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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
Geneva

TECHNICAL COMMITTEE

Fifty-First Session
Geneva, March 23 to 25, 2015

MOLECULAR TECHNIQUES

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1. The purpose of this document is to report on developments concerning molecular techniques in relation to the:

- (a) Technical Committee
- (b) Technical Working Parties
- (c) Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular
- (d) OECD/UPOV/ISTA Joint Workshop on Molecular Techniques
- (e) Discussion on molecular techniques at the fiftieth session of the TC
- (f) Presentation of information on the situation in UPOV with regard to the use of molecular techniques

2. The following abbreviations are used in this document:

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|---------|--|
| BMT: | Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular |
| CAJ: | Administrative and Legal Committee |
| TC: | Technical Committee |
| TC-EDC: | Enlarged Editorial 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 |

3. The structure of this document is as follows:

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TECHNICAL COMMITTEE

4. At its fiftieth session, held in Geneva, from April 7 to April 9, 2014, the TC considered document TC/50/13.
5. The TC noted that the fourteenth session of the BMT would be held in Seoul, the Republic of Korea, from November 10 to 13, 2014.
6. The TC agreed to the proposed amendment of the program of the fourteenth session of the BMT (see document TC/50/13, paragraph 20).
7. The TC agreed to the proposed plan for the fourteenth session of the BMT to be held in conjunction with the Joint Workshop with ISTA and OECD, to be held on November 12, 2014, as set out in document TC/50/13, paragraph 21.
8. The TC agreed that the progress of work of the BMT and the outcomes of the Joint Workshop with ISTA and OECD should be reported to the TC at its fifty-first session.

TECHNICAL WORKING PARTIES

9. At their sessions in 2014, the TWO, TWF, TWC, TWV and TWA considered documents TWO/47/2, TWF/45/2, TWC/32/2, TWV/48/2 and TWA/43/2 "Molecular Techniques", respectively.
10. The TWO, TWF, TWC, TWV and TWA noted the developments concerning the:
 - (a) use of biochemical and molecular markers in the examination of Distinctness, Uniformity and Stability (DUS);
 - (b) Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT); and
 - (c) presentation of information on the situation in UPOV with regard to the use of molecular techniques to a wider audience, including breeders and the public in general.
11. The TWO agreed that it was important to bear in mind that not all DUS examination offices had the facilities and resources to use molecular techniques. It recalled that the situation in UPOV with regard to molecular techniques, as set out in document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)", did not require the examination offices to use such techniques in order to be able to conduct a DUS examination, but would allow them to use the techniques in specific ways if that was considered appropriate for their circumstances (see document TWO/47/28 "Report", paragraph 15).
12. The TWF agreed that it would be useful to receive more information on the use of molecular techniques in DUS examination and, in that regard, invited the experts from Spain to provide information on the use of such tools by the *Oficina Española de Variedades Vegetales* (OEVV). The TWF also invited other participants to present their experience on the use of biochemical and molecular techniques in fruit crops at the TWF session in 2015 (see document TWF/45/32 "Report", paragraph 14).
13. The TWF received a presentation by the expert from France on the study concerning molecular techniques and DUS testing made by the Group for Study and Control of Varieties and Seeds (GEVES), explaining how those techniques are being used in France and especially in relation to the detection of resistance genes, as well as the use of molecular tools on fruit trees. A copy of the presentation made by the expert from France is provided in document TWF/45/2 Add. "Addendum to TWF/45/2 Molecular Techniques" (see document TWF/45/32, paragraph 15).
14. The TWV noted the report by an expert of the European Seed Association (ESA) that ESA planned to make a presentation on the use of molecular techniques in potato at the fourteenth session of the BMT to be held in Seoul, the Republic of Korea, from November 10 to 13, 2014 (see document TWV/48/43 "Report", paragraph 13).

15. The TWV noted that the expert of ESA was in favor of the approach taken by the TC at its fiftieth session in relation to the frequently asked questions for the use of molecular techniques (DNA profiles) in the DUS examination, as set out in document TWV/48/2, paragraph 15 (see document TWV/48/43, paragraph 15).

16. The TWV received a presentation by an expert from the Netherlands on “DNA in DUS examination for Registration and PBR/PVP”, a copy of which is provided in an addendum to document TWV/48/2 “Addendum to TWV/48/2 Molecular Techniques” (see document TWV/48/43, paragraph 16).

17. The TWA received a presentation by an expert from the United Kingdom by electronic means on “A European potato database as a centralized collection of varieties of common knowledge”, a copy of which is provided in document TWA/43/2 Add. “Addendum to document TWA/43/2 Molecular techniques” (see document TWA/43/27 “Report”, paragraph 88).

18. The TWA noted the information presented by the expert from the United Kingdom by electronic means and the investigations on the use of molecular data for the management of variety collections (see document TWA/43/27, paragraph 89).

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

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

20. The fourteenth session of the BMT was held in Seoul, Republic of Korea, from November 10 to 13, 2014, with the preparatory workshop on November 9, 2014 and OECD/UPOV/ISTA Joint Workshop on Molecular Techniques on November 12, 2014. The specific day for the agenda items “Report of work on molecular techniques in relation to DUS examination” and “The use of molecular techniques in variety identification” (the “Breeders’ Day”) was November 12, 2014.

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

Reports on Developments in UPOV Concerning Biochemical and Molecular Techniques
(document BMT/14/2 Rev.)

Short presentations on new developments in biochemical and molecular techniques by DUS experts, biochemical and molecular specialists, plant breeders and relevant international organizations
(document BMT/14/15 Annex I: France, Annex II: United States of America (the), Annex III: Iran (Islamic Republic of))

Report of Work on Molecular Techniques in Relation to DUS Examination

The Use of Reference Varieties in Varietal Distinctness: An Approach under Investigation in the United States of America for Potential Application in Plant Variety Protection
(document BMT/14/5 and BMT/14/5 Add.)

Identification of Rice Varieties Using Genic Markers for Three DUS Characteristics
(document BMT/14/8 and BMT/14/8 Add.)

The Use of Molecular markers (SNP) for Maize DUS Testing
(document BMT/14/10 and BMT/14/10 Add.)

Potential Uses of Molecular Markers in Management of Rose Varieties for the PVP System
(document BMT/14/12 and BMT/14/12 Add.)

Development of EST-SSR Markers of Lettuce and Variety Identification Using EST-SSR Markers
(document BMT/14/13 Rev.)

Construction of DNA Profile Database of Strawberry Varieties Using SSR Markers
(document BMT/14/14 Rev.)

Use of Molecular Marker Techniques for Selection of 'Similar Variety' about 'Candidate Variety' (document BMT/14/16 Rev2.)

Improving Efficiency of DUS Testing of Perennial Ryegrass by Combining Morphological and Molecular Variety Distances (document BMT/14/17 and BMT/14/17 Add.)

A European Potato Database as Centralized Collection of Varieties of Common Knowledge (document BMT/14/18 and BMT/14/18 Add.)

Molecular Markers as Predictors for 'Traditional' Characteristics (document BMT/14/19 Rev.)

International Guidelines on Molecular Methodologies (document BMT/14/3)

Variety Description Databases (document BMT/14/4)

Ownership and Use of DUS Samples and of DNA and DNA Data During and After the DUS Tests (document BMT/14/11)

The Use of Molecular Techniques in Examining Essential Derivation¹

Identification of SNP Markers to aid Assessment of Essential Derivation in Maize (document BMT/14/7 Rev.)

The Use of Molecular Techniques in Variety Identification¹

Use of DNA Variety Identification Technique for Measures Against the Infringement of Plant Breeders' Rights in Japan (document BMT/14/6 and BMT/14/6 Add. Rev.)

Determining a Threshold for Genetic Conformity in Potato Seedlings (document BMT/14/9 and BMT/14/9 Add.)

22. The BMT agreed to an invitation from Russian Federation to hold its fifteenth session in Moscow in May, 2016, with a preparatory workshop in May, 2016. The BMT planned to discuss the following items:

1. Opening of the session
2. Adoption of the agenda
3. Reports on developments in UPOV concerning biochemical and molecular techniques
4. Short presentations on new developments in biochemical and molecular techniques by DUS experts, biochemical and molecular specialists, plant breeders and relevant international organizations
5. Report of work on molecular techniques in relation to DUS examination
6. International guidelines on molecular methodologies
7. Variety description databases
8. Methods for analysis of molecular data
9. The use of molecular techniques in examining essential derivation²
10. The use of molecular techniques in variety identification²
11. Cooperation between OECD, UPOV, ISTA and ISO

¹These agenda items were discussed on Wednesday, November 12, 2014 ("Breeders' Day").

² Breeders' Day

12. Date and place of next session
13. Future program
14. Report of the session (if time permits)
15. Closing of the session

OECD/UPOV/ISTA JOINT WORKSHOP ON MOLECULAR TECHNIQUES

23. The OECD/UPOV/ISTA Joint Workshop on Molecular Techniques was held in Seoul, Republic of Korea, on November 12, 2014, in conjunction with the fourteenth session of the BMT, held in Seoul, Republic of Korea, from November 10 to 13.

24. The papers presented under each of the agenda items of the OECD/UPOV/ISTA Joint Workshop were as follows:

Introduction to the OECD Seed Schemes and the Situation with Regard to Molecular Techniques
(document BMT/14/Joint/6)

Introduction to UPOV and the Situation with Regard to Molecular Techniques
(document BMT/14/Joint/4 Rev.)

Introduction to ISTA and the Situation with Regard to Molecular Techniques
(document/BMT/14/Joint/3 Rev.)

Introduction to ISO and the Situation with Regard to Molecular Techniques (document BMT/14/Joint/2)

Existing Areas of Cooperation between OECD, UPOV and ISTA (document/BMT/14/Joint/5)

25. The Workshop agreed that it would be useful to develop a joint document explaining the principal features (e.g. DUS, variety identification, variety purity, etc.) of the systems of OECD, UPOV and ISTA. It was also agreed that it would be useful for mutual understanding, to repeat the joint workshop at relevant meetings of the OECD and ISTA (see document BMT/14/20 "Report", paragraph 54).

26. The Workshop agreed to propose an inventory by UPOV, OECD and ISTA of the use of molecular marker techniques, by crop, with a view to developing a document containing that information, in a similar format to UPOV document UPOV/INF/16 "Exchangeable Software". It was noted that OECD had already collected some information regarding the use of molecular techniques by its designated authorities (see document BMT/14/20 "Report", paragraph 55).

27. The Workshop further agreed to propose to invite UPOV, OECD and ISTA to develop lists of possible joint initiatives in relation to molecular techniques. It was noted that, in the case of UPOV, the list could be drafted by the BMT at its fifteenth session, subject to approval by the Technical Committee (see document BMT/14/20 "Report", paragraph 56).

28. The Technical Working Group Meeting of the OECD Seed Schemes, held in Paris, France, on January 28 and 29, 2015, received an oral report by Mr. Gerry Hall (United Kingdom), Chairperson of the OECD Seed Schemes *Ad hoc* Working Group on Biochemical and Molecular Techniques (AHWG), on the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques, held on November 12, 2014, during the fourteenth session of the BMT.

29. The Technical Working Group agreed that another OECD/UPOV/ISTA Joint Workshop on Molecular Techniques should be organized either back-to-back with the Annual Meeting of the OECD Seed Schemes, to be held in Paris, in June, 2015, or in conjunction with the Technical Working Group Meeting to be held in January, 2016.

DISCUSSION ON MOLECULAR TECHNIQUES AT THE FIFTIETH SESSION OF THE TECHNICAL COMMITTEE

30. The TC, at its fiftieth session, held in Geneva, from April 7 to 9, 2014, agreed that the draft agenda for the fifty-first session of the TC should include an item for a discussion of molecular techniques (see document TC/50/36 "Report on the Conclusions", paragraph 164).

31. The meeting of the TWP and TC chairpersons, held in Geneva, on January 9, 2015, proposed that the basis for the discussion could be the presentation of highlights from the fourteenth session of the BMT, held in Seoul, Republic of Korea, from November 10 to 13, 2014, and the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques held in Seoul, Republic of Korea, on November 12, 2014.

32. In that regard, it was proposed to arrange presentations on the following items for the discussion on molecular techniques at the fifty-first session of the TC as follows:

Reports on developments in UPOV Concerning Biochemical and Molecular Techniques (see also document BMT/14/2 Rev2.)

Use of Molecular Marker Techniques for Selection of 'Similar Variety' about 'Candidate Variety' (see also document BMT/14/16 Rev2.)

The Use of Reference Varieties in Varietal Distinctness : An Approach under Investigation in the United States of America for Potential Application in Plant Variety Protection (see also documents BMT/14/5 and BMT/14/5 Add.)

A European Potato Database as Centralized Collection of Varieties of Common Knowledge (see also documents BMT/14/18 and BMT/14/18 Add)

Development of EST-SSR Markers of Lettuce and Variety Identification Using EST-SSR Markers (see also document BMT/14/13 Rev.)

Ownership and Use of DUS Samples and of DNA and DNA Data During and After the DUS Tests (see also document BMT/14/11 Rev.)

Opportunities for Cooperation between OECD, UPOV, ISO and ISTA with Regard to Molecular Techniques (see also document BMT/14/Joint/5)

33. Subject to approval by the TC, a draft program for the discussion is provided as Annex II to this document, including an indication of how this discussion would be coordinated with the agenda item "Molecular Techniques".

PRESENTATION OF INFORMATION ON THE SITUATION IN UPOV WITH REGARD TO THE USE OF MOLECULAR TECHNIQUES

Background

34. The TC, at its forty-ninth session, held in Geneva from March 18 to 20, 2013, agreed that there was a need to provide suitable information on the situation in UPOV with regard to the use of molecular techniques to a wider audience, including breeders and the public in general. That information should explain the potential advantages and disadvantages of the techniques, and the relationship between genotype and phenotype, which lay behind the situation in UPOV (see document TC/49/41 "Report on the Conclusions", paragraph 136).

35. The Consultative Committee, at its eighty-sixth session, held in Geneva on October 23 and 24, 2013, considered a series of answers to frequently asked questions. One of the questions included was "Does UPOV allow molecular techniques (DNA profiles) in the DUS examination?" In that regard the Consultative Committee agreed that the answer should be developed via the Technical Committee. The Consultative Committee agreed to consider draft answers to this and other frequently asked questions at its eighty-seventh session, held in Geneva on April 11, 2014.

36. The TC, at its fiftieth session, held in Geneva on April 7 to 9, 2014 and the CAJ, at its sixty-ninth session, held in Geneva on April 10, 2014, agreed the proposed explanation of the situation in UPOV with regard to the use of molecular techniques, as set out below:

Question: Does UPOV allow molecular techniques (DNA profiles) in the DUS examination?

Answer: "It is important to note that, in some cases, varieties may have a different DNA profile but be phenotypically identical, whilst, in other cases, varieties which have a large phenotypic difference may have the same DNA profile for a particular set of molecular markers (e.g. some mutations).

"In relation to the use of molecular markers that are not related to phenotypic differences, the concern is that it might be possible to use a limitless number of markers to find differences between varieties at the genetic level that are not reflected in phenotypic characteristics.

"On the above basis, UPOV has agreed the following uses of molecular markers in relation to DUS examination:

"(a) Molecular markers can be used as a method of examining DUS characteristics that satisfy the criteria for characteristics set out in the General Introduction if there is a reliable link between the marker and the characteristic.

"(b) A combination of phenotypic differences and molecular distances can be used to improve the selection of varieties to be compared in the growing trial if the molecular distances are sufficiently related to phenotypic differences and the method does not create an increased risk of not selecting a variety in the variety collection which should be compared to candidate varieties in the DUS growing trial.

"The situation in UPOV is explained in documents TGP/15 'Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)' and UPOV/INF/18 'Possible use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)'".

37. With regard to a wider audience, the TC agreed that the question was not framed in an appropriate way and, therefore, it would not be appropriate to seek to develop an answer to that question. The TC agreed that the question should be rephrased after clarification of the issues of interest to a wider audience (see document TC/50/36 "Report on the Conclusions", paragraph 83 to 85).

38. The Council, at its thirty-first extraordinary session, held in Geneva, April 12, 2014, adopted the answers to the frequently asked questions including the FAQ as set out in paragraph 36 above (see document C(Extr.)/31/5 "Report on the Decisions", paragraph 15).

39. The answers to Frequently Asked Questions are published on the website at <http://www.upov.int/about/en/faq/>.

40. The Consultative Committee, at its eighty-eighth session, held in Geneva, on October 15, 2014, agreed that the draft FAQ concerning information on the situation in UPOV with regard to the use of molecular techniques for a wider audience, including the public in general, should be referred to the Technical Committee for consideration (see document C/48/19 "Report by the President on the work of the eighty-sixth session of the Consultative Committee; adoption of recommendations, if any, prepared by that Committee", paragraph 48).

41. *The TC is invited to:*

(a) *note the report on developments in the TC, TWPs and BMT, as set out in paragraphs 4 to 22 of this document;*

(b) *approve the program for the fifteenth session of the BMT, to be held in 2016, including the dedication of a particular date ("Breeders' Day"), for the items on the use of molecular techniques in the consideration of essential derivation and in variety identification, as set out in paragraph 22 above.*

(c) *consider whether to seek to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, as set out in paragraph 25 above;*

(d) *note that the Workshop had agreed that it would be useful to repeat the joint workshop at relevant meetings of the OECD and ISTA and, in that regard, that the Technical Working Group Meeting of the OECD Seed Schemes, had agreed that another OECD/UPOV/ISTA Joint Workshop on Molecular Techniques should be organized either back-to-back with the Annual Meeting of the OECD Seed Schemes, to be held in Paris, in June, 2015, or in conjunction with the Technical Working Group Meeting to be held in January, 2016;*

(e) *consider whether 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 26 above;*

(f) *consider 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, as set out in paragraph 27 above;*

(h) *consider whether to base the discussion on molecular techniques on the presentation of highlights from the fourteenth session of the BMT, held in Seoul, Republic of Korea, from November 10 to 13, 2014, and the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques held in Seoul, Republic of Korea, on November 12, 2014, as set out in paragraphs 31 to 33 and Annex II to this document; and*

(i) *prepare a draft question and answer concerning the information on the situation in UPOV with regard to the use of molecular techniques for a wider audience, including the public in general, as set out in paragraph 40 above.*

[Annexes follow]

ANNEX I

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.

[Annex II follows]

ANNEX II

DISCUSSION ON MOLECULAR TECHNIQUES
AT THE FIFTY-FIRST SESSION OF THE TECHNICAL COMMITTEE (MARCH 24)

DRAFT PROGRAM

Highlights of the Fourteenth Session of the BMT

- 11:15 Reports on developments in UPOV Concerning Biochemical and Molecular Techniques (Office of the Union, see also document BMT/14/2 Rev2.)
- 11:30 Use of Molecular Marker Techniques for Selection of 'Similar Variety' about 'Candidate Variety'
- 12:00 The Use of Reference Varieties in Varietal Distinctness: An Approach under Investigation in the United States of America for Potential Application in Plant Variety Protection
- 12:30 *Lunch Break*
- 14:30 A European Potato Database as Centralized Collection of Varieties of Common Knowledge
- 14:50 Development of EST-SSR Markers of Lettuce and Variety Identification Using EST-SSR Markers
- 15:10 Ownership and Use of DUS Samples and of DNA and DNA Data During and After the DUS Tests

OECD/UPOV/ISTA Joint Workshop on Molecular Techniques

- 15:30 Opportunities for Cooperation between OECD, UPOV, ISO and ISTA with Regard to Molecular Techniques
- 15:50 General discussion (25 minutes)

Technical Committee Agenda Item 8 "Molecular Techniques"

- 16:15 Agenda Item 8 "Molecular Techniques"

[End of Annex II and of document]