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PARTIAL REVISION OF THE TEST GUIDELINES FOR MELON
(DOCUMENT TG/104/5)

Document prepared by the Office of the Union

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1. At its forty-seventh session held in Nagasaki, Japan, from May 20 to 24, 2013, the Technical Working Party for Vegetables (TWV) considered the partial revision of the Test Guidelines for Melon on the basis of document TG/104/5 (see document TWV/47/34 "Report", paragraphs 76 to 78).

2. The proposed revisions are presented in the Annex to this document.

3. The structure of the Annex of this document is as follows:

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ANNEX

Proposal for a Revision of the Grouping Characteristics in Chapter 5.3

Current wording:

(a) Inflorescence: sex expression (at full flowering) (characteristic 12)
(b) Fruit: shape in longitudinal section (characteristic 28)
(c) Fruit: ground color of skin (characteristic 29)
(d) Fruit: warts (characteristic 38)
(e) Fruit: grooves (characteristic 43)
(f) Fruit: cork formation (characteristic 48)
(g) Fruit: main color of flesh (characteristic 54)
(h) Seed: length (characteristic 60)
(i) Seed: color (characteristic 63)

Proposed new wording:

(a) Inflorescence: sex expression (at full flowering) (characteristic 12)
(b) Fruit: shape in longitudinal section (characteristic 28)
(c) Fruit: ground color of skin (characteristic 29)
(d) Fruit: warts (characteristic 38)
(e) Fruit: grooves (characteristic 43)
(f) Fruit: cork formation (characteristic 48)
(g) Fruit: main color of flesh (characteristic 54)
(h) Seed: length (characteristic 60)
(i) Seed: color (characteristic 63)
(j) Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 0 (characteristic 69.1)
(k) Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 1 (characteristic 69.2)
(l) Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 2 (characteristic 69.3)

Proposal for a Revision of the Chapter 7: Table of Characteristics
Proposal to revise Characteristics 69 to 76

Current wording:

69. **(+)**	**VG**	**Resistance to *Fusarium oxysporum* f. sp. *melonis***	**Résistance à *Fusarium oxysporum* f. sp. *melonis***	**Resistenz gegen *Fusarium oxysporum* f. sp. *melonis***	**Resistencia al *Fusarium oxysporum* f. sp. *melonis***		
QL		---	---	---	---	---	---
69.1		**Race 0**	**Pathotype 0**	**Pathotyp 0**	**Raza 0**		
		absent	absente	fehlend	ausente	Jaune Canari 2	1
		present	présente	vorhanden	presente	Jador, Joker, Védrantais	9
		---	---	---	---	---	---
69.2		**Race 1**	**Pathotype 1**	**Pathotyp 1**	**Raza 1**		
		absent	absente	fehlend	ausente	Jaune Canari 2, Védrantais	1
		present	présente	vorhanden	presente	Jador, Joker	9
		---	---	---	---	---	---
69.3		**Race 2**	**Pathotype 2**	**Pathotyp 2**	**Raza 2**		
		absent	absente	fehlend	ausente	Jaune Canari 2, Joker	1
		present	présente	vorhanden	presente	Jador, Védrantais	9
		---	---	---	---	---	---
69.4 **(+)**		**Race 1-2**	**Pathotype 1-2**	**Pathotyp 1-2**	**Raza 1-2**		
		absent	absente	fehlend	ausente	Jaune Canari 2 Joker, Védrantais	1
		present	présente	vorhanden	presente	Jador	9

Proposed new wording:

69.	VG	Resistance to *Fusarium oxysporum* f. sp. *melonis*	Résistance à *Fusarium oxysporum* f. sp. *melonis*	Resistenz gegen *Fusarium oxysporum* f. sp. *melonis*	Resistencia al *Fusarium oxysporum* f. sp. *melonis*		
		---	---	---	---	---	---
69.1 (*) (+)		**Race 0**	**Race 0**	**Pathotyp 0**	**Raza 0**		
QL		absent	absente	fehlend	ausente	Jaune Canari 2	1
		present	présente	vorhanden	presente	Jador, Védrantais	9
		---	---	---	---	---	---
69.2 (*) (+)		**Race 1**	**Race 1**	**Pathotyp 1**	**Raza 1**		
QL		absent	absente	fehlend	ausente	Jaune Canari 2, Védrantais	1
		present	présente	vorhanden	presente	Arapaho, Jador, Rubbens	9
		---	---	---	---	---	---
69.3 (*) (+)		**Race 2**	**Race 2**	**Pathotyp 2**	**Raza 2**		
QL		absent	absente	fehlend	ausente	Arapaho, Jaune Canari 2, Rubbens	1
		present	présente	vorhanden	presente	Anasta, Cléo, Jador, Védrantais,	9
		---	---	---	---	---	---
69.4 (+)		**Race 1.2**	**Race 1.2**	**Pathotyp 1.2**	**Raza 1.2**		
QN		susceptible	sensible	anfällig	susceptible	Jaune Canari 2, Védrantais, Virgos	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Lunasol	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Dinero, Isabelle	3

Current wording:

70. **(+)** **QN**	**VG**	**Resistance to *Sphaerotheca fuliginea (Podosphaera xanthii)* (Powdery mildew)**	**Résistance à *Sphaerotheca fuliginea (Podosphaera xanthii)* (oïdium)**	**Resistenz gegen *Sphaerotheca fuliginea (Podosphaera xanthii* (Echter Mehltau)**	**Resistencia a *Sphaerotheca fuliginea (Podosphaera xanthii)* (Oidio)**		
		---	---	---	---	---	---
70.1		**Race 1**	**Pathotype 1**	**Pathotyp 1**	**Raza 1**		
		susceptible	sensible	anfällig	susceptible	Alpha, Boneto, Delta, Jerac	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Escrito	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Cézanne, Anasta, Théo	3
		---	---	---	---	---	---
70.2		**Race 2**	**Pathotype 2**	**Pathotyp 2**	**Raza 2**		
		susceptible	sensible	anfällig	susceptible	Boneto, Galoubet	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Flores, Enzo, Escrito	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Anasta, Cézanne, Théo	3
70.3		---	---	---	---	---	---
		Race 5	**Pathotype 5**	**Pathotyp 5**	**Raza 5**		
		susceptible	sensible	anfällig	susceptible	Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Enzo, Flores	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Gaetano, Lucas, Théo	3

Proposed new wording:

70.	**VG**	**Resistance to *Podosphaera xanthii (Sphaerotheca fuliginea)* (Powdery mildew)**	**Résistance à *Podosphaera xanthii (Sphaerotheca fuliginea)* (oïdium)**	**Resistenz gegen *Podosphaera xanthii (Sphaerotheca fuliginea)* (Echter Mehltau)**	**Resistencia a *Podosphaera xanthii (Sphaerotheca fuliginea)* (Oidio)**		
		---	---	---	---	---	---
70.1		**Race 1**	**Race 1**	**Pathotyp 1**	**Raza 1**		
(+)							
QN		susceptible	sensible	anfällig	susceptible	Jaune Canari 2, Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Escrito	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Anasta,Cézanne,	3
		---	---	---	---	---	---
70.2		**Race 2**	**Race 2**	**Pathotyp 2**	**Raza 2**		
(+)							
QN		susceptible	sensible	anfällig	susceptible	Galoubet, Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Escrito, Pendragon	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Anasta, Cézanne	3
		---	---	---	---	---	---
70.3		**Race 3**	**Race 3**	**Pathotyp 3**	**Raza 3**		
(+)							
QN		susceptible	sensible	anfällig	susceptible	Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Nettuno	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Batista, Godiva	3
		---	---	---	---	---	---
70.4		**Race 5**	**Race 5**	**Pathotyp 5**	**Raza 5**		
(+)							
QN		susceptible	sensible	anfällig	susceptible	Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Hugo, Pendragon	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Arapaho	3
		---	---	---	---	---	---
70.5		**Race 3-5**	**Race 3-5**	**Pathotyp 3-5**	**Raza 3-5**		
(+)							
QN		susceptible	sensible	anfällig	susceptible	Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Cisco	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	90625	3

Current wording:

71. **(+)**	**VG**	**Resistance to *Erysiphe cichoracearum (Golovinomyces cichoracearum)* Race 1 (Powdery mildew)**	**Résistance à *Erysiphe cichoracearum (Golovinomyces cichoracearum)* Pathotype 1 (oïdium)**	**Resistenz gegen *Erysiphe cichoracearum (Golovinomyces cichoracearum)* Pathotyp 1 (Echter Mehltau)**	**Resistencia a *Erysiphe cichoracearum (Golovinomyces cichoracearum)* Raza 1 (Oidio)**		
QN		susceptible	sensible	anfällig	susceptible	Bastion, Boneto	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Flores, Anasta	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Cézanne, Heliobel, Théo	3

Proposed new wording:

71. **(+)**	**VG**	**Resistance to *Golovinomyces cichoracearum (Erysiphe cichoracearum)* Race 1 (Powdery mildew)**	**Résistance à *Golovinomyces cichoracearum (Erysiphe cichoracearum)* Race 1 (oïdium)**	**Resistenz gegen *Golovinomyces cichoracearum (Erysiphe cichoracearum* Pathotyp 1 (Echter Mehltau)**	**Resistencia a *Golovinomyces cichoracearum (Erysiphe cichoracearum)* Raza 1 (Oidio)**		
QN		susceptible	sensible	anfällig	susceptible	Escrito, Score, Védrantais	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente	Anasta	2
		highly resistant	hautement résistant	hochresistent	altamente resistente	Heliobel	3

Current wording:

72. **(+)**	**VG**	**Resistance to colonization by *Aphis gossypii***	**Résistance à la colonisation par *Aphis gossypii***	**Resistenz gegen Befall durch *Aphis gossypii***	**Resistencia a la colonización por *Aphis gossypii***		
QL		absent	absente	fehlend	ausente	Charentais	1
		present	présente	vorhanden	presente	AR, Margot, Top Mark	9

Proposed new wording:

72. **(+)**	**VG**	**Resistance to colonization by *Aphis gossypii***	**Résistance à la colonisation par *Aphis gossypii***	**Resistenz gegen Befall durch *Aphis gossypii***	**Resistencia a la colonización por *Aphis gossypii***		
QL		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	AR Hale's Best Jumbo, AR Top Mark, Godiva, Heliobel, Virgos	9

Current wording:

73.	**VG**	**Resistance to Zucchini Yellow Mosaic Virus (ZYMV) Race F**	**Résistance au virus de la mosaïque jaune de la courgette (ZYMV) Pathotype F**	**Resistenz gegen Zucchinigelb-mosaikvirus (ZYMV), Pathotyp F**	**Resistencia al virus del mosaico amarillo del calabacín (ZYMV) Raza F**		
(+)							
QL		absent	absente	fehlend	ausente	Alpha, Boule d'Or, Cantor, Doublon	1
		present	présente	vorhanden	presente	Eloro, Hermes, Védrantais	9

Proposed new wording:

73.	**VG**	**Resistance to *Zucchini yellow mosaic virus* (ZYMV)**	**Résistance au virus de la mosaïque jaune de la courgette (ZYMV)**	**Resistenz gegen Zucchinigelb-mosaikvirus (ZYMV)**	**Resistencia al virus del mosaico amarillo del calabacín (ZYMV)**		
(+)							
QL		absent	absente	fehlend	ausente	Cardillo, Généris, Jador, Védrantais	1
		present	présente	vorhanden	presente	Hannah's Choice, Lunaduke	9

Current wording:

74.	**VG**	**Resistance to Papaya Ring Spot Virus (PRSV)**	**Résistance au virus des taches annulaires du papayer**	**Resistenz gegen Papayaringflecken-virus (PRSV)**	**Resistencia al virus de la mancha anular del papayo (PRSV)**		
(+)							
QL		----------	----------	----------	----------	----------	-------
74.1		**Race GVA**	**Pathotype GVA**	**Pathotyp GVA**	**Raza GVA**		
		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	WMRV 29, 72025	9
		----------	----------	----------	----------	----------	-------
74.2		**Race E2**	**Pathotype E2**	**Pathotyp E2**	**Raza E2**		
		absent	absente	fehlend	ausente	Védrantais, 72025	1
		present	présente	vorhanden	presente	WMRV 29	9

Proposed new wording:

74.	**VG**	**Resistance to *Papaya ringspot virus* (PRSV)**	**Résistance au virus des taches annulaires du papayer (PRSV)**	**Resistenz gegen Papayaringflecken-virus (PRSV)**	**Resistencia al virus de la mancha anular del papayo (PRSV)**		
		----------	----------	----------	----------	----------	-------
74.1		**Guadeloupe strain**	**Souche Guadeloupe**	**Pathotyp Guadeloupe**	**Cepa Guadeloupe**		
(+)							
QL		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	Hannah's Choice	9
		----------	----------	----------	----------	----------	-------
74.2		**E2 strain**	**Souche E2**	**Pathotyp E2**	**Cepa E2**		
(+)							
QL		absent	absente	fehlend	ausente	Hannah's Choice, Védrantais	1
		present	présente	vorhanden	presente	WMR29	9

Current wording:

75. **(+)**	**VG**	**Resistance to Muskmelon Necrotic Spot Virus (MNSV) Race E_8**	**Résistance au virus de la criblure du melon (MNSV) Pathotype E_8**	**Resistenz gegen Netzmelonen-nekrosefleckenvirus (MNSV), Pathotyp E_8**	**Resistencia al virus del cribado del melón (MNSV) Raza E_8**		
QL		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	Primal, VA 435	9

Proposed new wording:

75. **(+)**	**VG**	**Resistance to *Melon necrotic spot virus* (MNSV) E8 strain**	**Résistance au virus de la criblure du melon (MNSV) Souche E8**	**Resistenz gegen Netzmelonen-nekrosefleckenvirus (MNSV) Pathotyp E8**	**Resistencia al virus del cribado del melón (MNSV) Raza E8**		
QL		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	Cyro, Primal, Yellow Fun, Virgos	9

Current wording:

76. **(+)**	**VG**	**Resistance to Cucumber Mosaic Virus (CMV)**	**Résistance au virus de la mosaïque du concombre (CMV)**	**Resistenz gegen Gurkenmosaikvirus (CMV)**	**Resistencia al virus del mosaico del pepino (CMV)**		
QL		absent	absente	fehlend	ausente	Cézanne, Dalton	1
		present	présente	vorhanden	presente	Lunaduke	9

Proposed new wording:

76. **(+)**	**VG**	**Resistance to *Cucumber mosaic virus* (CMV)**	**Résistance au virus de la mosaïque du concombre (CMV)**	**Resistenz gegen Gurkenmosaikvirus (CMV)**	**Resistencia al virus del mosaico del pepino (CMV)**		
QL		absent	absente	fehlend	ausente	Védrantais	1
		present	présente	vorhanden	presente	Virgos, Lunaduke	9

Proposal for a Revision of the Chapter 8: Explanations on the Table of Characteristics
Proposal to Include a Revised Format for Disease Resistance Characteristics under section 8.2

(Current and Proposed New Wording are presented on opposite pages)

Current wording:

Ads. 69.1 - 69.3: Resistance to *Fusarium oxysporum* f. sp. *melonis,* races 0, 1 and 2

Maintenance of races

Type of medium:	on agar medium at 22 to 25°C
Special conditions:	transplantation of races each month

Execution of test

Growth stage of plants:	cotyledons expanded
Temperature:	24°C during day, 18°C during night
Light:	10 - 12 hours per day
Growing method:	Petri dishes in climatic chambers
Method of inoculation:	soaking of the root system in a suspension of liquid medium of fungus
Duration of test	
- from sowing to inoculation:	10-15 days
- from inoculation to reading:	20 days, death of susceptible plants
Number of plants tested:	30 plants
Remarks:	plants raised and transplanted in sterilized sand, irrigation with nutrient solution

Proposed new wording:

Ads. 69.1 - 69.3: Resistance to *Fusarium oxysporum* f. sp. *melonis,* races 0, 1 and 2 (Fom)

1.	Pathogen	*Fusarium oxysporum* f. sp. *melonis*
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR), Naktuinbouw (NL)
5.	Isolate	Fom: 0, Fom: 1, Fom: 2
6.	Establishment isolate identity	use differential varieties:

	Gene	Race 0	Race 1	Race 2
Charentais T		S	S	S
Védrantais	*Fom-1*	R	S	R
Charentais Fom-2	*Fom-2*	R	R	S
Isabelle, Jador		R	R	R

7.	Establishment pathogenicity	use susceptible melon varieties
8.	Multiplication inoculum	
8.1	Multiplication medium	on agar medium – e.g.Potato Dextrose Agar
8.2	Multiplication variety	-
8.3	Plant stage at inoculation	-
8.4	Inoculation medium	on liquid medium
8.5	Inoculation method	-
8.6	Harvest of inoculum	-
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. 3
9.3	Control varieties	Jaune Canari 2 (susceptible), Vedrantais, Arapaho, Rubbens, Anasta, Cleo (resistant, depending on the considered race)

	Gene	Race 0	Race 1	Race 2
Jaune Canari 2		S	S	S
Védrantais	*Fom-1*	R	S	R
Arapaho, Rubbens	*Fom-2*	R	R	S
Anasta, Cleo		R	R	R

9.4	Test design	-
9.5	Test facility	glasshouse or climatic room
9.6	Temperature	18-25°C
9.7	Light	12h
9.8	Season	all seasons
9.9	Special measures	optional: shading (no direct sunlight during 12 h after inoculation
10.	Inoculation	
10.1	Preparation inoculum	aerated culture 7-10 days, eg. Czapek Dox broth some isolates need filtration or centrifugation resuspend the pelleted spores in demineralized water
10.2	Quantification inoculum	spore count; adjust to 10^6 -10^7 per mL
10.3	Plant stage at inoculation	cotyledon expanded
10.4	Inoculation method	soaking of the root system in a suspension of liquid medium of fungus at least 30 sec - 5 min
10.5	First observation	7 days post inoculation

10.6	Second observation	14 -20 days post inoculation
10.7	Final observations	20 days post inoculation
11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	
	[1] absent	Growth retardation in combination with yellowing or wilting cotyledons (useful for judging the severity of the attack), possible internal vessel browning, death of plant.
	[9] present	no symptoms
11.3	Validation of test	on standards
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	For Race 1.2 the modified protocol on the next page should be used.

Current wording:

Ad. 69.4: Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 1-2

Maintenance of races

Type of medium:	on agar medium at 22 to 25°C
Special conditions:	transplantation of races each month

Execution of test

Growth stage of plants:	cotyledons expanded
Temperature:	24°C during day, 18°C during night
Light:	12 hours per day
Growing method:	dishes in climatic chambers
Method of inoculation:	absorption of 700 ml of a very diluted (30 to 50 times) fungus culture
Duration of test	
- from sowing to inoculation:	10 to 15 days
- from inoculation to reading:	3 weeks, until the death of the susceptible control
Number of plants tested:	30 plants
Remarks:	a moderately aggressive type of race 1-2 should be used as this is likely to show the difference between the presence and absence of resistance most clearly.

Proposed new wording:

Ad. 69.4: Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 1.2 (Fom)

1.	Pathogen	*Fusarium oxysporum* f. sp. *melonis*
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR), Naktuinbouw (NL)
5.	Isolate	Fom: 1.2 (moderately aggressive): TST strain
6.	Establishment isolate identity	use differential varieties: Védrantais, Virgos (susceptible), Lunasol (moderately resistant), Dinero, Isabelle (highly resistant)
7.	Establishment pathogenicity	use susceptible melon varieties
8.	Multiplication inoculum	
8.1	Multiplication medium	on agar medium e.g. Potato Dextrose Agar
8.2	Multiplication variety	-
8.3	Plant stage at inoculation	-
8.4	Inoculation medium	on liquid medium
8.5	Inoculation method	-
8.6	Harvest of inoculum	-
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 30
9.2	Number of replicates	e.g. 3
9.3	Control varieties	
	[1] susceptible	Védrantais, Virgos,
	[2] moderately resistant	Lunasol (the lowest accepted level)
	[3] highly resistant	Dinero, Isabelle, Jador
9.4	Test design	-
9.5	Test facility	glasshouse or climatic room
9.6	Temperature	18-25°C
9.7	Light	at least 12h
9.8	Season	All seasons in a climatic room / in a greenhouse: be aware of the strong environmental effect: winter could be too severe and summer could be too mild.
9.9	Special measures	optional shading (no direct sunlight during 12 h after inoculation)
10.	Inoculation	
10.1	Preparation inoculum	aerated culture 7-10 d old – e.g.: Czapek Dox broth
10.2	Quantification inoculum	spore count; adjust to 2.10^4 - 10^5 per ml
10.3	Plant stage at inoculation	cotyledons expanded
10.4	Inoculation method	soaking of the trays in spore suspension; 700 ml for a tray with 25 - 30 plants, plants are not uprooted
10.5	First observation	7 - 14 days post inoculation
10.6	Second observation	14 - 21 days post inoculation
10.7	Final observations	21- 28 days post inoculation

11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	symptoms:
	[1] susceptible	Védrantais: growth retardation, yellow cotyledons, drying, possible internal vessel browning, death of the plant
	[2] moderately resistant	Symptoms may be present, but the level of expression must be distinctly lower than the susceptible control variety. = the lowest level of resistance is defined by the behavior of Lunasol
	[3] highly resistant	Symptoms may be present, but the level of expression must be lower than the moderately control variety Lunasol.
11.3	Validation of test	on standards; Lunasol is intermediate and will show a percentage of diseased plants (quantitative evaluation)
11.4	Off-types	calibrate with Lunasol
12.	Interpretation of data in terms of UPOV characteristic states	QN
13.	Critical control points	A moderately aggressive type of Fom: 1.2 should be used as this is likely to show the difference between the presence and absence of resistance most clearly. There are two types of *Fusarium oxysporum* f. sp. *melonis,* Fom:1.2, viz. Fom: 1.2y which is a yellowing type with yellowing symptoms on leaves and another type and Fom: 1.2w which is a wilt type with wilting symptoms on leaves.

Current wording:

Ads. 70.1 to 70.3: Resistance to *Sphaerotheca fuliginea (Podosphaera xanthii)*, races 1, 2 and 5
Ad. 71: Resistance to *Erysiphe cichoracearum (Golovinomyces cichoracearum)*, race 1

1. Inoculum

Production of cotyledons

Cotyledons to be inoculated and tested: sow the seed in disinfected peat inside a closed mini glasshouse. When the cotyledons have expanded, remove them from the plant.

Desinfect the cotyledons by soaking them for 3 minutes in a mercuric chloride solution (0.05%). Rinse them twice with sterilized water. Dry the cotyledons with sterile paper towel, then place them in Petri dishes with the following medium:

sucrose	10 g
mannitol	20 g
agar	5 g
distilled water	1 liter

Propagation of the strains

Scatter conidia on the cotyledons and blow them. Incube the inoculated cotyledons in Petri dishes at 23°C during 14 hours in the light and at 18°C during 10 hours in the dark.

9 to 11 days after the inoculation, the cotyledons will be covered with spores and can be used as an inoculum.

Maintenance of races

Type of medium: on inoculated cotyledons

Special conditions: 17°C, under very low light intensity. Maximum storage time is 1 to 1.5 months, after the inoculation.

2. Execution of Test

Inoculation on leaf disks (to be used as routine method)

Leaf disks, 2 cm in diameter, are taken from young plants and placed in polystyrene boxes (180 x 125 mm, 54 leaf disks per box) on a medium (mannitol 40g/l, benzamidazole 30 mg/l, agar 4 g/l). The leaf disks are inoculated by placing the boxes at the base of an inoculation tower (height: 1.00 m, diameter 0.25 m).

A cotyledon, already covered with inoculum, is placed on the top of the tower and blown with a Pasteur pipette to detach spores. Wait 1 to 2 minutes so that the conidia fall down through the tower onto the leaf discs. The leaf disks are kept for 24 hours in the dark by covering the boxes with a black polyethylene sheet. The boxes are then placed in a climatised chamber (20°C in the light for 14 hours; 24°C in the dark, for 10 hours per day).

Duration of test/Number of plants

- from inoculation to reading: 10 days
- number of plants tested: 5

Scoring

Strongly resistant varieties (Note 3)
0 no development of the fungi
1 isolated colonies (less than 10% of the disk surface)
Moderately resistant varieties (especially for *Erysiphe cichoracearum (Golovinomyces cichoracearum)) (Note 2)*
2 isolated colonies (more than 10 % of the disk surface)
3 all the disk surface is covered with weak sporulation
Susceptible varieties (Note 1)
4 sporulation on all the disk surface
5 intense sporulation

Inoculation on young plants (to be used as a complementary method to the disk method, if necessary)

Take spores from a cotyledon already covered with conidia and deposit them on a leaf taken from a young plant. You can also proceed by blowing the spores from a cotyledon by the method mentioned above.

Scoring

Strongly resistant varieties (Note 3)
0 no development of the fungi
1 isolated colonies (less than 10% of the leaves)
Moderately resistant varieties (especially for *Erysiphe cichoracearum (Golovinomyces cichoracearum)) (Note 2)*
3 isolated colonies (more than 10% of the leaves)
5 weak sporulation
Susceptible varieties (Note 1)
7 medium sporulation
9 intense sporulation

3. Host differentials

	***Sphaerotheca fuliginea* (*Podosphaera xanthii*)**					***Erysiphe cichoracearum* (*Golovinomyces cichoracearum*)**	
	race 0	**race 1**	**race 2**	**race 4**	**race 5**	**race 0**	**race 1**
Iran H	S	S	S	S	S	S	S
Védrantais	R	S	S	S	S	R	S
PMR 45	R	R	S	S	S	R	S
WMR 29	R	R	R	S	S	R	S
Edisto 47	R	R	R	R	S	R	R
MR-1, PI 124112	R	R	R	R	R	R	R
PMR 5							
Nantais Oblong	R	S	S	S	S	R	R

S: susceptible (high sporulation) R: resistant (low sporulation)

Proposed new wording:

Ads. 70.1 to 70.3: Resistance to *Podosphaera xanthii* (*Sphaerotheca fuliginea*) (Powdery mildew) Px (Sf)
Ad. 71: Resistance to *Golovinomyces cichoracearum (Erysiphe cichoracearum),* race 1 (Powdery mildew) Gc (Ec)

1.	Pathogen	Powdery mildew: *Podosphaera xanthii* (*Spaerotheca fuliginea*) races 1, 2, 3, 5 and 3-5 *Golovinomyces cichoracearum* (*Erysiphe cichoracearum*) race 1
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR)
5.	Isolate	Px: races 1, 2, 3, 5 and 3-5; Gc: race 1
6.	Establishment isolate identity	on differentials:

	Powdery Mildew					
	***Podosphaera xanthii* (*Sphaerotheca fuliginea*)**					***Golovinomyces cichoracearum* (*Erysiphe cichoracearum*)**
	race 1	**race 2**	**race 3**	**race 5**	**race 3-5**	**race 1**
Védrantais	S	S	S	S	S	S
Nantais Oblong	S	S	S	S	S	R
PMR 45	R	S	S	S	S	S
Edisto 47, WMR 29	R	R	R	S	S	S
PI 124112, 90625	R	R	R	R	R	R
PMR 5	R	R	S	R	S	R
PI 414723	R	R	IR	R	R/ IR	R

Legend: S susceptible (high sporulation); R resistant (low sporulation), IR (moderately resistant)

7.	Establishment pathogenicity	use susceptible melon varieties
8.	Multiplication inoculum	
8.1	Multiplication medium	detached cotyledon in Petri-dish on 0.35 – 0.5% Agar, 1-2% mannitol, possible add of 1% sucrose
8.2	Multiplication variety	susceptible varieties
8.3	Plant stage at inoculation	young, unfolded cotyledon; decontaminated with e.g. 0.05% mercuric chloride or 3 to 5% bleach (NaClO + NaCl)
8.4	Inoculation medium	air
8.5	Inoculation method	scatter conidia on the cotyledons transferred by blowing
8.6	Harvest of inoculum	use cotyledons with strong sporulation
8.7	Check of harvested inoculum	check presence of spores
8.8	Shelflife/viability inoculum	on cotyledon, 17-23°C, under very low light intensity; maximum storage time is 15 days, after the inoculation Remark: In case of longer term preservation, inoculate locally with a few spores, store at 14°C/12h low light per day
9.	Format of the test	
9.1	Number of plants per genotype	at least 16 plants
9.2	Number of replicates	e.g. 3

9.3	Control varieties	

	Powdery Mildew					
	Podosphaera xanthii					*Golovinomyces cichoracearum*
	race 1	**race 2**	**race 3**	**race 5**	**race 3-5**	**race 1**
susceptible	Jaune Canari 2, Védrantais	Galoubet, Védrantais	Védrantais	Védrantais	Védrantais	Védrantais
moderately resistant	Escrito	Escrito, Pendragon	Nettuno	Hugo, Pendragon	Cisco	Anasta
highly resistant	Anasta, Cézanne	Anasta, Cézanne	Batista, Godiva	Arapaho	90625	Heliobel

9.4	Test design	leaf discs placed on 0.4% agar with 1- 4% mannitol and possible add of 0.003% benzimidazol
9.5	Test facility	climatic room
9.6	Temperature	20-24°C
9.7	Light	12 to 24h darkness after inoculation
9.8	Season	-
9.9	Special measures	Inoculation tower needed for even distribution of dry spores.
10.	Inoculation	
10.1	Preparation inoculum	-
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	Routine method: leaf disks, 2 cm in diameter, from young plants. Complementary method, if necessary: young plants
10.4	Inoculation method	Routine method: on leaf disks: inoculation tower needed for even distribution of dry spores. Complementary method: take spores from a cotyledon covered with conidia and deposit them on a leaf or blow the spores from a cotyledon.
10.5	First observation	8-10 days post inoculation
10.6	Second observation	-
10.7	Final observations	11-12 days post inoculation
11.	Observations	-
11.1	Method	visual
11.2	Observation scale	
	[1] susceptible	medium or intense sporulation all over the leaf disc surface
	[2] intermediate	weak sporulation all over the surface or isolated colonies on more than 10% of the surface
	[3] resistant	isolated colonies on less than 10% of the surface or no sporulation
11.3	Validation of test	on controls
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	QN
13.	Critical control points	-

Current wording:

Ad. 72: Resistance to colonization by *Aphis gossypii*

Maintenance of strain

Maintenance and multiplication:	on susceptible variety (Védrantais)
Special conditions:	low aphid density to avoid having too many winged types. "Synchronous"-type breeding in order to have only aphids of the same age and, therefore, at the same growing stage on a plant

Conduct of the test

Plant stage:	1st leaf measuring 2-3 cm
Temperature:	21°C
Light:	16 hours per day
Planting:	plants sown in sand, pricked out at cotyledon stage in compost-filled pots
Manner of inoculation:	deposit of ten adult wingless aphid per plant
Duration of test:	
- from sowing to inoculation:	15-18 days
- from inoculation to reading:	one day
Number of plants tested:	30
Recording:	- Resistance present = less than 7 adult aphids per plant; eggs rare. - Resistance absent = 9 or 10 adult aphids per plant; eggs frequent. - Record number of aphids per plant, 24 hours after inoculation.

Proposed new wording:

Ad. 72: Resistance to colonization by *Aphis gossypii*

1.	Pathogen	*Aphis gossypii*
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	INRA GAFL (FR)
5.	Isolate	NM1 clone
6.	Establishment isolate identity	-
7.	Establishment pathogenicity	on susceptible plants
8.	Multiplication inoculum	
8.1	Multiplication medium	living plant (obligate parasite), e.g. young plants of Melon or Cucumber
8.2	Multiplication variety	on susceptible variety (Corona, Védrantais, Ventura)
8.3	Plant stage at inoculation	at first leaf (measuring around 2-3 cm)
8.4	Inoculation medium	-
8.5	Inoculation method	deposit a piece of infested leaf (visual appreciation) or ten adult wingless aphids per plant
8.6	Harvest of inoculum	-
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	-
9.	Format of the test	
9.1	Number of plants per genotype	30
9.2	Number of replicates	e.g. 3
9.3	Control varieties	
	[1] absent	Védrantais
	[9] present	AR Hale's Best Jumbo, AR Top Mark, Virgos
9.4	Test design	-
9.5	Test facility	-
9.6	Temperature	21-24°C day/16-20°C night
9.7	Light	16 hours per day
9.8	Season	-
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	-
10.2	Quantification inoculum	at least 10 adults wingless aphid per plant
10.3	Plant stage at inoculation	1st leaf measuring around 2-3 cm
10.4	Inoculation method	deposit of a piece of infested leaf or ten adult wingless aphids per plant
10.5	First observation	1-4 days post inoculation
10.6	Second observation	-
10.7	Final observations	5-10 days post inoculation
11.	Observations	
11.1	Method	visual, to compare with standards
11.2	Observation scale	
	[1] absent	9 or 10 adult aphids per plant; larvae frequent, plants covered with aphids, shriveled leaves
	[9] present	less than 7 adult aphids per plant; larvae rare. Remark: counting is not compulsory, it can be a visual assessment of the respective level of colonization.
11.3	Validation of test	on standards
11.4	Off-types	-

12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	Low aphid density to avoid having too many winged types. "Synchronous"-type breeding in order to have only aphids of the same age and, therefore, at the same growing stage on a plant. Normally *Aphis gossypii* is viviparous, but sometimes (autumn, on particular crops) may produce eggs.

Current wording:

Ad. 73: Resistance to Zucchini Yellow Mosaic Virus (ZYMV), race F

A. INOCULUM

Maintenance of strain

Maintenance:	5°C and kept dry using anhydrous calcium chloride
Special conditions:	pre-multiplication of the virus on non-wilting variety (Védrantais) prior to testing

B. INOCULATION AND INCUBATION

Conduct of the test

Plant stage:	1st emergent leaf
Temperature:	25°C during day, 18°C during night
Light:	12 hours per day
Manner of inoculation:	mechanical inoculation by rubbing of cotyledons with inoculum
Duration of test:	
- from sowing to inoculation:	15 days
- from inoculation to reading:	15 days
Number of plants tested:	30

C. SYMPTOMS AND OBSERVATIONS

Reading difficulty:	- heterozygotes (Fn/Fn+) wither and die more slowly than homozygotes (Fn/Fn) - use the F pathotype of ZYMV
Example varieties:	
Védrantais (Fn+/Fn+):	mosaic (resistance present)
Cantor (Fn/Fn+):	slower necrosis with wilting (resistance absent)
Doublon (Fn/Fn):	necrosis with wilting (resistance absent)

Proposed new wording:

Ad. 73: Resistance to *Zucchini yellow mosaic virus* (ZYMV)

1.	Pathogen	*Zucchini yellow mosaic virus* (ZYMV)
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR)
5.	Isolate	F strain (e.g. strain 1318 Fn) or a NF strain (e.g. strain E15)
6.	Establishment isolate identity	use standard varieties, flaccida necrosis on Généris (Zym^+ / Fn)
7.	Establishment pathogenicity	on susceptible melon varieties - as above
8.	Multiplication inoculum	
8.1	Multiplication medium	-
8.2	Multiplication variety	susceptible variety (e.g.: Védrantais)
8.3	Plant stage at inoculation	first leaf appearing
8.4	Inoculation medium	fresh and dried leaves homogenized, in PBS with carborundum
8.5	Inoculation method	rubbing
8.6	Harvest of inoculum	on symptomatic leaves
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 30
9.2	Number of replicates	e.g. 3
9.3	Control varieties	Védrantais, Jador, Cardillo (susceptible), Hannah's Choice, Lunaduke, PI 414723 (resistant)
9.4	Test design	-
9.5	Test facility	growth chamber
9.6	Temperature	22°C - 25°C during day and 18°C during night
9.7	Light	12 hours
9.8	Season	all seasons
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	ice cold buffer solution: Fresh leaves homogenized in PBS and carborundum
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	cotyledon expanded or first emergent leaf
10.4	Inoculation method	mechanical inoculation by rubbing of cotyledons with inoculum
10.5	First observation	-
10.6	Second observation	-
10.7	Final observations	14-15 days post inoculation

11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	

Resistance to ZYMV		**ZYMV - Strain F** e.g. strain 1318 Fn	**ZYMV - Strain NF** e.g.: strain E15
1	absent	Mosaic, non wilting	Mosaic, non wilting
		Necrosis + slow wilting (flaccida necrosis)	
		Necrosis + fast wilting (flaccida necrosis)	
9	present	chlorotic or necrotic systemic lesions and possibly an apical necrosis	
9	present	No symptom	

11.3	Validation of test	on Standards
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	The three distinct phenotypes associated with susceptibility to ZYMV strain F are connected with Fn gene. The Zym gene is epistatic on the Fn gene. The Fn gene modifies the susceptibility symptom expression of strain F: Fn/Fn is associated with fast wilting and necrosis (Flaccida-necrosis), Fn/Fn+ with the same reaction, but slower. Flaccida-necrosis is a form of systemic hypersensitivity, which is interpreted as susceptibility. The Fn gene has no influence on the symptom expression of resistant varieties.

Current wording:

Ad. 74: Resistance to Papaya Ring Spot Virus (PRSV), race GVA and race E2

A. INOCULUM

Maintenance of strain

Maintenance:	5°C and kept dry using anhydrous calcium chloride
Special conditions:	pre-multiplication of the virus on susceptible variety (Védrantais) prior to testing

B. INOCULATION AND INCUBATION

Conduct of the test

Plant stage:	1st emergent leaf
Temperature:	25°C during day, 18°C during night
Light:	12 hours per day
Manner of inoculation:	mechanical inoculation by rubbing cotyledons with inoculum
Duration of test:	
- from sowing to inoculation:	15 days
- from inoculation to reading:	15-20 days
Number of plants tested:	30

C. SYMPTOMS AND OBSERVATIONS

Identification of two strains of the PRSV virus and of the two alleles concerned:

Genotypes/Strains	GVA strain	E2 strain
Védrantais ($Prsv^+$)	Mosaic (vein-clearing) = resistance absent	Mosaic (vein-clearing) = resistance absent
72025 ($Prsv^2$)	- No systemic symptoms - Local necrotic lesions on cotyledons (irregular) = resistance present	- Apical necrosis = Necrosis of plant instead of local lesions: resistance absent
WMRV 29 ($Prsv^1$)	- No systemic symptoms - Occasional local necrotic lesions on cotyledons = resistance present	- No systemic symptoms - Occasional local necrotic lesions on cotyledons = resistance present

Proposed new wording:

Ad. 74: Resistance to *Papaya ringspot virus* (PRSV), Guadeloupe strain and E2 strain

1.	Pathogen	*Papaya ringspot virus* (PRSV)
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	INRA Pathology - Avignon (FR)
5.	Isolate	Guadeloupe strain and E2 strain
6.	Establishment isolate identity	

Gene Pvr	**Standards**	Symptoms	Behavior against PRSV **Guadeloupe strain**
allele (Prv^+)	**Védrantais**	Mosaic (vein-clearing)	susceptible
allele (Prv^2)	**72-025, PI 414723** Hannah's Choice	No systemic symptoms or Irregular local necrotic lesions on cotyledons	**resistant**
allele (Prv^1)	**WMR29**	No systemic symptoms Occasional local necrotic lesions on cotyledons	**resistant**

Gene Pvr	**Standards**	Symptoms	Behavior against PRSV **E2 strain**
allele (Prv^+)	**Védrantais**	Mosaic (vein-clearing)	susceptible
allele (Prv^2)	**72-025, PI 414723** Hannah's Choice	Apical necrosis Necrosis of plant instead of local lesions	susceptible
allele (Prv^1)	**WMR29**	No systemic symptoms or few systemic chloronecrotic symptoms Occasional local necrotic lesions on cotyledons	**resistant**

7.	Establishment pathogenicity	-
8.	Multiplication inoculum	
8.1	Multiplication medium	-
8.2	Multiplication variety	pre-multiplication of the virus on non-wilting variety (Védrantais) prior to testing
8.3	Plant stage at inoculation	First leaf appearing
8.4	Inoculation medium	PBS with carborundum
8.5	Inoculation method	rubbing
8.6	Harvest of inoculum	Fresh or dried leaves homogenized in PBS and carborundum
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 30
9.2	Number of replicates	e.g. 3
9.3	Control varieties	Védrantais (susceptible), Hannah's Choice (resistant to Guadeloupe strain (Prv^2 / Prv^+)), WMR 29 (resistant to E2 strain (Prv^1 / Prv^+))
9.4	Test design	-
9.5	Test facility	-
9.6	Temperature	25°C /18°C
9.7	Light	12 h
9.8	Season	-

9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	fresh leaves homogenized in PBS and carborundum
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	first emergent leaf
10.4	Inoculation method	mechanical inoculation by rubbing cotyledons with inoculums
10.5	First observation	15 days post inoculation
10.6	Second observation	-
10.7	Final observations	20 days post inoculation
11.	Observations	visual, comparative
11.1	Method	
11.2	Observation scale	

Resistance to PRSV - **Guadeloupe strain**	Gene Pvr	Symptoms
[1] absent	allele (Prv^{+})	Mosaic (vein-clearing)
[9] present	allele (Prv^{2})	No systemic symptoms Irregular local necrotic lesions on cotyledons
[9] present	allele (Prv^{1})	No systemic symptoms Occasional local necrotic lesions on cotyledons

Resistance to PRSV – **E2 strain**	Gene Pvr	Symptoms
[1] absent	allele (Prv^{+})	Mosaic (vein-clearing)
[1] absent	allele (Prv^{2})	Apical necrosis Necrosis of plant instead of local lesions
[9] present	allele (Prv^{1})	No systemic symptoms or few systemic chloronecrotic symptoms Occasional local necrotic lesions on cotyledons

11.3	Validation of test	on standards
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	-

Current wording:

Ad. 75: Resistance to Muskmelon Necrosis Spot Virus (MNSV), race E_8

A. INOCULUM

Maintenance of strain

Maintenance:	5°C and kept dry using anhydrous calcium chloride
Special conditions:	pre-multiplication on susceptible variety (Védrantais) prior to test

B. INOCULATION AND INCUBATION

Conduct of the test

Plant stage:	1st emergent leaf
Temperature:	25°C during day, 18°C during night
Light:	12 hours per day
Manner of inoculation:	mechanical inoculation by rubbing of cotyledons with inoculum
Duration of test:	
- from sowing to inoculation:	15 days
- from inoculation to reading:	8 days
Number of plants tested:	30

C. SYMPTOMS AND OBSERVATIONS

Susceptible plants:	necrotic lesions on the inoculated organs (cotyledons)
Resistant plants:	no lesions

Proposed new wording:

Ad. 75: Resistance to *Melon necrotic spot virus* (MNSV), E8 strain

1.	Pathogen	*Melon necrotic spot virus* (MNSV)
2.	Quarantine status	-
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR)
5.	Isolate	E8 strain
6.	Establishment isolate identity	Védrantais (susceptible), PMR5, VA 435, Virgos (resistant)
7.	Establishment pathogenicity	on susceptible plant
8.	Multiplication inoculum	
8.1	Multiplication medium	living plant
8.2	Multiplication variety	pre-multiplication of the virus on non-wilting variety (Védrantais) prior to testing
8.3	Plant stage at inoculation	10.3
8.4	Inoculation medium	-
8.5	Inoculation method	10.4
8.6	Harvest of inoculum	10.1
8.7	Check of harvested inoculum	symptomatic leaves
8.8	Shelflife/viability inoculum	on susceptible variety
9.	Format of the test	
9.1	Number of plants per genotype	at least 30
9.2	Number of replicates	e.g. 3
9.3	Control varieties	Védrantais (susceptible), Cyro, Primal, Virgos, Yellow Fun, (resistant)
9.4	Test design	-
9.5	Test facility	growth chamber
9.6	Temperature	25°C during day and 18°C during night or 22°C constant
9.7	Light	12 h per day
9.8	Season	all seasons
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	fresh leaves homogenized in PBS and carborundum
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	cotyledon expanded or 1st emergent leaf
10.4	Inoculation method	mechanical inoculation by rubbing of cotyledons with inoculum
10.5	First observation	-
10.6	Second observation	-
10.7	Final observations	8-15 days after inoculation
11.	Observations	
11.1	Method	visual
11.2	Observation scale	
	[1] absent	necrotic lesions on the inoculated organs, possible systemic reaction (depends on condition, and varieties), possible death of plant
	[9] present	no lesions
11.3	Validation of test	on standards
11.4	Off-types	-

12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	-

Current wording:

Ad. 76: Resistance to Cucumber Mosaic Virus (CMV)

A. INOCULUM

1. Crushed solution

Phosphate disodic (Na_2HPO_4, 12 H_2O) (0,03M):	1,075 g
Diéthyldithiocarbamate of sodium (= DIECA):	0,2 g
Distilled water:	qsp 100 ml

The phosphate disodic solution can be stored in a refrigerator. Once the DIECA is added, the solution should be used within the next two hours.

2. Crushing the leaves

The source of the inoculum comes from crushing either the fresh leaves, or leaves desiccated in anhydrous calcium chloride (Ca $Cl_{2)}$, in a cold mortar.

Crush 1 gram of leaves with 4 ml of phosphate disodic solution at 5°C. Add active carbon (0,5 g) and carborendum (0,4 g) for each 1 gram of leaves. After crushing, put the mortar on a bed of ice.

Before using leaves dried with $CaCl_2$ to inoculate a plant test, do a multiplication of the inoculum on some 10 susceptible plants which would be used as inoculum.

3. Strains maintenance

CMV can be stored for several years by desiccation with anhydrous $CaCl_2$. Leaves showing mosaic symptoms should be chopped finely with a razor blade and placed in cups. Put a layer of anhydrous calcium chloride (0,5 cm) in a plastic box and cover it with filter paper. Place the cups on this layer. Close the box well with adhesive tape, and then place it in a tightly closed plastic bag. Store it in a refrigerator at 5°C.

B. INOCULATION AND INCUBATION

Cotyledons or young leaves should be inoculated by rubbing them with a latex-protected finger. After a few minutes, rinse the cotyledons with running water. Place the plants for incubation in a growth chamber (generally at 18°C at night and 25°C in the day, with 12 to 14 hours of daylight).

C. SYMPTOMS AND OBSERVATIONS

The “common” strains of CMV bring out mosaic symptoms on susceptible plants one week after inoculation. Resistant plants show no symptoms.

Remarks:

When light intensity and daylight are not sufficient (winter period), resistant plants (in particular PI 161375) may present chlorotic lesions on the first leaf.

Strains:

Use “common” strains (as T1, P9) rather than “song” strains (14, T2).

		CMV common strains (T1, P9)	CMV song strains (14, T2)
Susceptible	Védrantais	mosaïc	mosaic
Resistant	PI 161375	no symptoms	mosaic, chlorotic lesions
	Virgos		

P9 brings out “aucuba” mosaic on susceptible varieties

P9 is less aggressive than T1

It is preferable to use Virgos rather than PI 161375 (lower germination, weaker growth).

Observations, notes:

The genetic resistance is polygenic. Use a notation with classes. It is preferable to use the two strains P9 and T1 to have a better evaluation of the resistance.

High resistance confers resistance on all common strains. Some genotypes may present a resistance to P9 (no symptoms), and a slight susceptibility to T1 (slight mosaic).

Proposed new wording:

Ad. 76: Resistance to *Cucumber mosaic virus* (CMV)

1.	Pathogen	*Cucumber mosaic virus* (CMV)
2.	Quarantine status	no
3.	Host species	*Cucumis melo*
4.	Source of inoculum	GEVES (FR)
5.	Isolate	Use “common” strains (e.g. TI, P9)
6.	Establishment isolate identity	Védrantais, 72-025 (susceptible), PI 161375, Virgos (resistant)
7.	Establishment pathogenicity	on susceptible melon varieties
8.	Multiplication inoculum	don’t use leaves dried with $CaCl_2$ to inoculate, do a multiplication of the inoculum on susceptible plants
8.1	Multiplication medium	living plant
8.2	Multiplication variety	susceptible variety (e.g. Védrantais)
8.3	Plant stage at inoculation	cotyledon expanded or first leaf appearing
8.4	Inoculation medium	ice-cold buffer solution
8.5	Inoculation method	Inoculation by rubbing. Optional: after a few minutes, rinse the cotyledons with running water.
8.6	Harvest of inoculum	symptomatic leaves, e.g.: 1 g leaves with 4 mL buffer - 0,03 M PBS with 0.2% DIECA freshly added, addition of activated charcoal.
8.7	Check of harvested inoculum	-
8.8	Shelflife/viability inoculum	about 2 h
9.	Format of the test	
9.1	Number of plants per genotype	at least 30 plants
9.2	Number of replicates	e.g. 3
9.3	Control varieties	Védrantais (susceptible), Lunaduke, Virgos (resistant)
9.4	Test design	-
9.5	Test facility	climatic room or glasshouse
9.6	Temperature	22°C constant
9.7	Light	12 hours at least
9.8	Season	all seasons in climatic room, in glasshouse, strong environmental effect on the test severity (more severe in winter, too soft in summertime)
9.9	Special measures	-
10.	Inoculation	
10.1	Preparation inoculum	Fresh leaves homogenized in ice-cold buffer solution- in PBS and carborundum (active charcoal), with 0.2% DIECA freshly added.
10.2	Quantification inoculum	-
10.3	Plant stage at inoculation	cotyledon expanded or first leaf appearing
10.4	Inoculation method	Inoculation by rubbing. After a few minutes, rinse the cotyledons with running water, when uses activated charcoal.
10.5	First observation	-
10.6	Second observation	-
10.7	Final observations	7-8 days after inoculation

11.	Observations	
11.1	Method	visual, comparative
11.2	Observation scale	
	[1] absent	Mosaics
	[9] present	No symptoms or necrotic spot or very weak symptoms in case of a more aggressive strain like T1. *Remarks:* P9 strain brings out "aucuba" mosaic on susceptible varieties (aggressive symptoms) P9 strain is less virulent than TI strain.
11.3	Validation of test	on control varieties
11.4	Off-types	-
12.	Interpretation of data in terms of UPOV characteristic states	QL
13.	Critical control points	- When light intensity and daylight are not sufficient (winter period), resistant plants (in particular PI 161375) may present chlorotic lesions on the first leaf. - Virgos seeds usually germinate better than seeds of PI 161375 - Songwhan Charmi = PI 161375: name of the melon variety, on which this strain was identified. The "song" strains break the common resistance to CMV (e.g.: "song" strains 14, T2). - Intermediate reactions may occur; the resistance is polygenic.

Proposal for a Revision of the Chapter 9 “Literature”

To add the following literature reference to Chapter 9:

Bohn, G. W., Kishaba, A. N., McCreight, J. D., 1980: WMR 29 muskmelon breeding line. HortScience 15: pp 539-540

Henning, M. J., Munger, H. M., Jahn, M. M., 2005: Hannah's Choice F1: a new muskmelon hybrid with resistance to powdery mildew, Fusarium race 2, and potyviruses. HortScience 40:492-493

OECD, 2006: International Standards for Fruit and Vegetables – Commercial types of Melons. OECD publication, 96 pp.

Mention P., Cottet V. et al., 2011: Recognizing commercial melon and watermelon types - CTIFL publication. 203 pp.

Proposal for a Revision of the Chapter 10 “Technical Questionnaire”

Section 5: TQ characteristics selected from the Table of Characteristics

To add the following characteristics to Section 5 “Characteristics of the variety to be indicated”

Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 0 (characteristic 69.1)
Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 1 (characteristic 69.2)
Resistance to *Fusarium oxysporum* f. sp. *melonis,* race 2 (characteristic 69.3)

Section 7: Addition of new characteristics under 7.3.1

To add the following to Section 7 “Additional information which may help in the examination of the variety”:

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

		susceptible	moderately resistant	highly resistant	not tested
(a)	*Fusarium oxysporum* f. sp. *melonis,* Race 1.2 (char. 69.4)	[ ]	[ ]	[ ]	[ ]
(b)	*Podosphaera xanthii (*ex *Sphaerotheca fuliginea)* Race 1 (char. 70.1)	[ ]	[ ]	[ ]	[ ]
(c)	*Podosphaera xanthii (*ex *Sphaerotheca fuliginea)* Race 2 (char. 70.2)	[ ]	[ ]	[ ]	[ ]
(d)	*Podosphaera xanthii (*ex *Sphaerotheca fuliginea)* Race 3 (char. 70.3)	[ ]	[ ]	[ ]	[ ]
(e)	*Podosphaera xanthii (*ex *Sphaerotheca fuliginea)* Race 5 (char. 70.4)	[ ]	[ ]	[ ]	[ ]
(f)	*Podosphaera xanthii (*ex *Sphaerotheca fuliginea)* Race 3-5 (char. 70.5)	[ ]	[ ]	[ ]	[ ]
(g)	*Golovinomyces cichoracearum* (ex *Erysiphe cichoracearum*), Race 1 - *Powdery mildew* - Gc (Ec) (char. 71)	[ ]	[ ]	[ ]	[ ]

		absent	present	not tested
(h)	colonization by *Aphis gossypii* (char. 72)	[ ]	[ ]	[ ]
(i)	*Zucchini yellow mosaic virus* (ZYMV) (char. 73)	[ ]	[ ]	[ ]
(j)	*Papaya ringspot virus* (PRSV) (char. 74) *Strain to precise:* - Guadeloupe □ - E2 □	[ ]	[ ]	[ ]
(k)	*Melon necrotic spot virus* (MNSV), E8 strain (char. 75)	[ ]	[ ]	[ ]
(l)	*Cucumber mosaic virus* (CMV) (char. 76)	[ ]	[ ]	[ ]

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