UPOV

International Union for the Protection of New Varieties of Plants

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Technical Committee **TC/57/18**

Fifty-Seventh Session **Original:** English
Geneva, October 25 and 26, 2021 **Date:** September 6, 2021

PARTIAL REVISION OF THE TEST GUIDELINES FOR TOMATO ROOTSTOCKS

Document prepared by an expert from the Netherlands

Disclaimer: this document does not represent UPOV policies or guidance

1. The purpose of this document is to present a proposal for a partial revision of the Test Guidelines for Tomato Rootstocks (document TG/294/1 Corr. Rev. 3).

2. The Technical Working Party for Vegetables (TWV), at its fifty-fifth session[1], considered a proposal for a partial revision of the Test Guidelines for Tomato Rootstocks on the basis of documents TG/294/1 Corr. Rev. 3 and TWV/55/13 "Partial revision of the Test Guidelines for Tomato Rootstocks" and proposed the following changes (see document TWV/55/16 "Report", paragraph 128):

(a) Deletion of *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg (UPOV code SOLAN_LCH) from the coverage of the Test Guidelines:
  (i) Deletion from the cover page
  (ii) Chapter 1 "Subject of these Test Guidelines": Deletion from Chapter 1.1 and addition to Chapter 1.2
  (iii) Deletion from Technical Questionnaire, Section 1 "Subject of the Technical Questionnaire"

(b) Changes to notes and method of observation of characteristic 22 "Resistance to *Meloidogyne incognita* (Mi)" and explanation Ad. 22

(c) Changes to Characteristics 23 "Resistance to *Verticillium* sp. (Va and Vd)", 24.1 "Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) Race 0EU/1US" and characteristic 24.2 "Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) Race 1EU/2US":
  (i) Deletion of asterisks
  (ii) Deletion from grouping characteristics in Chapter 5.3.

(d) Changes to the explanation Ad. 24 "Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)"

(e) Correction of title of characteristic 26 "Resistance to *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)" and changes to explanation Ad. 26

(f) Chapter 10: Technical Questionnaire:
  (i) Section 5: Addition of all diseases resistances to Section TQ 5 with an option "not tested" for characteristics without (*)

3. The proposed changes to are presented below in highlight and underline (insertion) and ~~strikethrough~~ (deletion).

[1] hosted by Turkey and organized by electronic means, from May 3 to 7, 2021

Proposed deletion of *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg (UPOV code SOLAN_LCH) from the coverage of the Test Guidelines

Deletion from the cover page

Current wording

TOMATO ROOTSTOCKS *

UPOV Code: SOLAN_HAB; SOLAN_LHA; SOLAN_LPE; SOLAN_LCH; SOLAN_PHA

Solanum habrochaites S. Knapp *&* D.M. Spooner*;*
Solanum lycopersicum L. x *Solanum habrochaites* S. Knapp & D.M. Spooner;
Solanum lycopersicum L. x *Solanum peruvianum* (L.) Mill*.;*
Solanum lycopersicum L. x *Solanum cheesmaniae* (L. Ridley) Fosberg;
Solanum pimpinellifolium L. *x Solanum habrochaites* S. Knapp & D.M. Spooner

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Solanum habrochaites S. Knapp & D.M. Spooner, *Lycopersicon agrimoniifolium* Dunal, *Lycopersicon hirsutum* Dunal, *Lycopersicon hirsutum* f. *glabratum* C. H. Müll.				
Solanum lycopersicum L. x *Solanum habrochaites* S. Knapp & D.M. Spooner				
Solanum lycopersicum L. x *Solanum peruvianum* (L.) Mill.				
Solanum lycopersicum L. x *Solanum cheesmaniae* (L. Ridley) Fosberg				
Solanum pimpinellifolium L. x *Solanum habrochaites* S. Knapp & D.M. Spooner				

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

Proposed new wording

TOMATO ROOTSTOCKS

UPOV Code: SOLAN_HAB; SOLAN_LHA; SOLAN_LPE; ~~SOLAN_LCH;~~ SOLAN_PHA

Solanum habrochaites S. Knapp *&* D.M. Spooner*;*
Solanum lycopersicum L. x *Solanum habrochaites* S. Knapp & D.M. Spooner;
Solanum lycopersicum L. x *Solanum peruvianum* (L.) Mill*.;*
~~*Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg;~~
Solanum pimpinellifolium L. *x Solanum habrochaites* S. Knapp & D.M. Spooner

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Solanum habrochaites S. Knapp & D.M. Spooner, *Lycopersicon agrimoniifolium* Dunal, *Lycopersicon hirsutum* Dunal, *Lycopersicon hirsutum* f. *glabratum* C. H. Müll.				
Solanum lycopersicum L. x *Solanum habrochaites* S. Knapp & D.M. Spooner				
Solanum lycopersicum L. x *Solanum peruvianum* (L.) Mill.				
~~*Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg~~				
Solanum pimpinellifolium L. x *Solanum habrochaites* S. Knapp & D.M. Spooner				

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

Chapter 1 "Subject of these Test Guidelines": Deletion from Chapter 1.1 and addition to Chapter 1.2

Current wording

Subject of these Test Guidelines

1.1 These Test Guidelines apply to all varieties of *Solanum habrochaites* S. Knapp & D.M. Spooner*;* *Solanum lycopersicum* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner, *Solanum lycopersicum* L. x *Solanum peruvianum* L. (Mill.), *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg and *Solanum pimpinellifolium* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner. Such varieties are generally used as rootstocks for tomato varieties (varieties of *Solanum lycopersicum* L. (*Lycopersicum esculentum* L. (Mill.)).

1.2 Rootstocks belonging to *Solanum lycopersicum* L. (*Lycopersicum esculentum* Mill.) or to *Solanum lycopersicum* L. x *Solanum pimpinellifolium* L. (*Lycopersicum esculentum* Mill. x *Lycopersicum pimpinellifolium* Mill.) should be covered by UPOV Test Guidelines TG/44.

Proposed new wording

Subject of these Test Guidelines

1.1 These Test Guidelines apply to all varieties of *Solanum habrochaites* S. Knapp & D.M. Spooner*;* *Solanum lycopersicum* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner, *Solanum lycopersicum* L. x *Solanum peruvianum* L. (Mill.)~~, *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg~~ and *Solanum pimpinellifolium* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner. Such varieties are generally used as rootstocks for tomato varieties (varieties of *Solanum lycopersicum* L. (*Lycopersicum esculentum* L. (Mill.)).

1.2 Rootstocks belonging to *Solanum lycopersicum* L. (*Lycopersicum esculentum* Mill.), to *Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg or to *Solanum lycopersicum* L. x *Solanum pimpinellifolium* L. (*Lycopersicum esculentum* Mill. x *Lycopersicum pimpinellifolium* Mill.) should be covered by UPOV Test Guidelines TG/44.

Deletion from Technical Questionnaire, Section 1 "Subject of the Technical Questionnaire"

Current wording

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

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

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

1. Subject of the Technical Questionnaire

Tomato Rootstocks belonging to:

1.1	Botanical name	*Solanum habrochaites* S. Knapp & D.M. Spooner	[…]
1.2	Botanical name	*Solanum lycopersicum* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner	[…]
1.3	Botanical name	*Solanum lycopersicum* L. x *Solanum peruvianum* (L.) Mill.	[…]
1.4	Botanical name	*Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg	[…]
1.5	Botanical name	*Solanum pimpinellifolium* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner	[…]

Proposed new wording

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

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

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

1. Subject of the Technical Questionnaire

Tomato Rootstocks belonging to:

1.1	Botanical name	*Solanum habrochaites* S. Knapp & D.M. Spooner	[…]
1.2	Botanical name	*Solanum lycopersicum* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner	[…]
1.3	Botanical name	*Solanum lycopersicum* L. x *Solanum peruvianum* (L.) Mill.	[…]
~~1.4~~	~~Botanical name~~	~~*Solanum lycopersicum* L. x *Solanum cheesmaniae* (L. Ridley) Fosberg~~	~~[…]~~
1.~~5~~ 4	Botanical name	*Solanum pimpinellifolium* L. x *Solanum habrochaites* S. Knapp & D.M. Spooner	[…]

Proposed changes to notes and method of observation of characteristic 22 “Resistance to *Meloidogyne incognita* (Mi)” and explanation Ad. 22

Current wording

22. (*) (+)	VG	Resistance to *Meloidogyne incognita* (Mi)	Résistance à *Meloidogyne incognita* (Mi)	Resistenz gegen *Meloidogyne incognita* (Mi)	Resistencia a *Meloidogyne incognita* (Mi)		
QN		susceptible	sensible	anfällig	susceptible	Bruce	1
		moderately resistant	moyennement résistant	mäßig resistent	moderadamente resistente		2
		highly resistant	hautement résistant	hoch resistent	muy resistente	Emperador	3

proposed new wording

22. (*) (+)	~~VG~~ VS	Resistance to *Meloidogyne incognita* (Mi)	Résistance à *Meloidogyne incognita* (Mi)	Resistenz gegen *Meloidogyne incognita* (Mi)	Resistencia a *Meloidogyne incognita* (Mi)		
QN		susceptible	sensible	anfällig	susceptible	Bruce	1
		susceptible to intermediate resistant	sensible à résistant à un niveau intermédiaire	anfällig bis mittel resistent	susceptible a resistencia intermedia		2
		intermediate ~~moderately~~ resistant	~~moyennement~~ résistant à un niveau intermédiaire	~~mäßig~~ mittel resistent	~~moderadamente resistente~~ resistencia intermedia		~~2~~ 3
		intermediate to highly resistant	résistant à un niveau intermédiaire à hautement résistant	mittel bis hoch resistent	resistencia intermedia a muy resistente		4
		highly resistant	hautement résistant	hoch resistent	muy resistente	Emperador	~~3~~ 5

Current wording

Ad. 22: Resistance to *Meloidogyne incognita* (Mi)

1. Pathogen .....*Meloidogyne incognita*
3. Host species .....*Solanum lycopersicum*
4. Source of inoculum .....Naktuinbouw (NL[2]) or GEVES[3] (FR)
5. Isolate .....non-resistance breaking
6. Establishment isolate identity .....use rootstock or tomato standards
7. Establishment pathogenicity .....use susceptible rootstock or tomato standard
8. Multiplication inoculum
8.1 Multiplication medium .....living plant
8.2 Multiplication variety .....preferably resistant to powdery mildew
8.3 Plant stage at inoculation .....see 10.3
8.5 Inoculation method .....see 10.4
8.6 Harvest of inoculum.....root systems are cut with scissors into pieces of about 1 cm length
8.7 Check of harvested inoculum .....visual check for presence of root knots
8.8 Shelf life/viability inoculum.....1 day
9. Format of the test
9.1 Number of plants per genotype ....20 plants
9.2 Number of replicates…… 1 replicate
9.3 Control varieties.....
Susceptible: .....Bruce and (*Solanum lycopersicum*) Clairvil, Casaque Rouge
Moderately resistant : .....(*Solanum lycopersicum*) Madyta, Campeon, Madyta, Vinchy
Highly resistant: ..... Emperador and (*Solanum lycopersicum*) “Anahu x Casaque Rouge”, Anahu, Anabel
9.4 Test design .....include standard varieties
9.5 Test facility .....greenhouse or climate room
9.6 Temperature .....not over 28° C
9.7 Light.....at least 12 h per day
10. Inoculation
10.1 Preparation inoculum.....small pieces of diseased root mixed with soil mix soil and infested root pieces
10.2 Quantification inoculum .....soil: root ratio = 8:1, or depending on experience
10.3 Plant stage at inoculation .....seed, or cotyledons
10.4 Inoculation method ..... plants are sown in infested soil or contamination of soil after sowing when plantlets are at cotyledon stage
10.7 Final observations .....28 to 45 days after inoculation
11. Observations
11.1 Method.....root inspection
11.2 Observation scale.....Symptoms:
Galling, root malformation,
growth reduction, plant death
11.3 Validation of test ..... evaluation of variety resistance should be calibrated with results of resistant and susceptible controls on standards
12. Interpretation of test results in comparison with control varieties
To consider that resistant varieties may have a few plants with falls. These are not considered as off-types.

absent (susceptible)……	[1]	growth strongly reduced, high gall count
intermediate (moderately resistant)……	[2]	medium growth reduction, medium gall count
present (highly resistant)……	[3]	no growth reduction, no galls

13. Critical control points:
Avoid rotting of roots; high temperature causes breakdown of resistance

[2] Naktuinbouw: resistentie@naktuinbouw.nl

[3] Geves: matref@geves.fr

Proposed new wording

Ad. 22: Resistance to *Meloidogyne incognita* (Mi)

1.	Pathogen	*Meloidogyne incognita*
2.	Quarantine status	-
3.	Host species	Tomato - *Solanum lycopersicum*
4.	Source of inoculum	GEVES[4] (FR) or INIA (ES)[5] or Naktuinbouw (NL[6])
5.	Isolate	non-resistance breaking
6.	Establishment isolate identity	use tomato standards
7	Establishment pathogenicity	use susceptible rootstock or tomato standard
8.	Multiplication inoculum	
8.1	Multiplication medium	living plant
8.2	Multiplication variety	susceptible variety, preferably resistant to powdery mildew
8.3	Plant stage at inoculation	~~see 10.3~~ 2nd leaf stage
8.5	Inoculation method	~~see 10.4~~ deposit of piece of contaminated roots in soil (around 5-10g near each plant, to adapt depending on the population aggressivity)
8.6	Harvest of inoculum	6 to 10 weeks after inoculation, root systems are cut with scissors into pieces of about 1 cm length
8.7	Check of harvested inoculum	visual check for presence of root knots and ripe egg masses
8.8	Shelf life/viability inoculum	1 day
9.	Format of the test	
9.1	Number of plants per genotype	~~20 plants~~ 30 plants, plus at least 10 non-inoculated plants to observe if a possible lack of germination is due to nematode or not
9.2	Number of replicates	~~1 replicate~~ at least 2, preferably 3 to allow statistical analysis
9.3	Control varieties	Susceptible: Bruce and (*Solanum lycopersicum*) ~~Clairvil,~~ Casaque Rouge ~~Moderately~~ Intermediate resistant: (*Solanum lycopersicum*) ~~Madyta,~~ Campeon, ~~Madyta, Vinchy,~~ Tyonic Highly resistant: Emperador and (*Solanum lycopersicum*) “Anahu x Casaque Rouge”~~, Anahu, Anabel~~
9.4	Test design	~~include standard varieties~~ 3 replicates of 10 plants in different trays by variety, non-inoculated plants in a separate tray
9.5	Test facility	greenhouse or climate room
9.6	Temperature	~~not over 28° C~~ 20-26°C, the temperature may be adapted, depending on the aggressivity of the test, to obtain the expected response of the controls, but should not exceed 26°C. Higher temperatures will cause breakdown of resistance.
9.7	Light	at least 12 h per day
10	Inoculation	
10.1	Preparation inoculum	small pieces of diseased roots mixed with soil ~~mix soil and infested root pieces~~
10.2	Quantification inoculum	~~soil: root ratio = 8:1, or depending on experience~~ the ratio is depending of aggressiveness of test and lab’s conditions (e.g. between 30g to 60g of infested roots, for 100 plants in a tray of 45*30 cm containing approximately 5.5 kg of substrate), galls should be homogeneously mixed with soil.
10.3	Plant stage at inoculation	seed~~, or cotyledons~~

[4] GEVES; matref@geves.fr

[5] INIA; resistencias@inia.es

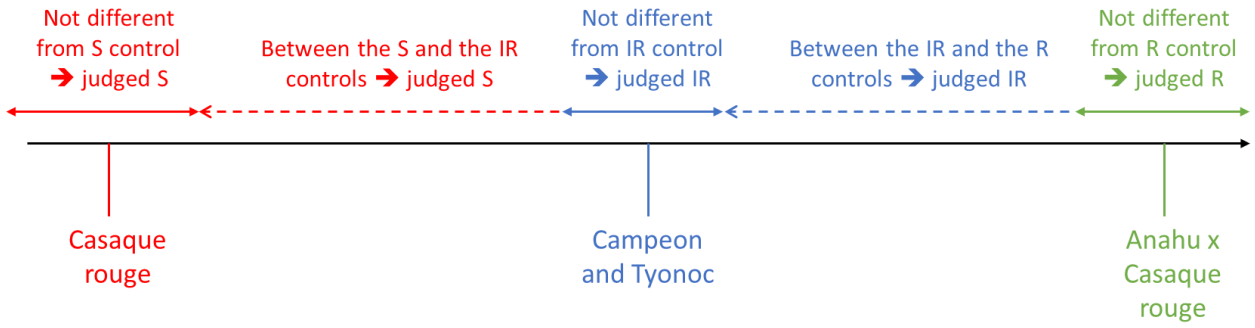
[6] Naktuinbouw; resistentie@naktuinbouw.nl

10.4	Inoculation method	~~plants are sown in infested soil or contamination of soil after sowing when plantlets are at cotyledon stage~~ plants sown in soil contaminated with galls
10.7	End of test	28 to 45 days after inoculation depending on test conditions (temperature, season)
11.	Observations	
11.1	Method	root inspection per plant
11.2	Observation scale	

Class 0: healthy plant, no galls	Class 1: few and little galls which are difficult to find (for example less than 5)	Class 2: few galls, easy to observe but on few roots, still a lot of roots without galls	Class 3: many individual galls on most but not all roots	Class 4: many galls on all roots, sometimes in chains, can lead to dead plants and /or may suppress emergence
				

The germination percentage of non-inoculated plants of the same seed lot in the same experiment should be used to calculate the number of seeds that did not produce a plant due to the presence of the nematode, and add these to plants in class 4.

11.3	Validation of test	~~evaluation of variety resistance should be calibrated with results of resistant and susceptible controls on standards~~ Validation on controls. Expected reactions of controls: Susceptible control: most plants at classes 3 and 4. Highly resistant: most plants at classes 0 and 1. Intermediate resistant: clearly different from other controls with majority of plants around class 2.
11.4	Off-types	resistant varieties may have a few plants with a few galls
12.	Interpretation of ~~test results in comparison with control varieties~~ data in terms of UPOV characteristic states	[1] Susceptible: variety very similar to susceptible control [3] Intermediate resistant: variety very similar to intermediate resistant control [5] Highly resistant: variety very similar to highly resistant control If results are not clear, statistical analysis is advised. If significantly different from the controls, a retest is advised to check if the result is stable. If significantly different from resistant and intermediate resistant control (result between highly resistant and intermediate resistant controls), the variety is judged as intermediate resistant. If significantly different from intermediate resistant and susceptible control (result between intermediate resistant and susceptible controls), the variety is judged as susceptible.



	~~To consider that resistant varieties may have a few plants with falls. These are not considered as off-types.~~ ~~absent (susceptible)…… [1] growth strongly reduced, high gall count~~ ~~intermediate (moderately resistant)…… [2] medium growth reduction, medium gall count~~ ~~present (highly resistant)…… [3] no growth reduction, no galls~~	
13.	Critical control points	~~Avoid rotting of roots; high temperature causes breakdown of resistance~~ Avoid overwatering. This may result in rotting of roots. In case of aggressive test, put seeds in a layer of non-contaminated soil or decrease the quantity of inoculum.

Proposed changes to Characteristics 23 “Resistance to *Verticillium* sp. (Va and Vd)”, 24.1 “Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) Race 0EU/1US” and characteristic 24.2 “Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) Race 1EU/2US”

Deletion of asterisks

Current wording

23. (*) (+)	**VG**	**Resistance to *Verticillium* sp. (Va and Vd)**	**Résistance à *Verticillium* sp. (Va et Vd)**	**Resistenz gegen *Verticillium* sp. (Va und Vd)**	**Resistencia a *Verticillium* sp. (Va y Vd)**		
		– Race 0	**– Pathotype 0**	**– Pathotyp 0**	**– Raza 0**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Big Power	9
24. (+)		**Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Résistance à *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Resistenz gegen *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Resistencia a *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**		
24.1 (*)	**VG**	**– Race 0EU/1US**	**– Race 0EU/1US**	**– Pathotyp 0EU/1US**	**– Raza 0EU/1US**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Emperador	9
24.2 (*)	**VG**	**– Race 1EU/2US**	**– Race 1EU/2US**	**– Pathotyp 1EU/2US**	**– Raza 1EU/2US**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Emperador	9
24.3 (*)	**VG**	**– Race 2EU/3US**	**– Race 2EU/3US**	**– Pathotyp 2EU/3US**	**– Raza 2EU/3US**		
QL		absent	absente	fehlend	ausente	Emperador	1
		present	présente	vorhanden	presente	Colosus	9

Proposed new wording

23. ~~(*)~~ (+)	**VG**	**Resistance to *Verticillium* sp. (Va and Vd)**	**Résistance à *Verticillium* sp. (Va et Vd)**	**Resistenz gegen *Verticillium* sp. (Va und Vd)**	**Resistencia a *Verticillium* sp. (Va y Vd)**		
		– Race 0	**– Pathotype 0**	**– Pathotyp 0**	**– Raza 0**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	~~Big Power~~ Bruce, Emperador, King Kong	9
24. (+)		**Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Résistance à *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Resistenz gegen *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**	**Resistencia a *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**		
24.1 ~~(*)~~	**VG**	**– Race 0EU/1US**	**– Race 0EU/1US**	**– Pathotyp 0EU/1US**	**– Raza 0EU/1US**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Emperador	9
24.2 ~~(*)~~	**VG**	**– Race 1EU/2US**	**– Race 1EU/2US**	**– Pathotyp 1EU/2US**	**– Raza 1EU/2US**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Emperador	9
24.3 (*)	**VG**	**– Race 2EU/3US**	**– Race 2EU/3US**	**– Pathotyp 2EU/3US**	**– Raza 2EU/3US**		
QL		absent	absente	fehlend	ausente	Emperador	1
		present	présente	vorhanden	presente	Colosus	9

Deletion from grouping characteristics in Chapter 5.3.

Current wording

5.3 The following have been agreed as useful grouping characteristics:

(a) Fruit: green shoulder (characteristic 11)
(b) Autonecrosis (characteristic 21)
(c) Resistance to *Meloidogyne incognita* (characteristic 22)
(d) Resistance to *Verticillium* sp. – Race 0 (characteristic 23)
(e) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 0EU/1US (characteristic 24.1)
(f) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 1EU/2US (characteristic 24.2)
(g) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 2EU/3US (characteristic 24.3)

Proposed new wording

5.3 The following have been agreed as useful grouping characteristics:

(a) Fruit: green shoulder (characteristic 11)
(b) Autonecrosis (characteristic 21)
(c) Resistance to *Meloidogyne incognita* (characteristic 22)
~~(d) Resistance to *Verticillium* sp. – Race 0 (characteristic 23)~~
~~(e) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 0EU/1US (characteristic 24.1)~~
~~(f) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 1EU/2US (characteristic 24.2)~~
~~(g)~~ (d) Resistance to *Fusarium oxysporum* f. sp. *lycopersici* – Race 2EU/3US (characteristic 24.3)

Proposed changes to the explanation Ad. 24 “Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)”

Current wording

Ad. 24: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)

1.	Pathogen	*Fusarium oxysporum* f. sp. *lycopersici*
3.	Host species	*Solanum lycopersicum*
4.	Source of inoculum	Naktuinbouw[7] (NL), GEVES[8] (FR) or INIA[9] (ES)
5.	Isolate	race 0EU/1US (e.g. strains Orange 71 or PRI 20698 or Fol 071) race 1EU/2US (e.g. strains 4152 or PRI40698 or RAF 70) race 2EU/3US (e.g. strain Fol029)
6.	Establishment isolate identity	use differential varieties (see ISF website: http://www.worldseed.org)
7.	Establishment pathogenicity	on susceptible tomato varieties
8.	Multiplication inoculum	
8.1	Multiplication medium	Potato Dextrose Agar, Medium “S” of Messiaen
8.4	Inoculation medium	water for scraping agar plates or Czapek-Dox culture medium (7 d-old aerated culture)
8.6	Harvest of inoculum	filter through double muslin cloth
8.7	Check of harvested inoculum	spore count; adjust to 10^6 per ml
8.8	Shelflife/viability inoculum	4-8 h, keep cool to prevent spore germination
9.	Format of the test	
9.1	Number of plants per genotype	at least 20 plants
9.2	Number of replicates	1 replicate
9.3.1	Control varieties for the test with race 0EU/1US	
	Susceptible	(*Solanum lycopersicum*) Marmande, Marmande verte, Resal
	Resistant	Emperador, Colosus and (*Solanum lycopersicum*) “Marporum x Marmande verte”, Motelle, Gourmet, Mohawk, Ranco, Tradiro
9.3.2	Control varieties for the test with race 1EU/2US	
	Susceptible	(*Solanum lycopersicum*) Marmande verte, Cherry Belle, Roma, Marporum, Ranco
	Resistant	Emperador, Colosus and (*Solanum lycopersicum*) Tradiro, Odisea, “Motelle x Marmande verte”
9.3.3	Control varieties for the test with race 2EU/3US	
	Susceptible	Emperador and (*Solanum lycopersicum*) Marmande verte, Motelle, Marporum
	Resistant	Colosus and (*Solanum lycopersicum*) Tributes, Murdoch, “Marmande verte x Florida”
9.4	Test design	>20 plants; e.g. 35 seeds for 24 plants, including 2 blanks
9.5	Test facility	glasshouse or climate room
9.6	Temperature	24-28°C (severe test, with mild isolate) 20-24°C (mild test, with severe isolate)
9.7	Light	12 hours per day or longer
9.8	Season	all seasons
9.9	Special measures	slightly acidic peat soil is optimal; keep soil humid but avoid water stress

[7] Naktuinbouw: resistentie@naktuinbouw.nl

[8] GEVES: matref@geves.fr

[9] INIA: resistencias@inia.es

10.	Inoculation	
10.1	Preparation inoculum	aerated Messiaen or PDA or Agar Medium S of Messiaen or Czapek Dox culture or scraping of plates
10.2	Quantification inoculum	spore count, adjust to 10^6 spores per ml, lower concentration for a very aggressive isolate
10.3	Plant stage at inoculation	10-18 d, cotyledon to first leaf
10.4	Inoculation method	roots and hypocotyls are immersed in spore suspension for 5-15 min; trimming of roots is an option
10.7	Final observations	14-21 days after inoculation
11.	Observations	
11.1	Method	visual
11.2	Observation scale	symptoms: growth retardation, wilting, yellowing, vessel browning extending above cotyledon
11.3	Validation of test	evaluation of variety resistance should be calibrated with results of resistant and susceptible controls.
12.	Interpretation of test results in comparison with control varieties	
	absent ..... [1]	severe symptoms
	present ..... [9]	mild or no symptoms
13.	Critical control points	Test results may vary slightly in inoculum pressure due to differences in isolate, spore concentration, soil humidity and temperature.

Proposed new wording

Ad. 24: Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)

1.	Pathogen	*Fusarium oxysporum* f. sp. *lycopersici*
3.	Host species	*Solanum lycopersicum*
4.	Source of inoculum	Naktuinbouw[10] (NL), GEVES[11] (FR) or INIA[12] (ES)
5.	Isolate	race 0EU/1US (e.g. strains Orange 71 or PRI 20698 or Fol 071) race 1EU/2US (e.g. strains 4152 or PRI40698 or RAF 70) race 2EU/3US (e.g. strain Fol029)
6.	Establishment isolate identity	use differential varieties (see ISF website: http://www.worldseed.org)
7.	Establishment pathogenicity	on susceptible tomato varieties
8.	Multiplication inoculum	
8.1	Multiplication medium	Potato Dextrose Agar, Medium “S” of Messiaen
8.4	Inoculation medium	water for scraping agar plates or Czapek-Dox culture medium (7 d-old aerated culture)
8.6	Harvest of inoculum	filter through double muslin cloth
8.7	Check of harvested inoculum	spore count; adjust to 10^6 per ml
8.8	Shelflife/viability inoculum	4-8 h, keep cool to prevent spore germination
9.	Format of the test	
9.1	Number of plants per genotype	at least 20 plants
9.2	Number of replicates	1 replicate
9.3.1	Control varieties for the test with race 0EU/1US	
	Susceptible	(*Solanum lycopersicum*) Marmande, Marmande verte, Resal
	Resistant	Emperador, Colosus and (*Solanum lycopersicum*) “Marporum x Marmande verte”, Motelle, Gourmet, Mohawk, Ranco, Tradiro
9.3.2	Control varieties for the test with race 1EU/2US	
	Susceptible	(*Solanum lycopersicum*) Marmande verte, Cherry Belle, Roma, Marporum, Ranco
	Resistant	Emperador, Colosus and (*Solanum lycopersicum*) Tradiro, Odisea, “Motelle x Marmande verte”
9.3.3	Control varieties for the test with race 2EU/3US	
	Susceptible	Emperador and (*Solanum lycopersicum*) Marmande verte, Motelle, Marporum. Susceptible rootstocks are generally less susceptible than susceptible *Solanum lycopersicum* varieties. The susceptible rootstock variety Emperador must be included as control.
	Resistant	Colosus and (*Solanum lycopersicum*) Tributes, Murdoch, “Marmande verte x Florida”
9.4	Test design	>20 plants; e.g. 35 seeds for 24 plants, including 2 blanks
9.5	Test facility	glasshouse or climate room
9.6	Temperature	24-28°C (severe test, with mild isolate) 20-24°C (mild test, with severe isolate)
9.7	Light	12 hours per day or longer
9.8	Season	all seasons
9.9	Special measures	slightly acidic peat soil is optimal; keep soil humid but avoid water stress

[10] Naktuinbouw: resistentie@naktuinbouw.nl

[11] GEVES: matref@geves.fr

[12] INIA: resistencias@inia.es

10.	Inoculation	
10.1	Preparation inoculum	aerated Messiaen or PDA or Agar Medium S of Messiaen or Czapek Dox culture or scraping of plates
10.2	Quantification inoculum	spore count, adjust to 10^6 spores per ml, lower concentration for a very aggressive isolate
10.3	Plant stage at inoculation	10-18 d, cotyledon to first leaf
10.4	Inoculation method	roots and hypocotyls are immersed in spore suspension for 5-15 min; trimming of roots is an option
10.7	Final observations	14-21 days after inoculation
11.	Observations	
11.1	Method	visual
11.2	Observation scale	symptoms: growth retardation, wilting, yellowing, vessel browning extending above cotyledon

Class 0	Class 1	Class 2	Class 3
Healthy compared to the non-inoculated control.	Healthy compared to the non-inoculated control with brown vessel above the cotyledon (observed when plants are cut in case of variety with different levels of symptoms)	Higher than 50% of growth reduction and/or yellowing and/or wilting on cotyledons and/or leaves.	Nearly dead: strong reduction with plants look dwarf (there can be necrosis but not always) or dead
			
If all plants in class 0 or if all plants in classes 2 and 3, it is not necessary to cut the plants.			
In case of variety or control with different levels of symptoms, cut the plants to check presence or not of strong brown vessel above cotyledons. In case of no brown vessels or below cotyledons, the plant is note 0. In case of brown vessels above cotyledons, the plant is note 1.			

11.3	Validation of test	evaluation of variety resistance should be calibrated with results of resistant and susceptible controls.
12.	Interpretation of ~~test results in comparison with control varieties~~data in terms of UPOV characteristic states	
	absent ..... [1]	severe symptoms
	present ..... [9]	mild or no symptoms
13.	Critical control points	Test results may vary slightly in inoculum pressure due to differences in isolate, spore concentration, soil humidity and temperature.

Correction of title of characteristic 26 “Resistance to *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)” and changes to explanation Ad. 26

Current wording

26. **(+)**		**Resistance to *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)**	**Résistance à *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)**	**Resistenz gegen *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)**	**Resistencia a *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)**		
26.1	**VG**	**– Race 0**	**– Pathotype 0**	**– Pathotyp 0**	**– Raza 0**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.2	**VG**	**– Group A**	**– Groupe A**	**– Gruppe A**	**– Grupo A**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Big Power	9
26.3	**VG**	**– Group B**	**– Groupe B**	**– Gruppe B**	**– Grupo B**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.4	**VG**	**– Group C**	**– Groupe C**	**– Gruppe C**	**– Grupo C**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	Big Power	9
26.5	**VG**	**– Group D**	**– Groupe D**	**– Gruppe D**	**– Grupo D**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.6	**VG**	**– Group E**	**– Groupe E**	**– Gruppe E**	**– Grupo E**		
QL		absent	absente	fehlend	ausente	Bruce, King Kong	1
		present	présente	vorhanden	presente	Big Power	9

Proposed new wording

26. **(+)**		**Resistance to *~~Fulvia~~ Passalora fulva* (~~Ff~~ Pf) ~~(ex *Cladosporium fulvum*)~~ (ex *Fulvia fulva*)**	**Résistance à *~~Fulvia~~ Passalora fulva* (~~Ff~~ Pf) ~~(ex *Cladosporium fulvum*)~~ (ex *Fulvia fulva*)**	**Resistenz gegen *~~Fulvia~~ Passalora fulva* (~~Ff~~ Pf) ~~(ex *Cladosporium fulvum*)~~ (ex *Fulvia fulva*)**	**Resistencia a *~~Fulvia~~ Passalora fulva* (~~Ff~~ Pf) ~~(ex *Cladosporium fulvum*)~~ (ex *Fulvia fulva*)**		
26.1	**VG**	**– Race 0**	**– Pathotype 0**	**– Pathotyp 0**	**– Raza 0**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.2	**VG**	**– Group A**	**– Groupe A**	**– Gruppe A**	**– Grupo A**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	~~Big Power~~ Vitalfort	9
26.3	**VG**	**– Group B**	**– Groupe B**	**– Gruppe B**	**– Grupo B**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.4	**VG**	**– Group C**	**– Groupe C**	**– Gruppe C**	**– Grupo C**		
QL		absent	absente	fehlend	ausente		1
		present	présente	vorhanden	presente	~~Big Power~~ Vitalfort	9
26.5	**VG**	**– Group D**	**– Groupe D**	**– Gruppe D**	**– Grupo D**		
QL		absent	absente	fehlend	ausente	King Kong	1
		present	présente	vorhanden	presente	Bruce	9
26.6	**VG**	**– Group E**	**– Groupe E**	**– Gruppe E**	**– Grupo E**		
QL		absent	absente	fehlend	ausente	Bruce, King Kong	1
		present	présente	vorhanden	presente	~~Big Power~~ Vitalfort	9

Current wording

Ad. 26: Resistance to *Fulvia fulva* (Ff) (ex *Cladosporium fulvum*)

1. Pathogen..... *Fulvia fulva* (ex *Cladosporium fulvum)*
3. Host species ..... *Solanum lycopersicum*
4. Source of inoculum ..... Naktuinbouw[13] (NL) or GEVES[14] (FR)
5. Isolate ..... Race group 0, A, B, C, D, and E
6. Establishment isolate identity..... with genetically defined differentials from GEVES (FR)
A breaks Cf-2, B Cf-4, C Cf-2&4, D Cf-5, E Cf-2&4&5
7. Establishment pathogenicity ..... symptoms on susceptible tomato
8. Multiplication inoculum.....
8.1 Multiplication medium ..... Potato Dextrose Agar or Malt Agar or a synthetic medium
8.8 Shelf life/viability inoculum ..... 4 hours, keep cool
9. Format of the test
9.1 Number of plants per genotype..... more than 20 plants
9.2 Number of replicates…… .. 1 replicate
9.3 Control varieties
Susceptible: ..... King Kong and (*Solanum lycopersicum*) Monalbo, Moneymaker
Resistant for race 0:..... Bruce and (*Solanum lycopersicum*) Angela, Estrella, Sonatine, Sonato, Vemone, Vagabond, IVT 1149, Vagabond × IVT 1149, IVT 1154
Resistant for race group A: ..... Big Power and (*Solanum lycopersicum*) Angela, Estrella, Sonatine, Sonato
Resistant for race group B: ..... Bruce and (*Solanum lycopersicum*) Angela, Estrella, Sonatine, Sonato, Vemone
Resistant for race group C: ..... Big Power and (*Solanum lycopersicum*) Angela, Estrella, Sonatine
Resistant for race group D: ..... Bruce and (*Solanum lycopersicum*) Estrella, Sonatine, Vemone
Resistant for race group E: ..... Big Power and (*Solanum lycopersicum*) Sonatine, Jadviga, Rhianna, IVT 1154
9.5 Test facility ..... glasshouse or climate room
9.6 Temperature ..... day: 22° C, night: 20° or day: 25°C, night 20°C
9.7 Light ..... 12 hours or longer
9.9 Special measures ..... depending on facility and weather, there may be a need to raise the humidity
e.g. humidity tent closed 3-4 days after inoculation
and after this, 66% until 80% closed during day, until end
10. Inoculation.....
10.1 Preparation inoculum ..... prepare evenly colonized plates, e.g. 1 for 36 plants;
remove spores from plate by scraping with water with Tween20;
filter through double muslin cloth
10.2 Quantification inoculum..... count spores; adjust to 10^5 spores per ml or more
10.3 Plant stage at inoculation..... 19-20 d (incl. 12 d at 24°), 2-3 leaves
10.4 Inoculation method..... spray on dry leaves
10.7 Final observations..... 14 days after inoculation
11. Observations
11.1 Method ..... visual inspection of abaxial side of inoculated leaves
11.2 Observation scale ..... Symptom: velvety, white spots
11.3 Validation of test ..... evaluation of variety resistance should be calibrated with results of resistant and susceptible controls
12. Interpretation of test results in comparison with control varieties

absent	……	[1]	symptoms
present	……	[9]	no symptoms

Excessively high humidity may cause rugged brown spots on all leaves. These are not to be considered as off-types.
13. Critical control points:
Ff spores have a variable size and morphology. Small spores are also viable.
Fungal plates will gradually become sterile after 6-10 weeks. Store good culture at -80°C.
For practical purposes, it is not possible to keep plants longer than 14 days inside a tent.

[13] Naktuinbouw: resistentie@naktuinbouw.nl

[14] Geves: matref@geves.fr

Proposed new wording

Ad. 26: Resistance to ~~*Fulvia*~~ *Passalora fulva* (~~Ff~~ Pf) ~~(ex *Cladosporium fulvum*)~~(ex *Fulvia fulva*)

1.	Pathogen	~~*Fulvia*~~ *Passalora fulva* ~~(ex *Cladosporium fulvum*)~~
3.	Host species	*Solanum lycopersicum*
4.	Source of inoculum	Naktuinbouw[15] (NL) or GEVES[16] (FR)
5.	Isolate	Race group 0, A, B, C, D, and E
6.	Establishment isolate identity	with genetically defined differentials from GEVES (FR) A breaks Cf-2, B Cf-4, C Cf-2&4, D Cf-5, E Cf-2&4&5
7.	Establishment pathogenicity	symptoms on susceptible tomato
8.	Multiplication inoculum	
8.1	Multiplication medium	Potato Dextrose Agar or Malt Agar or a synthetic medium
8.8	Shelflife/viability inoculum	4 hours, keep cool
9.	Format of the test	
9.1	Number of plants per genotype	more than 20 plants
9.2	Number of replicates	1 replicate
9.3	Control varieties	
	Susceptible	King Kong, ~~and~~ (*Solanum lycopersicum*) Monalbo, Moneymaker
	Resistant for race 0:	Bruce, ~~and~~ (*Solanum lycopersicum*) ~~Angela, Estrella, Sonatine, Sonato, Vemone,~~ Vagabond, ~~IVT 1149~~, Vagabond × IVT 1149, IVT 1154, Purdue
	Resistant for race group A:	~~Big Power~~ Vitalfort, ~~and~~ (*Solanum lycopersicum*) ~~Angela, Estrella, Sonatine~~, Sonato, Purdue, IVT 1154, IVT 1149
	Resistant for race group B:	Bruce, ~~and~~ (*Solanum lycopersicum*) ~~Angela, Estrella, Sonatine, Sonato, Vemone~~ Vétomold, IVT 1149, IVT 1154
	Resistant for race group C:	~~Big Power~~ Vitalfort, ~~and~~ (*Solanum lycopersicum*) ~~Angela, Estrella, Sonatine~~ IVT 1154, IVT 1149
	Resistant for race group D:	Bruce, ~~and~~ (*Solanum lycopersicum*) ~~Estrella, Sonatine, Vemone~~ Vétomold, IVT 1154
	Resistant for race group E:	~~Big Power~~ Vitalfort, ~~and~~ (*Solanum lycopersicum*) ~~Sonatine, Jadviga, Rhianna~~, IVT 1154
9.5	Test facility	glasshouse or climate room
9.6	Temperature	day: 22° C, night: 20° or day: 25°C, night 20°C
9.7	Light	12 hours or longer
9.9	Special measures	depending on facility and weather, there may be a need to raise the humidity e.g. humidity tent fully closed 3-4 days after inoculation and after that partly closed (66% until 80%, 24h per day), until end
10.	Inoculation	
10.1	Preparation inoculum	prepare evenly colonized plates, e.g. 1 for 36 plants; remove spores from plate by scraping with water with Tween20; filter through double muslin cloth
10.2	Quantification inoculum	count spores; adjust to 10^5 spores per ml or more
10.3	Plant stage at inoculation	19-20 d (incl. 12 d at 24°), 2-3 leaves
10.4	Inoculation method	spray on dry leaves
10.7	Final observations	14 days after inoculation; when susceptible control does not show clear symptoms the test may be prolonged until for example 18 days after inoculation
11.	Observations	
11.1	Method	visual inspection of abaxial side of inoculated leaves
11.2	Observation scale	Symptom: velvety, white spots

[15] Naktuinbouw: resistentie@naktuinbouw.nl

[16] Geves: matref@geves.fr

11.3	Validation of test	evaluation of variety resistance should be calibrated with results of resistant and susceptible controls
12.	Interpretation of ~~test results in comparison with control varieties~~data in terms of UPOV characteristic states	
	[1] absent	symptoms
	[9] present	no symptoms
13.	Critical control points	~~Ff~~ Pf spores have a variable size and morphology. Small spores are also viable. Fungal plates will gradually become sterile after 6-10 weeks and repeated subculturing. Do not subculture more often than strictly necessary for multiplication. Store good culture at -80°C. ~~For practical purposes, it is not possible to keep plants longer than 14 days inside a tent.~~ Excessively high humidity may cause rugged brown spots on all leaves. These are not to be considered as off-types.

Chapter 10: Technical Questionnaire:

Section 5: Addition of all diseases resistances to Section TQ 5 with an option "not tested" for characteristics without (*)

Current wording

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

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

	Characteristics	Example Varieties	Note
	[…]		
5.5 (22)	**Resistance to *Meloidogyne incognita* (Mi)**		
	susceptible	Bruce	1[ ]
	moderately resistant		2[ ]
	highly resistant	Emperador	3[ ]
5.6 (23)	**Resistance to *Verticillium* sp. (Va and Vd) - Race 0**		
	absent		1[ ]
	present	Big Power	9[ ]
5.7 (24)	**Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**		
5.8 (24.1)	**Race 0EU/1US**		
	absent		1[ ]
	present	Emperador	9[ ]
5.9 (24.2)	**Race 1EU/2US**		
	absent		1[ ]
	present	Emperador	9[ ]
5.10 (24.3)	**Race 2EU/3US**		
	absent	Emperador	1[ ]
	present	Colosus	9[ ]
5.11 (25)	**Resistance to *Fusarium oxysporum* f. sp. *radicis-lycopersici* (Forl)**		
	absent	Kemerit	1[ ]
	present	Emperador	9[ ]

Proposed new wording

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

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

	Characteristics	Example Varieties	Note
	[…]		
5.5 (22)	**Resistance to *Meloidogyne incognita* (Mi)**		
	susceptible	Bruce	1[ ]
	susceptible to intermediate resistant		2 [ ]
	intermediate ~~moderately~~ resistant		~~2~~ 3 [ ]
	intermediate to highly resistant		4 [ ]
	highly resistant	Emperador	~~3~~ 5 [ ]
5.6 (23)	**Resistance to *Verticillium* sp. (Va and Vd) - Race 0**		
	absent		1[ ]
	present	~~Big Power~~ Bruce, Emperador, King Kong	9[ ]
	not tested		[ ]
5.7 (24)	**Resistance to *Fusarium oxysporum* f. sp. *lycopersici* (Fol)**		
5.8 (24.1)	**Race 0EU/1US**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.9 (24.2)	**Race 1EU/2US**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.10 (24.3)	**Race 2EU/3US**		
	absent	Emperador	1[ ]
	present	Colosus	9[ ]
5.11 (25)	**Resistance to *Fusarium oxysporum* f. sp. *radicis-lycopersici* (Forl)**		
	absent	Kemerit	1[ ]
	present	Emperador	9[ ]

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

	Characteristics	Example Varieties	Note
5.12 (26.1)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Race 0**		
	absent	King Kong	1[ ]
	present	Bruce	9[ ]
	not tested		[ ]
5.13 (26.2)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Group A**		
	absent	King Kong	1[ ]
	present	Vitalfort	9[ ]
	not tested		[ ]
5.14 (26.3)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Group B**		
	absent	King Kong	1[ ]
	present	Bruce	9[ ]
	not tested		[ ]
5.15 (26.4)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Group C**		
	absent		1[ ]
	present	Vitalfort	9[ ]
	not tested		[ ]
5.16 (26.5)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Group D**		
	absent	King Kong	1[ ]
	present	Bruce	9[ ]
	not tested		[ ]
5.17 (26.6)	**Resistance to *Passalora fulva* (Pf) (ex *Fulvia fulva*) – Group E**		
	absent	Bruce, King Kong	1[ ]
	present	Vitalfort	9[ ]
	not tested		[ ]

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

	Characteristics	Example Varieties	Note
5.18 (27.1)	**Resistance to Tomato mosaic virus (ToMV) – Strain 0**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.19 (27.2)	**Resistance to Tomato mosaic virus (ToMV) – Strain 1**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.20 (27.3)	**Resistance to Tomato mosaic virus (ToMV) – Strain 2**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.21 (28)	**Resistance to *Pyrenochaeta lycopersici* (Pl)**		
	absent		1[ ]
	present	Emperador	9[ ]
	not tested		[ ]
5.22 (29)	**Resistance to *Stemphylium* spp. (Ss)**		
	absent	Big Power	1[ ]
	present	Body	9[ ]
	not tested		[ ]
5.23 (30)	**Resistance to Tomato yellow leaf curl virus (TYLCV)**		
	absent	Big Power	1[ ]
	present		9[ ]
	not tested		[ ]

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

	Characteristics	Example Varieties	Note
5.24 (31)	**Resistance to Tomato spotted wilt virus (TSWV)**		
	absent	Emperador	1[ ]
	present	Enpower	9[ ]
	not tested		[ ]
5.25 (32)	**Resistance to *Oidium neolycopersici* (On)**		
	absent		1[ ]
	present	Multifort	9[ ]
	not tested		[ ]

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