UPOV

International Union for the Protection of New Varieties of Plants

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Technical Working Party for Ornamental Plants and Forest Trees
Fifty-First Session
Christchurch, New Zealand, February 18 to 22, 2019

Technical Working Party for Vegetables
Fifty-Third Session
Seoul, Republic of Korea, May 20 to 24, 2019

Technical Working Party for Fruit Crops
Fiftieth Session
Budapest, Hungary, June 24 to 28, 2019

Technical Working Party for Agricultural Crops
Forty-Eighth Session
Montevideo, Uruguay, September 16 to 20, 2019

Technical Working Party on Automation and Computer Programs
Thirty-Seventh Session
Hangzhou, China, October 14 to 16 (morning), 2019

TWP/3/12

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CHARACTERISTIC-SPECIFIC MARKER WITH INCOMPLETE INFORMATION ON STATE OF EXPRESSION

Document prepared by the Office of the Union

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EXECUTIVE SUMMARY

1. This document should be considered in conjunction with document TWP/3/7 “Molecular Techniques.”

2. The purpose of this document is to report on developments concerning the revision of document TGP/15 “Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)” for the inclusion of a new example to Model (1) “Characteristic-specific molecular marker” and clarify the responsibility to decide on the reliability of the link between a gene and the expression of a characteristic and the inclusion of a method in Test Guidelines.

3. The TWPs are invited to:

(a) note that the TC agreed that document TGP/15 should be amended to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic;

(b) note that the TC agreed to include an explanation in document TGP/15 that it would be the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied in order to include a method in the Test Guidelines;

(c) note that the TC agreed that a new example should be added to document TGP/15 to illustrate a situation where the characteristic-specific marker does not provide complete information on the state of expression of a characteristic; and

(d) consider the proposal for a new example be added to document TGP/15 to illustrate a situation where the characteristic-specific marker does not provide complete information on the state of expression of a characteristic, as set out in the Annex to this document.

4. The structure of this document is as follows:

5. The following abbreviations are used in this document:

BMT: Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular
TC: Technical Committee
TWPs: Technical Working Parties

DEVELOPMENTS AT THE BMT

6. The BMT, at its seventeenth session, held in Montevideo, Uruguay, from September 10 to 13, 2018, considered document BMT/17/21 “Do resistance markers for tomato fulfil the requirements of TGP/15?” and received a presentation by Ms. Amanda van Dijk-Veldhuizen (Netherlands), a copy of which was provided as document BMT/17/21 Add. (see document BMT/17/25 “Report”, paragraphs 10 to 12).

7. The BMT agreed that the method presented in document BMT/17/21 was consistent with the model “Characteristic-Specific Molecular Markers” in document TGP/15. The BMT agreed to propose that a new example be added to document TGP/15, on the basis of the example provided by the Netherlands, to illustrate a situation where the characteristic-specific marker did not provide complete information on the state of expression of a characteristic.

8. The BMT agreed to propose that paragraph 3.1.4 (reproduced below) from document UPOV/INF/18/1 be introduced in document TGP/15 to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic.

> “3.1.4 In considering the model and example, as presented in Annex 1 of this document [Characteristic-specific molecular markers], the TC emphasized the importance of meeting the assumptions. In that regard, it clarified that it is a matter for the relevant authority to consider if the assumptions are met (see document TC/45/16 “Report”, paragraph 152).”

9. When considering whether to include the method in the Test Guidelines, the BMT further proposed that TGP/15 include an explanation that it would be the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied.

DEVELOPMENTS AT THE TECHNICAL COMMITTEE

10. The TC, at its fifty-fourth session, held in Geneva on October 29 and 30, 2018, agreed that the following text from document UPOV/INF/18/1 should be introduced in document TGP/15 to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic (see document TC/54/31 “Report”, paragraphs 272 to 275):

> “3.1.4 In considering the model and example, as presented in Annex 1 of this document [Characteristic-specific molecular markers], the TC emphasized the importance of meeting the assumptions. In that regard, it clarified that it is a matter for the relevant authority to consider if the assumptions are met (see document TC/45/16 “Report”, paragraph 152).”

11. The TC considered the proposal by the BMT and agreed to include an explanation in document TGP/15 that it would be the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied in order to include a method in the Test Guidelines.

12. The TC noted that the BMT, at its seventeenth session, had considered document BMT/17/21 “Do resistance markers for tomato fulfil the requirements of TGP/15” and received a presentation by Ms. Amanda van Dijk-Veldhuizen (Netherlands), a copy of which was provided as document BMT/17/21 Add..

13. The TC agreed with the proposal by the BMT that a new example be added to document TGP/15 to illustrate a situation where the characteristic-specific marker did not provide complete information on the state of expression of a characteristic, on the basis of the proposal by the Netherlands presented in document BMT/17/21. The TC agreed to invite the experts from the Netherlands to prepare a proposal to be presented to the TWPs and BMT and agreed that the resultant proposal should be presented to the TC, at its fifty-fifth session.

PROPOSAL

14. The Annex to this document presents a proposal prepared by the experts from the Netherlands for consideration by the TWPs, at their sessions in 2019.

15. The TWPs are invited to:

(e) note that the TC agreed that document TGP/15 should be amended to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic;

(f) note that the TC agreed to include an explanation in document TGP/15 that it would be the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied in order to include a method in the Test Guidelines;

(g) note that the TC agreed that a new example should be added to document TGP/15 to illustrate a situation where the characteristic-specific marker does not provide complete information on the state of expression of a characteristic; and

(h) consider the proposal for a new example be added to document TGP/15 to illustrate a situation where the characteristic-specific marker does not provide complete information on the state of expression of a characteristic, as set out in the Annex to this document.

[Annex follows]

ANNEX

EXAMPLE 2: GENE SPECIFIC MARKER FOR DISEASE RESISTANCE IN TOMATO

prepared by experts from The Netherlands

Example

1. Resistance to Tomato mosaic virus (ToMV) is included in the Test Guidelines for Tomato.

2. Resistance to ToMV Strain 0 is conferred by the presence of one or more genes, such as Tm1; Tm2; and $Tm2^2$.

3. A marker has been developed to identify the presence of resistance alleles Tm2 and $Tm2^2$ and the susceptible allele tm2. Marker $Tm2/2^2$ is positioned in the protein coding sequence.

4. A variety will be resistant to ToMV Strain 0 if resistance allele Tm2 or resistance allele $Tm2^2$ is present. In this case, the DNA marker test could replace the traditional bioassay to assess resistance to ToMV Strain 0.

5. A variety with homozygous allele tm2 will be susceptible to ToMV Strain 0 unless resistance is coded by resistance allele Tm1. In this case, resistance to ToMV Strain 0 cannot be assessed by DNA marker test as there is no reliable marker for gene Tm1.

6. If a variety is claimed to be resistant to ToMV strain 0 and the DNA marker test result is tm2/tm2 (homozygous susceptible) a bioassay must be performed to determine whether the variety is resistant on the basis of another gene, such as Tm1.

Table 1: Schematic overview of resistance to Tomato mosaic virus and resistance alleles:

Genetic background	tm2/tm2 and tm1/tm1	Tm2/Tm2 or Tm2/tm2 and Tm1/Tm1 or Tm1/tm1 or tm1/tm1	$Tm2^2/Tm2^2$ or $Tm2^2/Tm2$ or $Tm2^2/tm2$ and Tm1/Tm1 or Tm1/tm1 or tm1/tm1	tm2tm2 and Tm1/Tm1 or Tm1/tm1
Marker $Tm2/2^2$	susceptible allele	resistant allele	resistant allele	susceptible allele
Resistance to ToMV - Strain 0	absent	present	present	present

[End of Annex and of document]