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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL WORKING PARTY FOR VEGETABLES

Forty-Eighth Session
Paestum, Italy, from June 23 to 27, 2014

ADDENDUM TO DOCUMENT TWV/48/27

USE OF DISEASE RESISTANCE CHARACTERISTICS IN DUS EXAMINATION

Document prepared by Italy, the European Union and the European Seed Association (ESA)

Disclaimer: this document does not represent UPOV policies or guidance

The annexes to this document contain copies of presentations made at the forty-eighth session of the Technical Working Party for Vegetables (TWV) as follows:

ANNEX I: An overview on resistance tests on vegetable varieties in Italy: using of CPVO TP, critical points and perspectives, presented by an expert from Italy

ANNEX II: Use of disease resistance characteristics in DUS examination, presented by an expert from the European Union

ANNEX III: Outcome survey – CPVO vegetable protocols disease resistance, presented by an expert from the European Seed Association (ESA)

[Annexes follow]

ANNEX I

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TECHNICAL WORKING PARTY FOR VEGETABLES
Forty-Eighth Session
Paestum, Italy, June 23 to 27, 2014

An overview on resistance tests on vegetable varieties in Italy: using of CPVO TP, critical points and perspectives

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Phytopathological laboratory activity

Phytopatological Laboratory of CRA-SCS Battipaglia Station started resistance evaluation activity since 2001.

Tomato, French bean, pepper, lettuce, chickpea, pea, melon, basil are the species that were submitted to resistance tests during these 13 years.

Totally, more than **550** verieties were registered after describing resistance characters according to CPVO technical protocols or national protocols

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Actually.....

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In the last three years, as in the past, the most represented spiecies (as number of samples analysed and number of test developed) is tomato. Lettuce and spinach are not reported.

Number of variety examined per species (2° cycle is reported)

Year	Tomato	Pepper	French bean	Melon	Pea	Total/year
2011	31	10	2	3	/	46
2012	30	10	6	/	/	46
2013	16	2	/	5	1	24
*2014***	*31*	*22*	*1*	*1*	/	*45*
Total						161

*** in progress*

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A challenge (a dip) for small laboratories

Performing of resistance tests (2013)

Year	Tomato	Pepper	French bean	Melon	Pea	Total
n. samples	47	24	1	6	1	79
tests	235	96	2	18	1	**352**

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Critical points

1. Manteinance of reference varieties collection
2. Manteinance of reference pathogen collection
3. Working according to standardized procedure reported in CPVO technical protocols (availability of facilities, reagents, staff, training….)

Thanks to our system, that is managed according to quality standard ISO 9001:2008, we sufficiently manage point 3; point 1 and point 2 are still crucial.

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Reference varieties not always easily available

…mainly when varieties comes from foreign continents (long time for receiving materials, sometimes needs of special phytosanitary permission). **Reference varieties reported on TC are needful to set up pilot experiments.**

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Reference pathogen strains

It's rather easy to mantain fungi and bacteria that can be stored in conditions of medium and long term storage.

Much more difficult is to mantian biotrofic organism (peronospora, bremia, nematodes, some viruses). For these organisms Italy decided to order resistance analyses to other laboratories (Geves or Naktuinbouw) or to buy every year the inoculum from foreign collections.

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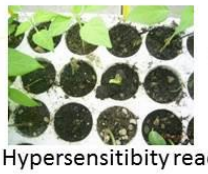
Working according to standardized procedure reported in CPVO technical protocols: the case of resistance to tobamoviruses in pepper

Reading of symptoms and expression of judgement can arise confusion.
Standardize the inoculum preparation? Varieties aren't unifrom?

Mild mosaic



Hypersensitibity reaction

Reference varieties not all available.
The document TWV/48/38 - Annex, page 7-8 reports new explanation
(and more... remarks TWV/48/38 - Annex, page 5)

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Set up of new protocols- Evaluation of

Resistance to *Fusarium oxysporum* f. sp. *lactucae* race 1

(see Document TG/13/11(PROJ.1))

Reference strain: *F. o. lactucae* race 1 - ATCC 3040
Reference varieties: resistant variety: Romasol; suceptible: Avidius
Plant stage for inoculation: 2 weeks
Number of plant tested per sample: 20
Inoculation method: dipping the roots in a conidia suspension (1 x 10^6 cfu/ml)
Incubation: climatic room (26°C, 12 h night/day, 10.000 lux)
First disease observation: after 7-10 days from inoculation
Second observation: 15 days from inoculation
Final observation: 20 – 25 days from inoculation
CCP: inoculation plant stage and choice of the reference varieties

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Set up of protocol for evaluation of resistance of tomato to *R.solanacearum*

Reference strain: ***R. solanacearum* razza 1, biovar 1, strain LMG 26752**
Reference varieties: resistant variety: Caraibo; suceptible: Gianna
Plant stage for inoculation: 3-4 true leaves
Number of plant tested per sample: 20
Inoculation method: at roots with 2 ml of a bacteria suspension (1 x 10^8 cfu/ml)
Incubation: climatic room (26°C, 12 h night)
First disease observation: after 7 days from inoculation
Second observation: 15 days from inoculation
Final observation: 20 – 25 days from inoculation
Observation scale: 1: no symptoms; 2 one or more wilted leaves; 3 all wilted leaves; 4 dead plant - Disease Incidence (DI) calculation
DI = (1A + 2B + 3C + 4D) *100/ ((A + B + C + D)*4)

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Set up of protocol for resistance evaluation of basil to *Fusarium oxysporum* f. sp .*basilici*

Reference strain: ***Fusarium oxysporum* f. sp. *basilici*** – VIT1 local strain
Reference varieties: resistant variety: ?; suceptible: Genovese
Plant stage for inoculation: fully expanded cotyledons
Number of plant tested per sample: 20
Inoculation method: by dipping root inoculation method with a conidial suspension (1 x 10^6 cfu/ml)
Incubation: climatic room (25°C, 12 h night)
First disease observation: after 10 days from inoculation
Second observation: 21 days from inoculation
Final observation: 28 days from inoculation
Observation scale: 0: no symptoms; 1: asimmetry; 2: strong asimmetry; 3: strong asimmetyry, chlorosis and wilting; 4: necrosis, wilting; 5: dead plant - Disease Incidence (DI) calculation
DI = (1A + 2B + 3C + 4D + 5E + 6F) *100/ ((A + B + C + D + E + F)*6)

Incidence %	Description
60 - 100	Very high susceptible
31 - 60	High susceptible
11 - 30	Middle susceptible
1 - 10	Lightly susceptible
0	Resistant

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Studying of *Pseudomonas syringae* pv. *phaseolicola* population on French bean seeds

In last four years we tested more than 200 French been seed samples according to ISTA protocol. 30% of these samples resulted infected by *Pseudomonas syringae* pv. *phaseolicola* and *P. s.* pv. *syringae.*
Than we collect 79 bacterial strain to be characterized to detect the most widespread race on French bean Italian seeds.

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New breeding programs in Italy

Resistance to:

- Peronospora of basil
- *Clavibacter michiganensis* subsp. *michiganensis* and *Ralstonia solanacearum* in tomato
- *Fusarium oxysporum* f. sp. *lactucae* race 1 in lettuce
- TSWV in pepper and tomato (even against resistance breaking strains)
- *Fusarium oxysporum* ff. spp. in wild rocket (studying of genetic background of commercial varieties – FISER project funded by Regione Campania)

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To summarize

This presentation had the aim:

- to introduce Italian activities developed in evaluation of disease resistances in vegetable varieties (and to know all of you)
- to underline the difficulties met in performing resistance tests (especially in small laboratories)
- to introduce Italian activities developed in setting up new protocols on demand of seed agencies or with the aim of reseach projects
- to show our intention to be present in ring tests planned to harmonize protocols
- to ask for support to all the expert in characterization of pathogen strains (in finding differential variety sets)

[Annex II follows]

ANNEX II

CPVO
Community Plant Variety Office

TWV/48 Session

Item 12: Use of disease resistance characteristics in DUS examination

Paestum, 25 June 2014

Introduction

1. Possibility to include disease ressistance characteristcs in UPOV Test Guidelines.
   - To be considered as physiological characteristics
   - Guidance given in TGP/12

2. Reflection of important breeding goals in several vegetable crops, but in relation to DUS testing:
   - Allows the creation of distinct varieties
   - Assists in the management of variety collections

Increasing use of disease resisistant characteristics in UPOV Test Guidelines

3. Usually added during a revision of a TG
4. Reflects desire to move away from agrochemical inputs
5. Possibility to make disease resistance characteristic compulsory (*)

However, this can have important consequences!

6. Tables of all disease resitance characteristics to be found in UPOV vegetable TGs / CPVO protocols

The usefulness of disease resistance characteristics for examination authorities

7. Greater possibilities to declare distinctness

✓ usually QL: high discriminatory power,
✓ greatly assists management of variety collection
✓ optimises set-up of DUS trial

Practical difficulties in relation to disease resistance characteristics

8. Consequences for examination authorities and breeders:

a) Investment required: financial, facilities, staff.
   - **Benefits need to outweigh costs!**

b) Reliable methodologies required.
   - **Harmonisation work necessary (see CPVO R&D projects: Harmores 1 & 2)**

c) Contrasting levels of expertise amongts examination authorities

Practical difficulties in relation to disease resistance characteristics

d) Different levels of importance given by breeders on the matter
   - **may not be relevant in their part of the world!**

e) Requirements on uniformity need to be fulfilled, **even for susceptible varieties** - but is this really necessary ?!

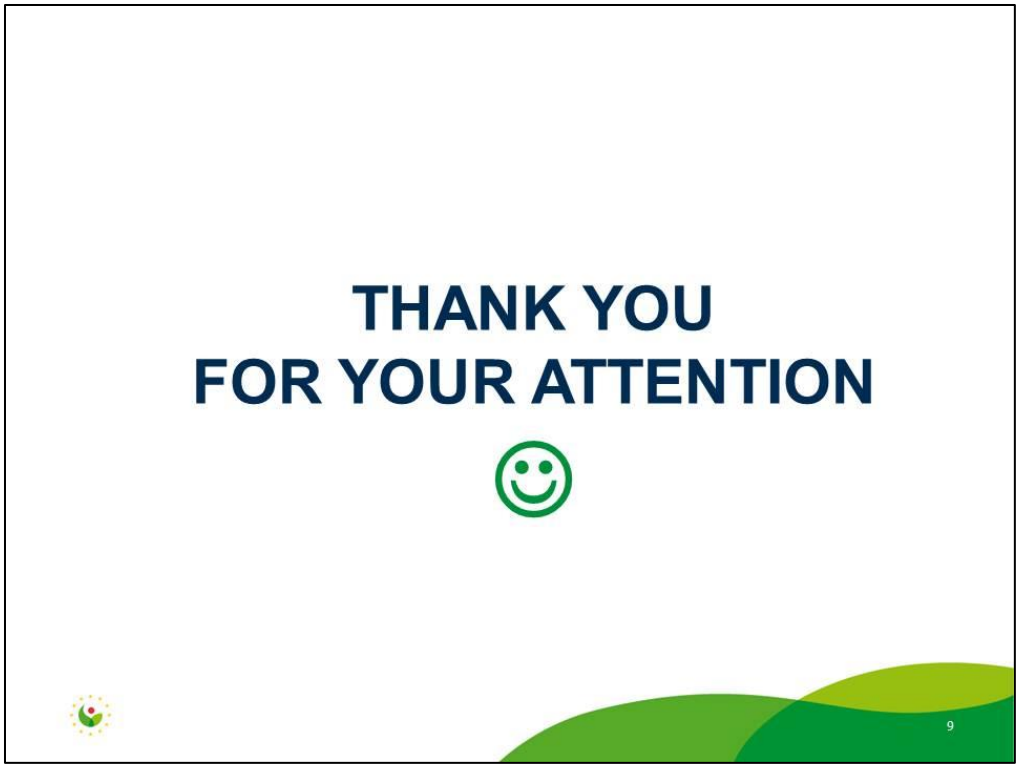
f) Periodic review necessary in order to keep up with changes and update techniques

Overview of current situation in the tional EU regarding asterisked disease resistance characteristics

9. Complicated situation due to conflicting standpoints
   - Slovak Constitutional Court Case
   - Moratorium on (*) within EU
   - ESA survey on the matter

When should a disease resistance characteristic become obligatory

10. Issue not to be taken likely. Three areas identified:
    a. Only when full consensus amongst all UPOV Members
    b. Review of all current 21 (*) in TGs. If some are contentious, need to undertake partial revision of corresponding TG
    c. *Way forward for the future*: Running in phase for (*) disease ressitance characteritics – **elegant & pragmatic solution !**



[Annex III follows]

ANNEX III

ESA

European Seed Association

Outcome survey – CPVO vegetable protocols
Disease resistance

Bert Scholte
Technical Director

Angers, December 2-3, 2013

FOLLOW ESA

Survey – CPVO TP – disease resistance

Answers received: 15

Survey – CPVO TP – disease resistance

1. Do you have any objections to the obligatory use of disease resistance characteristics in the CPVO Technical protocols?

YES	NO
5 companies	10 companies /Associations

Survey – CPVO TP – disease resistance

2. If Yes, which disease resistances characteristics are a concern to you in relation to the crops you are breeding in. Please indicate also the (technical) reasons why these are a concern to you.

Survey – CPVO TP – disease resistance

Cabbage : TP/48-3

Resistance characteristic	CPVO *	UPOV *
36. Resistance to race 1 of Fusarium oxysporum f. sp. conglutinans	No	No

- Not testing for fusarium resistance

Survey – CPVO TP – disease resistance

Cornsalad: TP/75-2

Resistance characteristic	CPVO *	UPOV *
21.1 Resistance to downy mildew (Peronospora valerianella) Strain 1	No	No
21.2 Resistance to downy mildew (Peronospora valerianella) Strain 2	No	No

Comment:

Peronospora valerianella: The importance of strain 1 and 2 in practice is really limited. Moreover there seem to be much more isolates with different virulence present than the 2 strains.

Survey – CPVO TP – disease resistance

Cucumber: TP/61-2

Resistance characteristic	CPVO *	UPOV *
44. Resistance to Cladosporium cucumerinum (Ccu)	No	No
45. Resistance to Cucumber Mosaic Virus (CMV)	No	No
46. Resistance to powdery mildew (Podospaera xanthii) (Px)	No	No
47. Resistance to downy mildew (Pseudoperonospora cubensis) (Pc)	No	No
48. Resistance to Corynespora blight and target leaf spot (Corynespora cassiicola) (Cca)	No	No
49. Resistance to Cucumber Vein Yellowing Virus (CVYV)	No	No
50. Resistance to Zucchini Yellow Mosaic Virus (ZYMV)	No	No

Comment:
For certain areas/countries some pathogens are irrelevant in practice (e.g. CVYV in Northern Europe).

Survey – CPVO TP – disease resistance

French bean: TP/12-3

Resistance characteristic	CPVO *	UPOV *
47.1 Resistance to Bean anthracnose (Colletotrichum lindemuthianum) Race Lambda	No	No
47.2 Resistance to Bean anthracnose (Colletotrichum lindemuthianum) Race 6	YES	YES
47.3 Resistance to Bean anthracnose (Colletotrichum lindemuthianum) Race Kappa	No	No
48. Resistance to Bean Common Mosaic Virus (BCMNV)	YES	YES
49. Resistance to Halo Blight (Pseudomonas savastanoi pv. phaseolicola) Race 6	No	No
50. Resistance to Common Blight (Xanthomonas campestris pv. phaseoli), Isolate 422	No	No

Comment:
47.2: company is not able to get any isolate of race 6
48: should be BCMV in stead of BCMNV

Survey – CPVO TP – disease resistance

Lettuce: TP/13-5

Resistance characteristic	CPVO *	UPOV *
37.1 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 2	No	No
37.2 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 5	No	No
37.3 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 7	No	No
37.4 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 12	No	No
37.5 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 14	No	No
37.6 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 15	No	No
37.7 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 16	YES	YES
37.8 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 17	No	No
37.9 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 18	No	No
37.10 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 20	YES	No
37.11 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 21	YES	No
37.12 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 22	YES	No
37.13 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 23	YES	No
37.14 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 24	YES	No
37.15 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 25	YES	No
37.16 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 26	YES	No
37.17 Resistance to downy mildew (Bremia lactucae) Isolate Bl: 27	No	No
38. Resistance to lettuce mosaic virus (LMV) Strain Ls1	No	No
39. Resistance to Nasonovia ribisnigri biotype Nr: 0	No	No

Survey – CPVO TP – disease resistance

Lettuce: TP/13-5

Comment

- List is not updated; Non-relevance of certain isolates in practice (e.g. Bl:1-15); some asterixed characteristics seem to be chosen at random.
- Not testing for LMV nasonovia; Bremia OK

Survey – CPVO TP – disease resistance

Melon: TP/104-2

Resistance characteristic	CPVO *	UPOV *
68.1 Resistance to Fusarium oxysporum f. sp. melonis Race 0	YES	No, but * agreed at TWV/47 for adoption at TC in 2014
68.2 Resistance to Fusarium oxysporum f. sp. melonis Race 1	YES	No, but * agreed at TWV/47 for adoption at TC in 2014
68.3 Resistance to Fusarium oxysporum f. sp. melonis Race 2	YES	No, but * agreed at TWV/47 for adoption at TC in 2014
68.4 Resistance to Fusarium oxysporum f. sp. melonis Race 1-2	No	No
69.1 Resistance to Sphaerotheca fuliginea (Podosphaera xanthii) (Powdery mildew) Race 1	No	No
69.2 Resistance to Sphaerotheca fuliginea (Podosphaera xanthii) (Powdery mildew) Race 2	No	No
69.3 Resistance to Sphaerotheca fuliginea (Podosphaera xanthii) (Powdery mildew) Race 5	No	No
70. Resistance to Erysiphe cichoracearum (Golovinomyces cichoracearum) Race 1 (Powdery mildew)	No	No
71. Resistance to colonization by Aphis gossypii	No	No
72. Resistance to Zucchini Yellow Mosaic Virus (ZYMV)Race F	No	No
73.1 Resistance to Papaya Ring Spot Virus (PRSV) Race GVA	No	No
73.2 Resistance to Papaya Ring Spot Virus (PRSV) Race E2	No	No
74. Resistance to Muskmelon Necrotic Spot Virus (MNSV) Race E8	No	No
75. Resistance to Cucumber Mosaic Virus (CMV)	No	No

Survey – CPVO TP – disease resistance

Melon: TP/104-2

Comment:

- 69.1/2/3: Maintenance and identification of powdery mildew races
- 70: Maintenance and identification of powdery mildew races
- 74 (MNSV): Maintenance and inoculation procedure of MNSV

Survey – CPVO TP – disease resistance

Pea: TP/7-2

Resistance characteristic	CPVO *	UPOV *
56.1 Resistance to Fusarium oxysporum f. sp. pisi Race 1	YES	No
56.2 Resistance to Fusarium oxysporum f. sp. pisi_ Race 5	No	No
56.3 Resistance to Fusarium oxysporum f. sp. pisi_ Race 6	No	No
57. Resistance to Erysiphe pisi Syd.	No	No
58. Resistance to Ascochyta pisi, Race C	No	No

No comments

Survey – CPVO TP – disease resistance

Pepper: TP/76-2

Resistance characteristic	CPVO *	UPOV *
47.1 Resistance to Tobamovirus Pathotype 0 (Tobacco MosaicVirus (0))	YES	YES
47.2 Resistance to Tobamovirus Pathotype 1 (Tobacco MosaicVirus (1))	No	No
47.3 Resistance to Tobamovirus Pathotype 1-2 (Pepper Mild Mottle Virus (1-2))	YES	YES
47.4 Resistance to Tobamovirus Pathotype 1-2-3 (Pepper Mild Mottle Virus (1-2-3))	YES	YES
48.1 Resistance to Potato Virus Y (PVY) Pathotype 0	YES	YES
48.2 Resistance to Potato Virus Y (PVY) Pathotype 1	No	No
48.3 Resistance to Potato Virus Y (PVY) Pathotype 1-2	No	No
49. Resistance to Phytophthora capsici	No	No
50. Resistance to Cucumber Mosaic Virus (CMV)	No	No
51. Resistance to Tomato Spotted Wilt Virus (TSWV) – race P0	No	No
52. Resistance to Xanthomonas campestris pv. vesicatoria	No	No

Survey – CPVO TP – disease resistance

Pepper: TP/76-2

Comments:

47.1 Resistance to Tobamovirus (P0) 0 (Tobacco MosaicVirus (0))

- Difficult to obtain pure isolate and control varieties
- Differentiation TMV P0 and ToMN P0 is problematic
- NAK-T / GEVES have monopoly on isolates: other EO's cannot offer the same isolates
- Isolate / pathotype not always listed

48.1 Resistance to Potato Virus Y (PVY) Pathotype 0

Same as for 47.1

- Availability isolates diseases and reliability testing protocols

Survey – CPVO TP – disease resistance

Spinach: TP/55-4

Resistance characteristic	CPVO *	UPOV *
18.1 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 1	No	No
18.2 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 2	No	No
18.3 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 3	No	No
18.4 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 4	No	No
18.5 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 5	YES	YES
18.6 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 6	YES	YES
18.7 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 7	YES	YES
18.8 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 8	No	No
18.9 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 9	No	No
18.10 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 10	No	No
18.11 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 11	No	No
18.12 Resistance to Peronospora farinosa f. sp. spinaciae Race Pfs: 12	No	No
19. Resistance to Cucumber mosaic virus (CMV)	No	No

Comment:

Peronospora farinose f.sp. *spinaciae*: List is not updated; Non-relevance of certain isolates in practice; some asterixed characteristics seem to be chosen at random.

Survey – CPVO TP – disease resistance

Tomato: TP/44-4

Resistance characteristic	CPVO *	UPOV *
43. Resistance to Meloidogyne incognita (Mi)	YES	YES
44. Resistance to Verticillium sp. (Va and Vd) - Race 0	YES	YES
45.1 Resistance to Fusarium oxysporum f. sp. lycopersici (Fol) - Race 0 (ex 1)	YES	YES
45.2 Resistance to Fusarium oxysporum f. sp. lycopersici (Fol) - Race 1 (ex 2)	YES	YES
45.3 Resistance to Fusarium oxysporum f. sp. lycopersici (Fol) - Race 2 (ex 3)	No	No
46. Resistance to Fusarium oxysporum f. sp. radicis-lycopersici (Forl)	No	No
47.1 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Race 0	No	No
47.2 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Group A	No	No
47.3 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Group B	No	No
47.4 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Group C	No	No
47.5 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Group D	No	No
47.6 Resistance to Fulvia fulva (Pf) (ex Cladosporium fulvum) – Group E (2-4-5)	No	No
48.1 Resistance to Tomato mosaic virus (ToMV) – Strain 0	YES	NO
48.2 Resistance to Tomato mosaic virus (ToMV) – Strain 1	No	No
48.3 Resistance to Tomato mosaic virus (ToMV) – Strain 2	No	No
49. Resistance to Phytophthora infestans (Pi)	No	No
50. Resistance to Pyrenochaeta lycopersici (Pl)	No	No
51. Resistance to Stemphyllium spp.	No	No
52. Resistance to Pseudomonas syringae pv. tomato (Pst)	No	No
53. Resistance to Ralstonia solanacearum (Rs) - Race 1	No	No
54. Resistance to Tomato yellow leaf curl virus (TYLCV)	No	No
55. Resistance to Tomato spotted wilt virus (TSWV) – Race 0	No	No
56. Resistance to Leveillula taurica (Lt)	No	No
57. Resistance to Oidium neolycopersici (On) (ex Oidium lycopersicum (Ol))	No	No
58. Resistance to Tomato torrado virus (ToTv)	No	No

Survey – CPVO TP – disease resistance

Tomato: TP/44-4

Comments:

- 43. Resistance to Meloidogyne incognita (Mi): Difficult to test as CPVO method is inapplicable in practice. Needs to be elaborated.
- 45.1 Resistance to Fusarium oxysporum f. sp. lycopersici (Fol) - Race 0 (ex 1): difficult to obtain the isolate;
- 45.2 Resistance to Fusarium oxysporum f. sp. lycopersici (Fol) - Race 1 (ex 2); same comments as for pepper
- 50. Resistance to Pyrenochaeta lycopersici (Pl): Complicated propagation and testing procedure
- 52. Resistance to Pseudomonas syringae pv. tomato (Pst): Strain denomination? Identification unclear. Quarantine facilities required.
- 54. Resistance to Tomato yellow leaf curl virus (TYLCV): Strain denomination ?, identification unclear. Quarantine facilities required
- 56. Resistance to Leveillula taurica (Lt): Maintenance and identification of powdery mildew races.
- 57. Resistance to Oidium neolycopersici (On) (ex Oidium lycopersicum (Ol)): Maintenance and identification of powdery mildew races.
- 58. Resistance to Tomato torrado virus (ToTv): Strain denomination ?, identification unclear. Quarantine facilities required
- Availability isolates diseases and reliability testing protocols.

Survey – CPVO TP – disease resistance

Watermelon: TP/142/1

Resistance characteristic	CPVO *	UPOV *
47.1 Resistance to Fusarium oxysporum f.sp. niveum (E.F. Smith) Snyder et Hansen Race 0	No	No
47.2 Resistance to Fusarium oxysporum f.sp. niveum (E.F. Smith) Snyder et Hansen Race 1	No	No
47.3 Resistance to Fusarium oxysporum f.sp. niveum (E.F. Smith) Snyder et Hansen Race 2	No	No
48.1 Resistance to Collectotrichum lagenarium (passerini) Ellis et Halsted Race 1	No	No
48.2 Resistance to Collectotrichum lagenarium (passerini) Ellis et Halsted Race 2	No	No
48.3 Resistance to Collectotrichum lagenarium (passerini) Ellis et Halsted Race 3	No	No

No comments

Survey – CPVO TP – disease resistance

In summary

Species	Comments	Relevance
Cabbage : TP/48-3	1	No
Cornsalad: TP/75-2	1	No
Cucumber: TP/61-2	1	No
French bean: TP/12-3	1	Yes
Lettuce: TP/13-5	2	No
Melon: TP/104-2	3	Yes

Species	Comments	Relevance
Pea: TP/7-2	No	-
Pepper: TP/76-2	6	Yes
Spinach: TP/55-4	1	No
Tomato: TP/44-4	10	Yes
Watermelon: TP/142/1	No	-

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