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| International Union for the Protection of New Varieties of Plants |  |

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| Technical Working Party for Vegetables  Fifty-Ninth Session Virtual meeting, May 5 to 8, 2025 | TWV/59/3  Original: English  Date: March 31, 2025 |

Partial revision of the Test Guidelines for TOMATO ROOTSTOCKS

Document prepared by an expert from the Netherlands (Kingdom of)

Disclaimer: this document does not represent UPOV policies or guidance

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 Rev. 5).

The Technical Working Party for Vegetables (TWV), at its fifty-eighth session[[1]](#footnote-2), agreed that the Test Guidelines for Tomato rootstocksbe partially revised (see document TWV/58/11 “Report”, Annex II).

The following changes are proposed:

1. Revision of characteristic 22 “*Meloidogyne incognita* (Mi)”: states of expression to read the same as in the Test Guidelines for Tomato
2. Revision of explanation Ad. 22 “*Meloidogyne incognita* (Mi)”

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

## Proposed revision of characteristic 22 “*Meloidogyne incognita* (Mi): states of expression to read the same as in the Test Guidelines for Tomato

*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** | **Resistance to *Meloidogyne incognita* (Mi)** | **Résistance à *Meloidogyne incognita* (Mi)** | **Resistenz gegen *Meloidogyne incognita* (Mi)** | **Resistencia a *Meloidogyne incognita* (Mi)** |  |  |
| **QN** |  | ~~susceptible~~ absent or low | ~~sensible~~ absente ou faible | ~~anfällig~~ fehlend oder gering | ~~susceptible~~ ausente o baja | Bruce | 1 |
|  |  | ~~moderately resistant~~ medium | ~~moyennement resistant~~ moyenne | ~~mäßig resistent~~ mittel | ~~moderadamente resistente~~ media |  | 2 |
|  |  | ~~highly resistant~~ high | ~~hautement resistant~~ élevée | ~~hoch resistent~~ hoch | ~~muy resistente~~ alta | Emperador | 3 |

## Revision of explanation Ad. 22 “*Meloidogyne incognita* (Mi): control varieties

*Current 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[[2]](#footnote-3) (FR) or INIA – CSIC (ES)[[3]](#footnote-4) or Naktuinbouw (NL[[4]](#footnote-5)) |
| 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 | 2nd leaf stage |
| 8.5 | Inoculation method | deposit of piece of inoculated 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 | 30 plants  Remark: knowing that germination in rootstocks might be low and/or irregular it is recommended to sow more seeds to be sure to get at least 30 plants.  It is recommended to include in the test, 10 non-inoculated plants, to be able to identify a possible lack of germination or a delay in plant growth, due to the material. |
| 9.2 | Number of replicates | at least 2, preferably 3 to allow statistical analysis |
| 9.3 | Control varieties | Susceptible: Bruce and (*Solanum lycopersicum*) Casaque Rouge  Intermediate resistant: (*Solanum lycopersicum*)  Campeon, Tyonic  Highly resistant: Emperador |
| 9.4 | Test design | 3 replicates of 10 plants in different trays by variety |
| 9.5 | Test facility | greenhouse or climate room |
| 9.6 | Temperature | 20-26°C, the temperature should be adapted, depending on the aggressiveness 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 |
| 10.2 | Quantification inoculum | Quantity of inoculum depends on aggressivness of test and growing conditions (e.g. between 30g to 60g of inoculated 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 |
| 10.4 | Inoculation method | Seeds are sown in non-inoculated soil and inoculation of soil and inoculation of soil is done after sowing when plantlets are at cotyledon stage. |
| 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 |  |
| Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving | | |
| 11.3 | Validation of test | 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. |
| 12. | Interpretation of data in terms of UPOV characteristic states | [1] Susceptible: variety very similar to susceptible control  [2] Intermediate resistant: variety very similar to intermediate resistant control  [3] 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. |
| 13. | Critical control points | Avoid overwatering. This may result in rotting of roots.  In case of aggressive test, decrease the quantity of inoculum. |

*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[[5]](#footnote-6) (FR) or INIA – CSIC (ES)[[6]](#footnote-7) or Naktuinbouw (NL[[7]](#footnote-8)) |
| 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 | 2nd leaf stage |
| 8.5 | Inoculation method | deposit of piece of inoculated 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 | 30 plants  Remark: knowing that germination in rootstocks might be low and/or irregular it is recommended to sow more seeds to be sure to get at least 30 plants.  It is recommended to include in the test, 10 non-inoculated plants, to be able to identify a possible lack of germination or a delay in plant growth, due to the material. |
| 9.2 | Number of replicates | at least 2, preferably 3 to allow statistical analysis |
| 9.3 | Control varieties | ISF definitions: [[8]](#footnote-9) |
|  | Susceptible | Bruce and (*Solanum lycopersicum*) Casaque Rouge |
|  | Intermediate resistant | (*Solanum lycopersicum*) Campeon, Tyonic |
|  | Highly resistant | Emperador and (*Solanum lycopersicum*) Arletta, Anahu, Anahu x Casaque Rouge |
| 9.4 | Test design | 3 replicates of 10 plants in different trays by variety |
| 9.5 | Test facility | greenhouse or climate room |
| 9.6 | Temperature | 20-26°C, the temperature should be adapted, depending on the aggressiveness 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 |
| 10.2 | Quantification inoculum | Quantity of inoculum depends on aggressivness of test and growing conditions (e.g. between 30g to 60g of inoculated 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 |
| 10.4 | Inoculation method | Seeds are sown in non-inoculated soil and inoculation of soil and inoculation of soil is done after sowing when plantlets are at cotyledon stage. |
| 10.7 | End of test | 28 to 45 days after inoculation depending on test conditions (temperature, season) |

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| 11. | Observations |  |
| 11.1 | Method | root inspection per plant |
| 11.2 | Observation scale |  |
| Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving | | |
| 11.3 | Validation of test | 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. |
| 12. | Interpretation of data in terms of UPOV characteristic states | [1] ~~Susceptible~~ absent or low: variety very similar to susceptible control.  [2] ~~Intermediate resistant~~ medium: variety very similar to intermediate resistant control.  [3] ~~Highly resistant~~ high: 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. |
| 13. | Critical control points | Avoid overwatering. This may result in rotting of roots.  In case of aggressive test, decrease the quantity of inoculum. |

[End of document]

1. held via electronic means, from April 22 to 25, 2024. [↑](#footnote-ref-2)
2. GEVES; [matref@geves.fr](mailto:matref@geves.fr) [↑](#footnote-ref-3)
3. INIA; [resistencias@inia.es](mailto:resistencias@inia.es) [↑](#footnote-ref-4)
4. Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl) [↑](#footnote-ref-5)
5. GEVES; [matref@geves.fr](mailto:matref@geves.fr) [↑](#footnote-ref-6)
6. INIA; [resistencias@inia.es](mailto:resistencias@inia.es) [↑](#footnote-ref-7)
7. Naktuinbouw; [resistentie@naktuinbouw.nl](mailto:resistentie@naktuinbouw.nl) [↑](#footnote-ref-8)
8. ISF, [https://www.worldseed.org](https://www.worldseed.org/) [↑](#footnote-ref-9)