

**Technical Committee****TC/55/7 Corr.****Fifty-Fifth Session  
Geneva, October 28 and 29, 2019****Original:** English  
**Date:** August 21, 2019**MOLECULAR TECHNIQUES***Document prepared by the Office of the Union**Disclaimer: this document does not represent UPOV policies or guidance***EXECUTIVE SUMMARY**

1. The purpose of this document is to present matters for consideration by the Technical Committee (TC) on the use of biochemical and molecular techniques in DUS examination and molecular techniques in relation to the Technical Working Parties (TWPs) and the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT).
2. Matters for information only, concerning the use of biochemical and molecular techniques in DUS examination and molecular techniques in relation to the TWPs and the BMT will be presented in document TC/55/INF/6 “Molecular techniques – matters for information”.
3. The TC is invited to:
  - (a) note that the BMT, at its eighteenth session, will be invited to consider document UPOV/INF/17 Draft 2 “Guidelines for DNA-Profiling: Molecular marker selection and database construction (‘BMT Guidelines’)”, as set out in paragraph 7 of this document;
  - (b) note that the proposal by the TWV to develop guidance on elements to be included in a protocol of DNA marker assay for a specific characteristic in document UPOV/INF/17, will be reported to the BMT, at its eighteenth session, as set out in paragraph 9 of this document;
  - (c) consider whether to request a draft of document UPOV/INF/17 be prepared for consideration by the TC, at its fifty-sixth session;
  - (d) note that the BMT, at its eighteenth session, will be invited to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, as set out in paragraph 15 of this document;
  - (e) note that proposals developed by the BMT, at its eighteenth session, concerning a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, will be reported as an addendum to this document, as set out in paragraph 15 of this document;
  - (f) consider the elements for an inventory on the use of molecular marker techniques, by crop, as set out in paragraph 23 of this document, in conjunction with the comments by the TWPs and BMT, at their sessions in 2019;
  - (g) note that, subject to agreement by the TC, at its fifty-fifth session, and in coordination with the OECD, a circular will be issued to request members of the Union to complete a survey as a basis to develop an inventory on the use of molecular marker techniques, by crop, as set out in paragraph 25 of this document;
  - (h) note that the BMT, at its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques, as set out in paragraph 27 of this document;
  - (i) note that proposals developed by the BMT, at its eighteenth session, concerning lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques, will be reported as an addendum to this document, as set out in paragraph 27 of this document;

(j) note the outcomes of discussions held at the TWP, at their sessions in 2019, on cooperation in relation to the use of molecular techniques, as set out in paragraphs 32 to 35 of this document;

(k) note that the BMT, at its eighteenth session, will be invited to develop proposals on next steps to explore areas for cooperation in the use of molecular techniques, as set out in paragraph 38 of this document; and

(l) note that proposals developed by the BMT, at its eighteenth session, concerning areas for cooperation in the use of molecular techniques, will be reported as an addendum to this document, as set out in paragraph 39 of this document.

4. The following abbreviations are used in this document:

BMT:	Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular
TC:	Technical Committee
TWA:	Technical Working Party for Agricultural Crops
TWC:	Technical Working Party on Automation and Computer Programs
TWF:	Technical Working Party for Fruit Crops
TWO:	Technical Working Party for Ornamental Plants and Forest Trees
TWPs:	Technical Working Parties
TWV:	Technical Working Party for Vegetables
OECD:	Organization for Economic Co-operation and Development
ISTA:	International Seed Testing Association

5. The structure of this document is as follows:

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#### REVIEW OF DOCUMENT UPOV/INF/17 "GUIDELINES FOR DNA-PROFILING: MOLECULAR MARKER SELECTION AND DATABASE CONSTRUCTION ('BMT GUIDELINES')

6. The background to this matter is provided in document TC/54/11 Add. "Molecular Techniques", paragraphs 10 to 45.

7. The TC, at its fifty-fourth session, held in Geneva, on October 29 and 30, 2018, agreed with the proposal by the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT), at its seventeenth session, held in Montevideo, Uruguay, from September 10 to 13, 2018, for the European Union, France and the Netherlands to prepare a new draft of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular marker selection and database construction ('BMT Guidelines')" (document UPOV/INF/17/2 Draft 2) for consideration at the eighteenth session of the BMT, to be held in Hangzhou, China, from October 16 to 18, 2019 (see document TC/54/31 "Report", paragraph 264).

#### Guidance on protocol of DNA marker assay for a specific characteristic

8. The Technical Working Party for Vegetables (TWV), at its fifty-third session, held in Seoul, Republic of Korea, from May 20 to 24, 2019, proposed that the BMT be invited to develop guidance on

elements to be included in a protocol of a DNA marker assay for a specific characteristic, in document UPOV/INF/17 (see document TWV/53/14 "Report", paragraph 44).

9. The proposal by the TWV, at its fifty-third session, to develop guidance on elements to be included in a protocol of DNA marker assay for a specific characteristic in document UPOV/INF/17, will be reported to the BMT, at its eighteenth session.

10. *The TC is invited to:*

*(a) note that the BMT, at its eighteenth session, will be invited to consider document UPOV/INF/17/2 Draft 2 "Guidelines for DNA-Profiling: Molecular marker selection and database construction ('BMT Guidelines')", as set out in paragraph 7 of this document;*

*(b) note that the proposal by the TWV to develop guidance on elements, to be included in a protocol of DNA marker assay for a specific characteristic in document UPOV/INF/17, will be reported to the BMT, at its eighteenth session, as set out in paragraph 9 of this document; and*

*(c) consider whether to request that a draft of document UPOV/INF/17 be prepared for consideration by the TC, at its fifty-sixth session.*

#### COOPERATION BETWEEN INTERNATIONAL ORGANIZATIONS

11. The background to this matter is provided in document TC/54/11 "Molecular Techniques", paragraphs 19 to 23 and document TC/54/11 Add., paragraphs 48 to 50.

12. The TC, at its fifty-fourth session, held in Geneva, on October 29 and 30, 2018, agreed that UPOV and OECD should make progress on the matters previously agreed by the TC (see document TC/54/31 "Report", paragraphs 267 to 271), namely:

(a) to develop a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA;

(b) to develop an inventory on the use of molecular marker techniques, by crop, with a view to developing a joint OECD/UPOV/ISTA document containing that information, in a similar format to UPOV document UPOV/INF/16 "Exchangeable Software", subject to the approval of the Council and in coordination with OECD and ISTA; and

(c) the BMT to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC.

13. The TC, at its fifty-fourth session, agreed to invite ISTA to join the initiatives when in position to do so.

14. Developments concerning the matters above are as follows:

#### Joint document explaining the principal features of the systems of OECD, UPOV and ISTA

15. With regard to the possible development of a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, as set out in paragraph 12(a), the TC agreed to request the BMT to develop a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA. The Office of the Union will prepare a draft for consideration by the BMT, at its eighteenth session, to be held in Hangzhou, China, from October 16 to 18, 2019, on the basis of relevant elements from the World Seed Partnership and the FAQ on the use of molecular techniques in the examination of DUS. Developments at the eighteenth session of the BMT will be reported as an addendum to this document.

16. *The TC is invited to:*

(a) *note that the BMT, at its eighteenth session, will be invited to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, as set out in paragraph 15 of this document; and*

(b) *note that proposals developed by the BMT, at its eighteenth session, concerning a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, will be reported as an addendum to this document, as set out in paragraph 15 of this document.*

Inventory on the use of molecular marker techniques, by crop

17. With regard to the possible development of an inventory on the use of molecular marker techniques, by crop, as set out in paragraph 12(b), the TC agreed to invite the BMT and the TWPs to develop an inventory on the use of molecular marker techniques, by crop, with a view to developing a joint OECD/UPOV/ISTA document containing that information, in a similar format to document UPOV/INF/16 “Exchangeable Software”.

18. The Technical Working Party for Ornamental Plants and Forest Trees (TWO), at its fifty-first session, held in Christchurch, New Zealand, from February 18 to 22, 2019, the Technical Working Party for Vegetables (TWV), at its fifty-third session, held in Seoul, Republic of Korea, from May 20 to 24, 2019, and the Technical Working Party for Fruit Crops (TWF), at its fiftieth session, held in Budapest, Hungary, from June 24 to 28, 2019, considered the following elements for the inventory on the use of molecular marker techniques, by crop, which had been developed in consultation with the OECD, as set out in document TWP/3/7 “Molecular techniques”, paragraph 81:

Country or Intergovernmental Organization using molecular marker technique
Source [the name of the Authority] and Contact details [email address]
Type of molecular marker technique
Crop (s) for which the molecular marker technique is used [botanical name(s) and UPOV code(s) to be provided]
Purpose of the use of the molecular technique [UPOV model “Characteristic-Specific Molecular Markers”, UPOV model “Combining Phenotypic and Molecular Distances in the Management of Variety Collections”, Purity, Identity, Verification of hybridity]
Is the molecular marker technique used as part of Seed Certification in the last two years? [National certification, OECD certification] [relevant for OECD seed schemes]
In the last 2 years, how many times did the Authority use the molecular marker techniques?
The molecular marker technique is covered by [UPOV Test Guideline(s), UPOV TGP document(s), other document(s) (please specify)]
Is the molecular technique validated? [If yes, please specify a particular organization or authority] [relevant for OECD seed schemes]

19. The TWO, at its fifty-first session, endorsed the elements for the inventory on the use of molecular marker techniques, by crop, proposed by the Office of the Union” (see document TWO/51/12 “Report”, paragraphs 42 to 43).

20. The TWO agreed that the term “identity” should be clarified to include the verification of conformity of plant material to a protected variety for the exercise of breeders’ rights. The TWO also agreed to propose that information on molecular markers should provide details on source and availability of the marker, such as whether it was a publicly available or a proprietary marker.

21. The TWV, at its fifty-third session, endorsed the elements in document TWP/3/7 for the inventory on the use of molecular marker techniques, by crop, proposed by the Office of the Union, with the following additions to reflect the current status of molecular marker techniques (i.e. already in use or in development). (highlighted in grey) (see document TWV/53/14 “Report”, paragraph 48):

Status (i.e. in current use or in development)
Crop(s) for which the molecular marker technique is used and characteristic concerned (in the case of use) [botanical name(s) and UPOV code(s) to be provided]

22. The TWF, at its fiftieth session, endorsed the elements for the inventory on the use of molecular marker techniques, by crop, proposed in document TWP/3/7, with the additions suggested by the TWV at its fifty-third session to reflect the current status of molecular marker techniques (i.e. already in use or in development) (see document TWF/50/13 "Report", paragraph 63).

*Proposal*

23. On the basis of the comments by the TWPs and BMT, at their sessions in 2019, it is proposed that the following elements be considered as the basis for an inventory on the use of molecular marker techniques, by crop:

Country or Intergovernmental Organization using molecular marker technique
Source [name of the Authority] and Contact details [email address]
Type of molecular marker technique
Source of the molecular marker and contact details [email address]
Availability of the marker [publicly available or a proprietary marker]
Status (i.e. in current use or under development)
Crop(s) for which the molecular marker technique is used and characteristic concerned [botanical name(s) and UPOV code(s) to be provided]
Purpose of the use of the molecular technique [UPOV model "Characteristic-Specific Molecular Markers", UPOV model "Combining Phenotypic and Molecular Distances in the Management of Variety Collections", Purity, Identity, Verification of conformity of plant material to a protected variety for the exercise of breeders' rights, Verification of hybridity]
Whether the molecular marker technique was used as part of Seed Certification in the last two years [National certification, OECD certification] [relevant for OECD seed schemes]
Number of times the Authority used the molecular marker technique in the last 2 years
Whether the molecular marker technique is covered by [UPOV Test Guideline(s), UPOV TGP document(s), other UPOV document(s)] (please specify)
Whether the molecular technique is validated [yes to specify a particular organization or authority] [relevant for OECD seed schemes]

24. Developments on this matter at the Technical Working Party for Agricultural Crops (TWA), Technical Working Party on Automation and Computer Programs (TWC) and BMT, at their sessions in 2019, will be reported in an addendum to this document.

25. Subject to agreement by the TC, at its fifty-fifth session, and in coordination with the OECD, a circular will be issued to request members of the Union to complete the survey as a basis to develop an inventory on the use of molecular marker techniques, by crop.

26. *The TC is invited to:*

*(a) consider the elements for an inventory on the use of molecular marker techniques, by crop, as set out in paragraph 23 of this document, in conjunction with the comments by the TWPs and BMT, at their sessions in 2019; and*

*(b) note that, subject to agreement by the TC, at its fifty-fifth session, and in coordination with the OECD, a circular will be issued to request members of the Union to complete a survey as a basis to develop an inventory on the use of molecular marker techniques, by crop, as set out in paragraph 25 of this document.*

Lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques

27. The BMT, at its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC at its fifty-fifth session. Developments at the eighteenth session of the BMT will be reported as an addendum to this document.

28. *The TC is invited to:*

(a) *note that the BMT, at its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques, as set out in paragraph 27 of this document; and*

(b) *note that proposals developed by the BMT, at its eighteenth session, concerning lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques, will be reported as an addendum to this document, as set out in paragraph 27 of this document.*

## SESSION TO FACILITATE COOPERATION IN RELATION TO THE USE OF MOLECULAR TECHNIQUES

### Developments at the fifty-fourth session of the Technical Committee

29. The background to this matter is provided in document TC/54/11 Add. "Molecular Techniques", paragraphs 56 to 66.

30. The TC, at its fifty-fourth session, agreed that the results of the coordination session in the BMT, at its seventeenth session, as set out in paragraphs 57 to 66 of document TC/54/11 Add., be reported to the other TWPs. The TC agreed to invite the TWPs to undertake a similar session to build on the BMT outcomes and feed into the future work of the BMT. The TC agreed that discussion groups should be formed for the main crops at each TWP to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation (see document TC/54/31 "Report", paragraph 281).

### Developments at Technical Working Parties and the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular in 2019

31. At their sessions in 2019, the TWO, TWV and TWF considered document TWP/3/7 "Molecular Techniques" (see documents TWO/51/12 "Report", paragraphs 36 and 51, TWV/53/14 "Report", paragraphs 40 and 56, and TWF/50/13 "Report", paragraphs 56 and 74).

### *Technical Working Party for Ornamental Plants and Forest Trees*

32. The following information was provided by TWO participants (see document TWO/51/12 "Report", paragraphs 52 and 53):

Australia	<ul style="list-style-type: none"><li>• DNA information may be used in some cases of infringement action;</li><li>• currently considering constituting DNA collection for native species</li></ul>
China	<ul style="list-style-type: none"><li>• crop interest: forestry sector and woody ornamentals, <i>Fraxinus</i> in particular;</li><li>• currently developing databases with DNA information for Rose, Poplar and Tree Peony</li></ul>
European Union:	<ul style="list-style-type: none"><li>• applicants for new varieties of Rose can request for a fee to have a DNA sample extracted and stored; similar procedure for fruit crops under consideration</li></ul>
France	<ul style="list-style-type: none"><li>• crop interest: Hydrangea;</li><li>• currently testing a set of molecular markers for Hydrangea varieties</li></ul>
Netherlands	<ul style="list-style-type: none"><li>• crop interest: <i>Chrysanthemum</i>, <i>Gypsophila</i>, <i>Helleborus</i>, <i>Lilium</i>, <i>Phalaenopsis</i> and Rose;</li><li>• currently building a DNA database for <i>Fraxinus</i> and <i>Ulmus</i>;</li><li>• DNA information used for varietal identity;</li><li>• possible future development of databases with DNA information for ornamental plants</li></ul>

33. The TWO agreed that possible UPOV initiatives could include the development of guidance on collecting DNA samples, ownership of material collected and how to facilitate the use of material or information.

*Technical Working Party for Vegetables*

34. Following subgroup discussions, the following information was provided by TWV participants (see document TWV/53/14 "Report", paragraph 57):

Summary of crops and authorities currently using (or under development) biochemical and molecular techniques in the vegetable sector

Tomato	China, European Union, (France), (Italy), Netherlands, Republic of Korea
Pepper	China, (France), Republic of Korea
Watermelon	Republic of Korea
Melon	(France), Republic of Korea
Lettuce	France, (Italy), Japan, (Netherlands), Republic of Korea
Cabbage	European Union, Netherlands, Republic of Korea
Mushroom	Japan
French bean	Netherlands
Pea	(Netherlands), (United Kingdom)
Onion	Netherlands
Eggplant	(China)

Summary of current use of biochemical and molecular techniques in the vegetable sector

Use:
Management of reference collections
Selection of similar varieties/ grouping characteristics
Variety identification
Enforcement of IP Rights/ infringement
Check specific characteristics (e.g. male sterility, disease resistance: as replacement or addition to bioassay)
Techniques:
SSRs
SNPs
Electrophoresis (Isoenzyme)

Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the vegetable sector

Encourage sharing of data & techniques
Facilitate cooperation & training
Encourage exchange of DNA/marker set (no living organisms) and seeds
Ensuring consistency among UPOV members in the use of BMT
Identify focal point for molecular techniques in DUS examination for each UPOV member and make this information available via the UPOV website
Develop guidance on collecting DNA samples, ownership of material exchanges (confidentiality)
Update guidance on how to use information and exchange DNA material
Explore the possibility to build a "UPOV" DNA database, "UPOV" marker set
Develop guidance and/or training for specialized courts/ experts
Set up comparative trials (e.g. Harmores project)
Encourage and promote the work of the BMT as platform to improve cooperation and encourage participation from members
Encourage and improve cooperation with breeders and their representatives

*Technical Working Party for Fruit Crops*

35. Following subgroup discussions, the following information was provided by TWF participants (see document TWF/50/13 "Report", paragraph 75):

Summary of crops and authorities currently using biochemical and molecular techniques in the fruit sector

Czech Republic	Grapevine
France	Apple, Peach, Pear, Sweet Cherry, Apricot, Japanese Plum
Germany	Pear, Apple, Strawberry, Sweet Cherry, Sour Cherry
Republic of Korea	Apple, Grapevine, Peach, Pear, Strawberry
Morocco	Citrus, Date Palm
Italy	Grapevine
Hungary	Grapevine, Peach, Cherry, Sour Cherry, Apricot, Plum,
Spain	Almond, Apricot, Avocado, Banana, Cherimoya, Citrus, Fig tree Grapevine, Hazelnut Mango, Peach, Pear, Pineapple, Strawberry, Sweet Cherry, Walnut,
Japan	Apple, Citrus, Pineapple, Japanese Pear, Sweet Cherry, Strawberry, Grapevine

Summary of current use of biochemical and molecular techniques in the fruit sector

Use:
Management and description of variety collections
Genetic distance and molecular profiling
Uniformity assessment
Research purposes
Enforcement
Identification of varieties for certification scheme purposes.
Techniques:
SSR
SNPs

Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the fruit sector

Develop and share common databases (identifying a leading country and coordinator)
Sharing techniques
Harmonize projects/markers/methods/procedures
Exchange of knowledge and techniques
Encourage crop experts to attend BMT meetings

36. The TWA, at its forty-eighth session, to be held in Montevideo, Uruguay, from September 16 to 20, 2019, and the TWC, at its thirty-seventh session, to be held in Hangzhou, China, from October 14 to 16, 2019, will consider document TWP/3/7 "Molecular Techniques".

37. The outcomes of discussions at the TWPs to explore areas for cooperation on the use of molecular techniques, will be reported to the BMT, at its eighteenth session, to be held in Hangzhou, China, from October 16 to 18, 2019.

38. The BMT, at its eighteenth session, will be invited to develop proposals on next steps to explore areas for cooperation in the use of molecular techniques.

39. Proposals developed by the BMT, at its eighteenth session, will be reported to the TC, at its fifty-fifth session, as an addendum to this document.

40. *The TC is invited to:*

*(a) note the outcomes of discussions held at the TWPs, at their sessions in 2019, on cooperation in relation to the use of molecular techniques, as set out in paragraphs 32 to 35 of this document;*



*(b) note that the BMT, at its eighteenth session, will be invited to develop proposals on next steps to explore areas for cooperation in the use of molecular techniques, as set out in paragraph 38 of this document; and*

*(c) note that proposals developed by the BMT, at its eighteenth session, concerning areas for cooperation in the use of molecular techniques, will be reported as an addendum to this document, as set out in paragraph 39 of this document.*

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