



TWV/49/2

ORIGINAL: English

DATE: May 18, 2015

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL WORKING PARTY FOR VEGETABLES**Forty-Ninth Session
Angers, France, from June 15 to 19, 2015**

MOLECULAR TECHNIQUES

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EXECUTIVE SUMMARY

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

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

2. The TWV is invited to:

(a) note the report on developments in the BMT, at its fourteenth session, held in Seoul, Republic of Korea, from November 10 to 13, 2014, as set out in paragraphs 7 to 10 of this document;

(b) note that the TC, at its fifty-first session, held in Geneva, from March 23 to 25, 2015, agreed to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, subject to the approval of the Council and in coordination with the OECD and ISTA, as set out in paragraph 18;

(c) note that the TC, at its fifty-first session, agreed 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 the OECD and ISTA, as set out in paragraph 20; and

(d) note that the TC, at its fifty-first session, agreed 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, as set out in paragraph 21.

(e) note that the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques, held in Seoul, Republic of Korea, on November 12, 2014, agreed that it would be useful to repeat the joint workshop at relevant meetings of the OECD and ISTA, as set out in paragraph 19, and, in that regard, that the Technical Working Group Meeting of the OECD Seed Schemes, 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 or in conjunction with the Technical Working Group Meeting; and

(f) consider the initial 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 discussed during the TC, at its fifty-first session as reproduced in paragraph 32 to this document;

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
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
OECD	Organization for Economic Co-operation and Development
ISTA	International Seed Testing Association

PURPOSE

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

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

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

7. 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.

8. 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.)

¹ This agenda item was discussed on Wednesday, November 12, 2014 ("Breeders' Day").

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

9. The BMT, at its fourteenth session, agreed to an invitation from Russian Federation to hold its fifteenth session in Moscow in May, 2016, with a preparatory workshop in May, 2016 (see document BMT/14/20 "Report", paragraph 57). 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 identification
11. Cooperation between OECD, UPOV, ISTA and ISO
12. Date and place of next session
13. Future program
14. Report of the session (if time permits)
15. Closing of the session

10. The TC, at its fifty-first session, held in Geneva, from March 23 to 25, 2015, approved 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 9 above.

OECD/UPOV/ISTA JOINT WORKSHOP ON MOLECULAR TECHNIQUES

11. 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, 2014.

12. 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)*

² To be discussed on Breeders' Day

*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)

13. 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).

14. 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, paragraph 55).

15. 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, paragraph 56).

16. The Technical Working Group Meeting of the OECD Seed Schemes (OECD TWG), 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 during the fourteenth session of the BMT.

17. OECD TWG 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 OECD TWG, to be held in January, 2016.

18. The TC, at its fifty-first session, agreed to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA (e.g. DUS, variety identification, variety purity, etc.), subject to the approval of the Council and in coordination with OECD and ISTA, see documents TC/51/39 "Report on the Conclusions", paragraph 177, and CAJ/71/10 "Report on the Conclusions", paragraph 83.

19. The TC, at its fifty-first session, noted that the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques 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 OECD TWG 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 or in conjunction with the OECD TWG (see document TC/51/39, paragraph 178).

20. The TC, at its fifty-first session, agreed 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 of document TC/51/11, subject to the approval of the Council and in coordination with OECD and ISTA. It agreed that it would be necessary to establish criteria and a process for information to be added to the document (see document TC/51/39, paragraph 179).

21. The TC, at its fifty-first session, agreed that the BMT, at its fifteenth session, should develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques, for consideration by the TC (see document TC/51/39, paragraph 180).

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

22. 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).

23. The TC, at its fifty-first session, received the following presentations on molecular techniques (in order of presentation) (see document TC/51/39, paragraph 172):

Reports on developments in UPOV Concerning Biochemical and Molecular Techniques	Office of the Union
Marker-Assisted Selection of "Similar Variety" in DUS Testing	Republic of Korea (Mr. Seung-In Yi)
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	United States of America (Mr. Paul Nelson)
A European Potato Database as Centralized Collection of Varieties of Common Knowledge	United Kingdom (Mr. Alex Reid)
Development of EST-SSR Markers of Lettuce and Application for Variety Identification	Republic of Korea (Mr. Seung-In Yi)
Ownership and Use of DUS Samples and of DNA and DNA Data During and After the DUS Tests	Netherlands (Mr. Kees van Ettekooven)
Existing Areas of Cooperation Between OECD, UPOV and ISTA	Office of the Union

24. A copy of the presentations is available on the UPOV website (see http://www.upov.int/meetings/en/details.jsp?meeting_id=35045).

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

25. 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).

26. 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.

27. 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)'".

28. With regard to a wider audience, the TC, at its fiftieth session, 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).

29. The Council, at its thirty-first extraordinary session, held in Geneva, on April 12, 2014, adopted the answers to the frequently asked questions including the FAQ as set out in paragraph 29 above (see document C(Extr.)/31/5 "Report on the Decisions", paragraph 15).

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

31. 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).

32. The TC, at its fifty-first session, considered the development of 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. The TC agreed to request the TWPs, at their sessions in 2015, to consider the following initial draft discussed during the TC session (see document TC/51/39, paragraphs 181 and CAJ/71/10, paragraph 86):

"Is it possible to obtain protection of a variety on the basis of its DNA-profile?

"For a variety to be protected, it needs to be clearly distinguishable from all existing varieties on the basis of characteristics that are physically expressed, e.g. plant height, time of flowering, fruit color, disease resistance etc. [Molecular techniques (DNA profiles) may be used as supporting information].

"A more detailed explanation is provided in the FAQ 'Does UPOV allow molecular techniques (DNA profiles) in the examination of Distinctness, Uniformity and Stability ("DUS")?'

"See also:

"What are the requirements for protecting a new plant variety?"

33. *The TWV is invited to:*

(a) *note the report on developments in the BMT, as set out in paragraphs 7 to 10 of this document;*

(b) *note that the TC, at its fifty-first session, agreed to develop a joint document explaining the principal features of the systems of OECD, UPOV and ISTA, subject to the approval of the Council and in*

coordination with the OECD and ISTA, as set out in paragraph 18 above;

(c) note that the TC, at its fifty-first session, agreed 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 the OECD and ISTA, as set out in paragraph 20 above; and

(d) note that the TC, at its fifty-first session, agreed 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, as set out in paragraph 21 above.

(e) note that the OECD/UPOV/ISTA Joint Workshop on Molecular Techniques agreed that it would be useful to repeat the joint workshop at relevant meetings of the OECD and ISTA, as set out in paragraph 19 above, and, in that regard, that the Technical Working Group Meeting of the OECD Seed Schemes, 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 or in conjunction with the OECD Technical Working Group Meeting;

(f) consider the initial 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, discussed during the TC, at its fifty-first session as reproduced in paragraph 32 to this document;

[Annexes follow]

ANNEX

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]