

Technical Working Party for Vegetables

TWV/59/11

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DISEASE RESISTANCE CHARACTERISTICS IN TEST GUIDELINES

Document prepared by the Office of the Union

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EXECUTIVE SUMMARY

1. The purpose of this document is to report developments on the use of disease resistance characteristics in Test Guidelines (TG). A series of ongoing measures to streamline the revision of Test Guidelines is reported, including:

- An improved version of the TG template enabling the drafting of partial revisions and live editing during Technical Working Party (TWP) sessions.
- Promoting UPOV members' reports on additional characteristics in DUS examination, including disease resistance characteristics.
- Promoting intersessional meetings of the subgroups of interested experts to advance discussions of partial revisions of Test Guidelines

2. The document also reports discussions held at the Technical Committee (TC) and Technical Working Party for Vegetables (TWV), in 2024.

3. The TWV is invited to consider the matters reported in this document on disease resistance characteristics in Test Guidelines.

Background:

4. The TC, at its sixtieth session, agreed with the TWV to invite the Office of the Union to provide information on challenges and opportunities for disease resistance characteristics in Test Guidelines, for consideration at the fifty-ninth session of the TWV, as set out in document TC/60/3, paragraph 7.

PREPARATION OF DRAFT TEST GUIDELINES

5. The online tool for drafting Test Guidelines (TG template) is being updated. An improved version is expected to be released in May 2025. The new version will enable partial revisions to be drafted using the same tool used for full revision of Test Guidelines. It will also allow editing draft Test Guidelines during the TWP meetings. Both of these changes should reduce the number of steps and time required to process partial revisions of Test Guidelines.

REPORTING ADDITIONAL CHARACTERISTICS

6. UPOV members are invited to report the use of additional characteristics used in DUS examination using the form available in [document TGP/5, Section 10](#) "Notification of Additional Characteristics and States of Expression". These characteristics will be presented to the TWV, including information on the extent of use of the characteristic. The characteristics will then, as appropriate, be posted on the TG Drafters' webpage of the UPOV website (https://www.upov.int/resource/en/tg_drafters.html) or initiate a revision or a partial revision of the Test Guidelines concerned.

SUBGROUP OF INTERESTED EXPERTS

7. The TC, at its sixtieth session¹, noted that more disease resistance characteristics were being proposed in Test Guidelines, requiring more frequent revision and agreed that subgroups of interested experts should be promoted to advance discussions more expeditiously.

8. From 2025, leading experts of partial revisions will be encouraged to establish subgroups of interested experts and conduct consultations prior to submitting the proposal to the TWPs. This procedure should increase the number of meetings and consultations taking place during the intersessional period between two TWP sessions.

SCALE OF NOTES FOR QN DISEASE RESISTANCE CHARACTERISTICS WITH NO EXAMPLE VARIETY FOR HIGH LEVEL OF RESISTANCE

9. Document TGP/12/5 “Guidance on certain physiological characteristics” Section 2.3.2, states that “disease resistances for which there is a continuous range of levels of susceptibility / resistance across varieties, are quantitative characteristics.”

10. Document TGP/7 “Development of Test Guidelines”, GN 28, section 2.4, states example varieties should be provided for at least two states of expression for characteristics using scales with three, four or five notes. Document TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”, Part I, Section 2.3.2.19 states that the distances between discrete categories of an ordinal scale of notes are not exactly known and not necessarily equal.

11. As an example, quantitative disease resistance characteristics with three states of expression should have at least two example varieties and use an ordinal scale with discrete categories.

QUALITATIVE CHARACTERISTICS

12. Document TG/1/3 “General introduction to DUS examination” section 4.4.1 states that “Qualitative characteristics are those that are expressed in discontinuous states (e.g. sex of plant: dioecious female (1), dioecious male (2), monoecious unisexual (3), monoecious hermaphrodite (4)). These states are self-explanatory and independently meaningful. All states are necessary to describe the full range of the characteristic, and every form of expression can be described by a single state. The order of states is not important. As a rule, the characteristics are not influenced by environment.”

DEVELOPMENTS AT THE TECHNICAL COMMITTEE IN 2024: DISCUSSION ON DISEASE RESISTANCE CHARACTERISTICS IN DUS EXAMINATION

13. The TC, at its sixtieth session², received the following presentations on disease resistance characteristics in DUS examination (see: https://www.upov.int/meetings/en/details.jsp?meeting_id=80839):

Disease resistance characteristic in DUS examination - Introduction	UPOV Office
Disease resistance characteristic in DUS examination - Argentina	Argentina (Mr. Alberto Ballesteros)
Disease resistance characteristics in DUS examination: CPVO experience	European Union (Ms. Celine Morineau)
Current experience at GEVES concerning the use of disease resistance characteristics in DUS examination France	France (Ms. Clarisse Leclair)

¹ Technical Committee, sixtieth session, held in Geneva on October 21 and 22, 2024. See document TC/60/8 “Report”, paragraph 12

² Technical Committee, sixtieth session, held in Geneva on October 21 and 22, 2024. See document TC/60/8 “Report”, paragraphs 73 and 74

Use of resistance characteristics in DUS in Germany	Germany (Ms. Swenja Tams)
Physiological characteristics and Disease resistance characteristics in PVP - Japan	Japan (Mr. Yoshiyuki Ohno)
Importance of disease resistance characteristics for DUS examination – Netherlands (Kingdom of the)	Netherlands (Kingdom of the) (Mr. Raoul Haegens)
Disease resistance characteristics used in DUS examinations - United States of America	United States of America (Mr. Jeffery Haynes)
Disease Resistance Characteristics in DUS Examination: Breeders' Perspectives - ISF	International Seed Federation (Mr. Ben Rivoire)

14. The TC agreed the following summary of discussions:

- Disease resistance characteristics are important for DUS. Examples were presented for vegetables and agricultural species.
- There may be different need for international harmonization through UPOV TGs, more clearly for vegetables.
- Complex interaction pathogen x environment x variety may require frequent review of characteristics in test guidelines, including technical questionnaires
- National, regional and international importance should be considered when deciding for whether to include disease resistance characteristics in test guidelines
- Clear definition and harmonization of methods is required for reliable descriptions (involvement of DUS experts, phytopathologists and breeders)
- Development of new technologies, e.g. molecular markers as alternative methods can improve testing
- Cooperation between authorities in disease resistance testing may be considered
- TWP sessions should be used to inform on developments and to consider inclusion in TGs or notification of additional characteristics in the UPOV webpage
- TWPs may consider addressing specific items on disease resistance characteristics in subgroups to advance discussions, including outside of TWP sessions

[Annex follows]

ASSESSING DISTINCTNESS IN DISEASE RESISTANCE CHARACTERISTICS

Extract from document TWV/58/11 “Report”

15. The TWV, at its fifty-eighth session³, received an oral report from the Office of the Union on disease resistance characteristics in Test Guidelines. The TWV noted the challenges arising from the frequent partial revision of Test Guidelines for the inclusion of new races and strains, along with complex explanations and concepts preventing machine translation. The TWV noted the opportunities for further discussing the special features of disease resistance characteristics, including intersessional crop subgroup meetings, enabling the participation of phytopathologists and the open discussion session to be held at the sixtieth session of the Technical Committee.

16. The TWV agreed to invite the Office of the Union to provide information on challenges and opportunities identified for disease resistance characteristics in Test Guidelines, for consideration at its fifty-ninth session.

Disease resistance characteristics, states of expression scales of notes

17. The TWV considered documents TWV/58/3 and TWV/58/3 Add., presented by experts from France and the Netherlands (Kingdom of).

18. The TWV considered the proposal of a new type of expression for disease resistance characteristics, similar to a quantitative (QN) characteristic but with two states of expression and particular features.

19. The TWV noted the explanation from the experts from France and the Netherlands (Kingdom of) that some QN disease resistance characteristics had no example varieties for high-level of resistance and their range of expression was divided into two states only (e.g. “absent or low / medium or high”). The TWV noted that other disease resistance characteristics were only partially continuous, having no example varieties for part of the range of variation.

20. The TWV recalled that guidance on the requirement for example varieties in QN characteristics in document TGP/7 “Development of Test Guidelines”, Guidance Note 28, section 2.4, stated that “in general, it is necessary to provide example varieties for more than one state of expression and in the case of QN characteristics:

- (i) “1-9” scale: to provide example varieties for at least three states of expression (e.g. (3), (5) and (7)), although, in exceptional cases, example varieties for only two states of expression may be accepted;
- (ii) “1-5” / “1-4” / “1-3” scales: to provide example varieties for at least two states of expression.”

21. The TWV considered whether example varieties could be provided for two states of expression for some QN disease resistance characteristics and agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether that approach could be used when no example varieties for high-level of resistance or part of the range of variation were available.

22. The TWV considered the division of the range of expression of QN disease resistance characteristics into notes and could not reach an agreement on whether to use the existing types of expression, such as quantitative or pseudo-qualitative.

23. The TWV noted that the new type of expression proposed for QN disease resistance characteristics aimed at establishing distinctness based on a one-note difference for selecting varieties for the growing trial (grouping characteristics). The TWV noted that document TGP/7, GN 13 “Characteristics with specific functions”, paragraph 3.6, stated that:

“GN 13(4)(b) explains that ‘TQ characteristics selected from the Table of Characteristics should, in general, receive an asterisk in the Table of Characteristics’. Certain characteristics, particularly disease resistance characteristics, which are potentially useful as grouping characteristics might not be indicated with an asterisk in the Table of Characteristics. In the case of disease resistance characteristics, for example, there may be obstacles to the use of the characteristic for a number of members of the Union because of technical

³ TWV, fifty-eight session, held via virtual means, from April 22 to 25, 2024. See document TWV/58/11 “Report”, paragraphs 37 to 53

or quarantine requirements. Those same obstacles might also make it difficult for applicants to provide information on those characteristics. Therefore, disease resistance characteristics not indicated with an asterisk at the Table of Characteristics and not used as grouping characteristic may be presented in Section 5 of Technical Questionnaires (TQ) with the addition of a state of expression 'not tested'."

24. The TWV agreed that the use of QN disease resistance characteristics as grouping characteristics in Test Guidelines would normally lead to a compulsory request for that information from applicants.

25. The TWV noted that document TGP/9 "Examining Distinctness" Section 2, provided guidance for selecting varieties for the growing trial, including the use of grouping characteristics, characteristics in combination and the GAIA method. The TWV noted that Section 5 of that document provided guidance on assessing distinctness based on the growing trial (e.g. assessing distinctness of varieties in the same trial). The TWV agreed to invite experts to check whether the methods provided in Section 2 could support the analysis on the use of QN disease resistance characteristics for selecting varieties for the growing trial.

26. The TWV considered the scale of symptoms provided with the explanations for QN disease resistance characteristics and agreed to request further information on how the observations of the different numbers of plants in each class were used to convert observations to notes for the variety description.

27. The TWV noted that guidance in document TGP/8 "Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability", Part I, Section 2.3.2.19 stated that "The distances between the discrete categories of an ordinal scale are not exactly known and not necessarily equal. Therefore, an ordinal scale does not fulfil the condition to calculate arithmetic mean values, which is the equality of intervals throughout the scale." The TWV agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether QN disease resistance characteristics data would be discrete and not continuous, identifying categories with scales not necessarily equally distant.

28. The TWV noted that document TGP/8, Part II, Section 5, provided guidance on the use of contingency tables with number of plants counted in nine different classes of infection for a QN disease resistance characteristic, using the Pearson's chi-square test for assessing distinctness.

29. The TWV noted that the software PATHOSTAT was used by France and utilized contingency tables with number of plants counted in different classes of infection for QN disease resistance characteristics, also referring to the use of Pearson's chi-square test.
(available at: https://www.upov.int/it_resources/en/exchangeable_software.html).

30. The TWV considered the cut-off points between states of expression to be included in the trials ("threshold controls"). The TWV agreed to invite experts to provide further information on the level of difference required to demonstrate a clear difference between the expression of a characteristic of two varieties that were close to the same border line (e.g. high end of one note and low end of the next), including the use of statistical analysis to establish distinctness.

31. The TWV noted that document TGP/8, Part I, Section 2 "Data to be recorded" provided guidance on scale levels for variety description and agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether it would be useful to distinguish between different process levels for the use of QN disease resistance characteristics as grouping characteristics (e.g. trial data process level 2; variety description process level 3).

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