UPOV
International Union for the Protection of New Varieties of Plants

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Enlarged Editorial Committee **TC-EDC/Mar18/7**

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PARTIAL REVISION OF THE TEST GUIDELINES FOR SPINACH

Document prepared by an expert from the Netherlands

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1. The purpose of this document is to present a proposal for a partial revision of the Test Guidelines for Spinach (document TG/55/7 Rev. 4).

2. The Technical Working Party for Vegetables (TWV), at its fifty-first session, held in Roelofarendsveen, Netherlands, from July 3 to 7, 2017, considered a proposal for a partial revision of the Test Guidelines for Spinach (*Spinacea oleracea* L.) on the basis of documents TG/55/7 Rev. 4 and TWV/51/8 "Partial Revision of the Test Guidelines for Spinach (document TG/55/7 Rev. 4)" and proposed the following revisions to the Test Guidelines Spinach (see document TWV/51/16 "Report", paragraph 111):

(a) Addition of "Race Pfs: 16" to Characteristic 18 "Resistance to *Peronospora farinosa* f. sp. *spinaciae* (Pfs)", including example varieties;
(b) Revision of explanation Ad. 18 in Chapter 8.2 "Explanations for individual characteristics"
(c) Addition of "Race Pfs: 16" to TQ 7.3 "Other information" and addition of option "not tested" for new race "Race Pfs: 16" and all races

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

Addition of "Race Pfs: 16" to Characteristic 18 "Resistance to *Peronospora farinosa* f. sp. *spinaciae* (Pfs)", including example varieties

4. **(+)**	**VG**	**Resistance to *Peronospora farinosa* f. sp. *spinaciae* (Pfs)**	**Résistance à *Peronospora farinosa* f. sp. *spinaciae* (Pfs)**	**Resistenz gegen *Peronospora farinosa* f. sp. *spinaciae* (Pfs)**	**Resistencia a *Peronospora farinosa* f. sp. *spinaciae* (Pfs)**		
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18.1		**Race Pfs: 1**	**Race Pfs: 1**	**Pathotyp Pfs: 1**	**Raza Pfs: 1**		
QL		absent	absente	fehlend	ausente	Viroflay, Winterreuzen	1
		present	présente	vorhanden	presente	Califlay, Resistoflay	9
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18.2		**Race Pfs: 2**	**Race Pfs: 2**	**Pathotyp Pfs: 2**	**Raza Pfs: 2**		
QL		absent	absente	fehlend	ausente	Califlay	1
		present	présente	vorhanden	presente	Resistoflay	9
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18.3	**Race Pfs: 3**	**Race Pfs: 3**	**Pathotyp Pfs: 3**	**Raza Pfs: 3**		
QL	absent	absente	fehlend	ausente	Resistoflay	1
	present	présente	vorhanden	presente	Califlay, Clermont	9
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18.4	**Race Pfs: 4**	**Race Pfs: 4**	**Pathotyp Pfs: 4**	**Raza Pfs: 4**		
QL	absent	absente	fehlend	ausente	Califlay	1
	present	présente	vorhanden	presente	Clermont	9
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18.5	**Race Pfs: 5**	**Race Pfs: 5**	**Pathotyp Pfs: 5**	**Raza Pfs: 5**		
QL	absent	absente	fehlend	ausente	Clermont	1
	present	présente	vorhanden	presente	Califlay, Campania	9
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18.6	**Race Pfs: 6**	**Race Pfs: 6**	**Pathotyp Pfs: 6**	**Raza Pfs: 6**		
QL	absent	absente	fehlend	ausente	Califlay, Campania	1
	present	présente	vorhanden	presente	Boeing	9
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18.7	**Race Pfs: 7**	**Race Pfs: 7**	**Pathotyp Pfs: 7**	**Raza Pfs: 7**		
QL	absent	absente	fehlend	ausente	Califlay	1
	present	présente	vorhanden	presente	Campania	9
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18.8	**Race Pfs: 8**	**Race Pfs: 8**	**Pathotyp Pfs: 8**	**Raza Pfs: 8**		
QL	absent	absente	fehlend	ausente	Boeing, Campania	1
	present	présente	vorhanden	presente	Lazio, Lion	9
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18.9	**Race Pfs: 10**	**Race Pfs: 10**	**Pathotyp Pfs:10**	**Raza Pfs:10**		
QL	absent	absente	fehlend	ausente	Boeing, Campania, Lion	1
	present	présente	vorhanden	presente	Lazio	9
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18.10	**Race Pfs: 11**	**Race Pfs: 11**	**Pathotyp Pfs: 11**	**Raza Pfs: 11**		
QL	absent	absente	fehlend	ausente	Lazio	1
	present	présente	vorhanden	presente	Boeing, Califlay, Campania, Lion	9

18.11	**Race Pfs: 12**	**Race Pfs: 12**	**Pathotyp Pfs: 12**	**Raza Pfs: 12**		
QL	absent	absente	fehlend	ausente	Boeing, Campania	1
	present	présente	vorhanden	presente	Finch, Pigeon, Red Kitten, Zebu	9
18.12	**Race Pfs: 13**	**Race Pfs: 13**	**Pathotyp Pfs: 13**	**Raza Pfs: 13**		
QL	absent	absente	fehlend	ausente	Campania	1
	present	présente	vorhanden	presente	Boeing, Lion	9
18.13	**Race Pfs: 14**	**Race Pfs: 14**	**Pathotyp Pfs: 14**	**Raza Pfs: 14**		
QL	absent	absente	fehlend	ausente	Campania, Pigeon	1
	present	présente	vorhanden	presente	Califlay, Lion	9
18.14	**Race Pfs: 15**	**Race Pfs: 15**	**Pathotyp Pfs: 15**	**Raza Pfs: 15**		
QL	absent	absente	fehlend	ausente	Caladonia	1
	present	présente	vorhanden	presente	Pigeon	9
18.15	**Race Pfs: 16**	**Race Pfs: 16**	**Pathotyp Pfs: 16**	**Raza Pfs: 16**		
QL	absent	absente	fehlend	ausente	Meerkat	1
	present	présente	vorhanden	presente	Caladonia	9

Proposal to revise explanation Ad. 18 in Chapter 8.2 “Explanations for individual characteristics”

Ad. 18: Resistance to *Peronospora farinosa* f. sp. *spinaciae*

Maintenance of races

Type of medium:	Living host plants, obtainable from: Naktuinbouw P.O. Box 40 NL-2370 AA Roelofarendsveen Netherlands www.naktuinbouw.com or plant material with spores stored at -20° C for a maximum of one year

Execution of test

Growth stage of plants:	First cotyledons/leaf, eleven-day-old plants
Temperature:	15°C during day/12°C during night
Light:	15 hours per day, after emergence
Growing method:	In soil in pots or trays in a glasshouse or growth chamber
Method of inoculation:	Sporulating leaves, taken from host plants that were infected seven days before, are thoroughly rinsed with sterile tap water (maximum 150 ml water per 224 plants). The spore suspension is filtered through cheesecloth and sprayed on test plants until the inoculum covers the leaves but does not run off. 150 ml of suspension is enough for up to 3 x 224 plants. Spore density should be 20,000 to 100,000 conidia/ml water. The spore suspension should be used fresh.
Remarks:	Spinach downy mildew is wind-borne. Sporulating plants should be kept in closed containers or isolated chambers to prevent any cross-contamination. Resistant controls are needed in each multiplication and in each test to ensure the race identity. Light and humidity conditions during seedling development and incubation are critical. Optimal humidity of approximately 80-90% RH allows plant growth and fungal growth; strong light inhibits spore germination and infection. The test should be carried out in wintertime with protection against direct sunshine. After inoculation, the plants should remain under plastic for three days. After this time, the plastic should be slightly raised during the daytime.

Duration of test

- Multiplication	harvest spores 7 days after inoculation
- Sowing to inoculation:	11 days
- Inoculation to reading:	10 days

Number of plants tested	~~56 plants~~ at least 20 plants
Evaluation of infection:	Resistance is usually complete; sometimes necrotic spots are visible as a result of infection. Susceptible plants show varying degrees of sporulation. Sporulation is visible as a grey covering on leaves, starting on the more humid abaxial side.

Differential varieties to identify races

Races Pfs: 1-8 and 10-16 of *Peronospora farinosa* f. sp. *spinaciae* are defined with a standard set of "differential varieties" according to the following table:

Differential variety	Pfs: 1	Pfs: 2	Pfs: 3	Pfs: 4	Pfs: 5	Pfs: 6	Pfs: 7	Pfs: 8	Pfs: 10	Pfs: 11	Pfs: 12	Pfs: 13	Pfs: 14	Pfs: 15	Pfs: 16
Viroflay	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Resistoflay	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S
Califlay	R	S	R	S	R	S	S	R	S	R	R	S	R	S	R
Clermont	R	R	R	R	S	S	S	S	S	S	S	S	S	R	S
Campania	R	R	R	R	R	S	R	S	S	R	S	S	S	R	R
Boeing	R	R	R	R	R	R	R	S	S	R	S	R	S	R	R
Lion	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R
Lazio	R	R	R	R	R	R	R	R	R	S	S	S	S	R	S
Whale	R	R	R	R	R	R	R	R	S	R	R	S	R	S	R
Pigeon	R	R	R	R	R	R	R	R	R	R	R	R	S	R	S
Caladonia	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R
Meerkat	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S

Legend: R= resistance present; S = resistance absent, susceptible

Proposal to add "Race Pfs: 16" to TQ 7.3 "Other information" and addition of option "not tested" for new race "Race Pfs : 16" and all races

"7.3 Other information

[…]

"(b) Resistance to pests and diseases (specify)

"(i) Resistance to *Peronospora farinosa* f. sp. *spinaciae*

Race Pfs: 1	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 2	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 3	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 4	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 5	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 6	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 7	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 8	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 10	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 11	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 12	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 13	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 14	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 15	[ ] absent	[ ] present	[ ] not tested
Race Pfs: 16	[ ] absent	[ ] present	[ ] not tested

[…]"

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