. sp. <i>radicis lycopersici</i> (char. 48)	[]	[]	[]
c) <i>Cladosporium fulvum</i> :			
(i) Race 0 (char. 49.1)	[]	[]	[]
(ii) Group A (char. 49.2)	[]	[]	[]
(iii) Group B (char. 49.3)	[]	[]	[]
(iv) Group C (char. 49.4)	[]	[]	[]
(v) Group D (char. 49.5)	[]	[]	[]
(vi) Group E (char. 49.6)	[]	[]	[]
d) Tomato Mosaic Virus			
(i) Stain 1 (char. 50.2)	[]	[]	[]
(ii) Stain 2 (char. 50.3)	[]	[]	[]
(iii) Stain 1-2 (char. 50.4)	[]	[]	[]
e) <i>Phytophthora infestans</i> (char. 51)	[]	[]	[]
f) <i>Pyrenochaeta lycopersici</i> (char. 52)	[]	[]	[]
g) <i>Stemphylium</i> spp. (char. 53)	[]	[]	[]
h) <i>Pseudomonas syringae</i> pv. tomato (char. 54)	[]	[]	[]
i) <i>Ralstonia solanacearum</i> race 1 (char. 55)	[]	[]	[]
j) Tomato Yellow Leaf Curl Virus (char. 56)	[]	[]	[]
k) Tomato Spotted Wilt Virus (char. 57)	[]	[]	[]
l) <i>Leveillula taurica</i> (char. 58)	[]	[]	[]
m) <i>Oidium lycopersicum</i> (char. 59)	[]	[]	[]
n) Others (please specify)			

7.2 Special conditions for the examination of the variety

- | | | |
|------|---|-------|
| (i) | Type of culture | |
| | - under glass | [] |
| | - in the open | [] |
| (ii) | Main use | |
| | - fresh market or garden | [] |
| | - industrial processing (indicate type) | [] |
| | - pot plant | [] |

7.3 Other information

☐ YES, please specify

☐ NO

8. GMO-information required

The variety represents a Genetically Modified Organism within the meaning of Article 2(2) of Council Directive 2001/18/EC of 12/03/2001.

☐ YES ☐ NO

If yes, please add a copy of the written attestation of the responsible authorities stating that a technical examination of the variety under Articles 55 and 56 of the Basic Regulation 2100/94 does not pose risks to the environment according to the norms of the above-mentioned Directive.

9. Information on plant material to be examined

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 or pesticide) | ☐ Yes | ☐ No |
| (c) Tissue culture | ☐ Yes | ☐ No |
| (d) Other factors | ☐ Yes | ☐ No |

Please provide details of where you have indicated "Yes":

I/we hereby declare that to the best of my/our knowledge the information given in this form is complete and correct.

Date

Signature

Name

[End of document]