

Technical Committee**TC/54/11****Fifty-Fourth Session
Geneva, October 29 and 30, 2018****Original:** English
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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 report on developments concerning the use of biochemical and molecular techniques in DUS examination and molecular techniques in relation to the Technical Working Parties and the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular.
2. The TC is invited to:
 - (a) note that the BMT agreed to invite members and observers to provide comments on document UPOV/INF/17 “Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)”, which would be compiled by the Office of the Union in a document that would form the basis of a review of document UPOV/INF/17 by the BMT at its seventeenth session, as set out in paragraph 13;
 - (b) consider the proposal by the BMT to introduce a new chapter concerning cooperation in the exchange of data and construction of databases in document UPOV/INF/17;
 - (c) note that practical workshops on “DNA Techniques and Variety Identification” had been held in Roelofarendsveen, Netherlands, from May 8 to 10, 2017 and from September 20 to 22, 2017, as set out in paragraph 20;
 - (d) consider whether to propose the BMT to develop a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA, as set out in paragraph 22 (a);
 - (e) consider to propose the BMT 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”, as set out in paragraph 22 (b);
 - (f) note that the BMT agreed that consideration of possible harmonization of terms and methodologies used for different crops and the possible development of standards, might be advanced through a further international practical workshop, to be jointly coordinated by OECD, UPOV and ISTA and supported by Naktuinbouw and/or another partner with the relevant facilities, as set out in paragraph 23;
 - (g) note that, at the sixteenth session of the BMT, discussion groups were formed for: agricultural crops; fruit crops; ornamental plants and forest trees; and vegetables, for BMT participants to exchange information on their work and explore areas for cooperation, as set out in paragraph 25; and
 - (h) note the agenda of the BMT at its seventeenth session, as set out in paragraph 33.

3. The structure of this document is as follows:

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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
AOSA:	Association of Official Seed Analysts
ISTA:	International Seed Testing Association
CIOPORA:	International Community of Breeders of Asexually Reproduced Ornamental and Fruit Plants

DEVELOPMENTS AT THE TECHNICAL WORKING PARTIES IN 2017

5. At their sessions in 2017, the TWA, TWV, TWO, TWF and TWC considered document TWP/1/7 "Molecular Techniques".

6. The TWV, at its fifty-first session, held in Roelofarendsveen, Netherlands, from July 3 to 7, 2017, received the following presentations, as reproduced in the Annexes to document [TWV/51/2 Rev.](#) (in alphabetical order) (see document TWV/51/16 "Report", paragraph 151):

- | |
|---|
| (a) "Management of variety collections - How we use molecular techniques in France" presented by an expert from France |
| (b) "Onion- Managing the variety collection with the use of DNA information" presented by an expert from the Netherlands |
| (c) "Efficient DUS test in French Bean (<i>Phaseolus vulgaris</i> L.) by using molecular data" presented by an expert from the Netherlands |

7. The TWC, at its thirty-fifth session, held in Buenos Aires, Argentina, from November 14 to 17, 2017, received an oral presentation by an expert from Argentina. The TWC noted that Argentina was using molecular marker information for the management of variety collections and planned to integrate this information with the GAIA software (see document TWC/35/21 "Report", paragraphs 71 and 127).

8. The TWC received a presentation by the Office of the Union on "Standards for databases containing molecular information", a copy of which was provided as document TWC/35/20. The TWC noted the offer for interested members to participate in the test campaigns to develop the ST-26 standard for the presentation of nucleotide and amino acid sequence listings using XML.

DEVELOPMENTS AT THE SIXTEENTH SESSION OF THE WORKING GROUP ON BIOCHEMICAL AND MOLECULAR TECHNIQUES, AND DNA-PROFILING IN PARTICULAR

9. The role of the BMT is reproduced in the Annex to this document.

10. The sixteenth session of the BMT was held in La Rochelle, France, from November 7 to 10, 2017, with the preparatory workshop on November 6, 2017. The specific day for the agenda items "The use of molecular techniques in examining essential derivation" and "The use of molecular techniques in variety identification" (the "Breeders' Day") was November 8, 2017.

Papers presented

11. The papers presented under each of the agenda items of the sixteenth session of the BMT were as follows:

Reports on developments in UPOV concerning biochemical and molecular techniques

Reports on developments in UPOV concerning biochemical and molecular techniques (document BMT/16/2)

Report of work on molecular techniques in relation to DUS examination

Genetic Distance-based selection of similar varieties for wheat distinctness test (document BMT/16/6)

Test of the potential use of SNPs markers on oilseed rape varieties (document BMT/16/7)

The use of molecular markers (SNP) for maize DUS testing in France (2013 to 2016) (document BMT/16/8 and BMT/16/8 Add.)

The use of genetic distances as characteristics? Assessment of this approach based on GEVES SNP maize data (document BMT/16/9 Rev.)

The use of molecular markers (SNP) for maize DUS testing: Development and official applications to assess distinctness of hybrids varieties (France) (document BMT/16/10)

An attempt to use molecular markers for winter wheat reference collection management (document BMT/16/11)

Update on the American Seed Trade Association and United States PVP Office Molecular Marker Working Group (document BMT/16/12 and BMT/16/12 Add.)

The use of Reference Variety Similarities in Varietal Distinctness II: Reference Variety Selection (document BMT/16/14 and BMT/16/14 Add.)

IMODDUS proposal: Developing a toolbox to distinguish apple mutants for DUS testing (document BMT/16/15 Rev.)

Use of GBS for Lucerne Variety Distinction (document BMT/16/17)

Genetic selection of similar varieties for the first growing cycle: example French bean (document BMT/16/19 and BMT/16/19 Add.)

SDN-assisted plant breeding and potential impact on DUS testing (document BMT/16/20)

Report on IMODDUS activities in 2017 (document BMT/16/22)

The Tomato project proposal in CPVO IMODDUS program (document BMT/16/27)

International guidelines on molecular methodologies including cooperation between the OECD, UPOV, ISTA and ISO

International guidelines on molecular methodologies including cooperation between the OECD, UPOV, ISTA and ISO (document BMT/16/3)

Practical workshops on DNA techniques and variety identification (document BMT/16/13 BMT/16/3 Add.)

OECD Seed Certification Schemes (document BMT/16/23)

Variety description databases including databases containing molecular data

Integration of molecular data into DUS testing in Durum Wheat: Use of a standardized method for the efficient management of reference collections (document BMT/16/21)

The use of molecular techniques in variety identification¹

Assessment of reproducibility of 6K SNP genotyping in soybean across laboratories (document BMT/16/16)

Assignment Tests for Genotype Classification (document BMT/16/18 Rev.)

Development on Use of Molecular Technique for PVP in Republic of Korea (document BMT/16/24 and BMT/16/24 Add.)

Determination of purity and quantification of varietal components through NGS (Next Generation Sequencing) (document BMT/16/25)

Determining the parameters to characterize Soybean varieties using single nucleotide polymorphisms (document BMT/16/26)

Confirmation of validation for DNA variety identification technique (document BMT/16/28)

Review of document UPOV/INF/17 “Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)”

12. The BMT, at its sixteenth session, considered documents BMT/16/4 ‘Review of document UPOV/INF/17 “Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)’ and BMT/16/5 “Standards for Databases containing Molecular Information” and received a presentation by the Office of the Union, on “Standards for databases containing molecular information”, a copy of which is reproduced in document BMT/16/5 Add. (see document BMT/16/29 “Report”, paragraphs 44 and 45).

13. The BMT agreed to invite members and observers to provide comments on document UPOV/INF/17 “Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)”. The comments would be compiled by the Office of the Union in a document that would form the basis of a review of document UPOV/INF/17 by the BMT at its seventeenth session. The BMT further agreed to propose to introduce a new chapter concerning cooperation in the exchange of data and construction of databases in document UPOV/INF/17 on the basis of document BMT/16/5.

14. On February 15, 2018, Circular E-18/004 was issued to designated persons of UPOV members in the Technical Committee and the BMT inviting members and observers of the BMT to provide comments on document UPOV/INF/17 “Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)” by June 15, 2018.

¹ This agenda item was discussed on Wednesday, November 8, 2017 (“Breeders-Day”).

15. The Office of the Union received comments from Argentina, Ecuador and Spain, joint comments from the European Union, France and the Netherlands, and comments from the European Seed Association (ESA).

16. On the basis of the comments received in response to the circular a draft revised review of document UPOV/INF/17 will be prepared for consideration by the BMT at its seventeenth session, to be held in Montevideo, Uruguay, from September 10 to 13, 2018.

17. *The TC is invited to:*

(a) *note that the BMT agreed to invite members and observers to provide comments on document UPOV/INF/17 "Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction ('BMT Guidelines')", which would be compiled by the Office of the Union in a document that would form the basis of a review of document UPOV/INF/17 by the BMT at its seventeenth session, as set out in paragraph 13; and*

(b) *consider the proposal by the BMT to introduce a new chapter concerning cooperation in the exchange of data and construction of databases in document UPOV/INF/17.*

International guidelines on molecular methodologies including cooperation between the OECD, UPOV, ISTA and ISO

18. The background to this matter is provided in document TC/53/11 "Molecular Techniques", paragraphs 25 to 26.

19. The BMT noted that the TC, at its fifty-third session, had agreed that possible future collaboration between UPOV, the Organization for Economic Co-operation and Development (OECD) and the International Seed Testing Association (ISTA) might include the harmonization of terms and methodologies used for different crops and the possible development of standards, after agreement by those organizations.

20. The BMT noted that practical workshops on "DNA Techniques and Variety Identification" had been held in Roelofarendsveen, Netherlands, from May 8 to 10, 2017 and from September 20 to 22, 2017.

21. The BMT noted that the TC had agreed that UPOV and OECD should consider making progress in the matters reported in this document if ISTA was unable to participate in the near future.

22. The BMT recalled that the TC, at its fifty-first session, had agreed (see document TC/52/29 Rev. "Revised Report", paragraph 129):

- (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 proposal for the BMT, at its fifteenth session, to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC to be presented at the TC, at its fifty-third session.

23. The BMT agreed that the initiatives above, and consideration of possible harmonization of terms and methodologies used for different crops and the possible development of standards, might be advanced through a further international practical workshop, to be jointly coordinated by OECD, UPOV and ISTA and supported by Naktuinbouw and/or another partner with the relevant facilities.

24. The TC is invited to:

(a) note that practical workshops on “DNA Techniques and Variety Identification” had been held in Roelofarendsveen, Netherlands, from May 8 to 10, 2017 and from September 20 to 22, 2017, as set out in paragraph 20;

(b) consider whether to propose the BMT to develop a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA, as set out in paragraph 22 (a);

(c) consider to propose the BMT 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”, as set out in paragraph 22 (b); and

(d) note that the BMT agreed that consideration of possible harmonization of terms and methodologies used for different crops and the possible development of standards, might be advanced through a further international practical workshop, to be jointly coordinated by OECD, UPOV and ISTA and supported by Naktuinbouw and/or another partner with the relevant facilities, as set out in paragraph 23.

Coordination session

25. Discussion groups were formed for: agricultural crops; fruit crops; ornamental plants and forest trees; and vegetables, for BMT participants to exchange information on their work and explore areas for cooperation (see document BMT/16/29 “Report”, paragraphs 48 to 53).

26. The BMT noted the following outcomes of the discussions:

Agricultural Crops

27. The United Kingdom to compile a list of crops of interest to members of the Union.

Fruit Crops

28. The following interest in cooperation was identified:

- Apple: Australia, Canada, France, Republic of Korea, United Kingdom, CIOPORA
- Stone fruit: France, Republic of Korea, Spain, United Kingdom
- Berries: Austria, Germany, Netherlands, United Kingdom, CIOPORA
- Nuts: China, Spain

Ornamental Plants and Forest Trees

29. Opportunities for cooperation on Rose to be explored by the Netherlands (coordinator), China, the United Kingdom and CIOPORA.

Vegetables

30. The following UPOV members would share their criteria for selecting crops for work in relation to the use of molecular techniques: Canada; China; France; Germany; Netherlands (coordinator); Republic of Korea; United Kingdom.

31. *The TC is invited to note that, at the sixteenth session of the BMT, discussion groups were formed for: agricultural crops; fruit crops; ornamental plants and forest trees; and vegetables, for BMT participants to exchange information on their work and explore areas for cooperation, as set out in paragraph 25.*

Future program

Date and place of next session

32. The BMT welcomed the invitation of Uruguay to hold its seventeenth session in Montevideo, Uruguay, from September 10 to 13, 2018, with the elements of the preparatory workshop included in the session (see document BMT/16/29 "Report", paragraph 46).

Program for the seventeenth session

33. During its seventeenth session, the BMT planned to discuss the following items (see document BMT/16/29, paragraph 54):

1. Opening of the session
2. Adoption of the agenda
3. Reports on developments in UPOV concerning biochemical and molecular techniques (document to be prepared by the Office of the Union)
4. Short presentations on new developments in biochemical and molecular techniques by DUS experts, biochemical and molecular specialists, plant breeders and relevant international organizations (oral reports by participants)
5. Report of work on molecular techniques in relation to DUS examination (papers invited)
6. Cooperation between international organizations (document to be prepared by the Office of the Union)
7. Variety description databases including databases containing molecular data (papers invited)
8. Methods for analysis of molecular data (papers invited)
9. The use of molecular techniques in examining essential derivation² (papers invited)
10. The use of molecular techniques in variety identification² (papers invited)
11. Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction"
12. Revision of document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)"
13. Session to facilitate cooperation
14. Date and place of next session
15. Future program
16. Report of the session (if time permits)
17. Closing of the session

² Breeders' Day

DEVELOPMENTS AT THE TECHNICAL WORKING PARTIES IN 2018

34. The TWA, at its forty-seventh session, held in Naivasha, Kenya, from May 21 to 25, 2018, considered document [TWP/2/7](#) "Molecular Techniques".

35. Developments concerning molecular techniques at the forty-seventh session of the TWA, are reported in document TC/54/23 "Revision of document TGP/15".

DEVELOPMENTS AT THE SEVENTEENTH SESSION OF THE WORKING GROUP ON BIOCHEMICAL AND MOLECULAR TECHNIQUES, AND DNA-PROFILING IN PARTICULAR

36. Developments at the seventeenth session of the BMT will be reported in an addendum to this document.

37. The TC is invited to note the agenda of the BMT at its seventeenth session, as set out in paragraph 33.

[Annex follows]

ROLE OF THE WORKING GROUP ON BIOCHEMICAL AND MOLECULAR TECHNIQUES,
AND DNA-PROFILING IN PARTICULAR (BMT)

*(as agreed by the Technical Committee at its thirty-eighth session, held in Geneva,
from April 15 to 17, 2002 (see document TC/38/16, paragraph 204))*

The BMT is a group open to DUS experts, biochemical and molecular specialists and plant breeders, whose role is to:

- (i) Review general developments in biochemical and molecular techniques;
- (ii) Maintain an awareness of relevant applications of biochemical and molecular techniques in plant breeding;
- (iii) Consider the possible application of biochemical and molecular techniques in DUS testing and report its considerations to the TC;
- (iv) If appropriate, establish guidelines for biochemical and molecular methodologies and their harmonization and, in particular, contribute to the preparation of document TGP/15, "New Types of Characteristics." These guidelines to be developed in conjunction with the Technical Working Parties;
- (v) Consider initiatives from TWPs, for the establishment of crop specific subgroups, taking into account available information and the need for biochemical and molecular methods;
- (vi) Develop guidelines regarding the management and harmonization of databases of biochemical and molecular information, in conjunction with the TWC;
- (vii) Receive reports from Crop Subgroups and the BMT Review Group;
- (viii) Provide a forum for discussion on the use of biochemical and molecular techniques in the consideration of essential derivation and variety identification.

[End of Annex and of document]