E

BMT/11/2
ORIGINAL: English
DATE: August 27, 2008

UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

WORKING GROUP ON BIOCHEMICAL AND MOLECULAR TECHNIQUES AND DNA PROFILING IN PARTICULAR

Eleventh Session
Madrid, September 16 to 18, 2008

REPORT ON DEVELOPMENTS IN UPOV CONCERNING BIOCHEMICAL AND MOLECULAR TECHNIQUES

Document prepared by the Office of the Union

1. The purpose of this document is to report on developments concerning the:

(a) possible use of molecular tools for variety identification in relation to the enforcement of plant breeders' rights, technical verification and the consideration of essential derivation;

(b) *Ad Hoc* Crop Subgroups on Molecular Techniques (Crop Subgroups);

(c) Technical Working Parties (TWPs); and

(d) Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT).

2. Reports on developments concerning the UPOV Guidelines for DNA-profiling: molecular marker selection and database construction (BMT Guidelines) and a practical exercise in the development of an exchangeable database are provided in documents BMT/11/3 and BMT/11/5, respectively.

3. An overview of the UPOV bodies involved in the consideration of biochemical and molecular techniques is provided on the first restricted area of the UPOV website at

http://www.upov.int/restrict/en/upov_structure_index.html. That overview is also attached as the Annex to this document.

4. The following abbreviations are used in this document:

CAJ:	Administrative and Legal Committee
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
TWV:	Technical Working Party for Vegetables
TWP(s):	Technical Working Party(ies)
BMT:	Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular
BMT Review Group:	*Ad Hoc* Subgroup of Technical and Legal Experts on Biochemical and Molecular Techniques
Crop Subgroup:	*Ad Hoc* Crop Subgroup on Molecular Techniques

POSSIBLE USE OF MOLECULAR TOOLS FOR VARIETY IDENTIFICATION IN RELATION TO THE ENFORCEMENT OF PLANT BREEDERS' RIGHTS, TECHNICAL VERIFICATION AND THE CONSIDERATION OF ESSENTIAL DERIVATION

5. At its seventy-second session, held in Geneva on October 18, 2006, the Consultative Committee noted that the role of the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT) included the following:

> "The BMT is a group open to DUS experts, biochemical and molecular specialists and plant breeders, whose role is to:
>
> […]
>
> "(viii) Provide a forum for discussion on the use of biochemical and molecular techniques in the consideration of essential derivation and variety identification."

6. The Consultative Committee noted that this provision enabled the BMT to provide a forum for discussion on the use of biochemical and molecular techniques in the consideration of variety identification. The Vice Secretary-General noted that, with regard to the use of molecular tools for variety identification, the current terms of reference of the BMT appeared to be sufficiently broad. As a consequence, there was no immediate need to change the terms of reference of the BMT nor of the *Ad Hoc* Subgroup of Technical and Legal Experts on Biochemical and Molecular Techniques (BMT Review Group). The BMT could continue its work and report to the Technical Committee (TC) and the Administrative and Legal Committee (CAJ). The TC and CAJ could identify any matters which the Consultative Committee might need to consider.

7. At its forty-third session, held in Geneva, from March 26 to 28, 2007, the TC noted the conclusion of the Consultative Committee. The TC noted the importance of the Technical Working Parties (TWPs) in the consideration of biochemical and molecular techniques and the contact between other UPOV bodies dealing with those matters. It noted the importance

of communication between the TWPs, BMT, TC, CAJ and the Council within the existing UPOV structure. The TC also noted the importance of the *Ad Hoc* Crop Subgroups on Molecular Techniques (Crop Subgroups) as a forum for DUS experts and molecular specialists to consider matters at a crop specific level. It agreed to invite the Crop Subgroups to develop proposals concerning the possible use of molecular tools for variety identification in relation to the enforcement of plant breeders' rights, technical verification and the consideration of essential derivation.

AD HOC CROP SUBGROUPS ON MOLECULAR TECHNIQUES (CROP SUBGROUPS)

Crop Subgroup for Potato

8. The Crop Subgroup for Potato held its second session in Quimper, France, on April 17, 2007. All documents considered at that session can be found on the UPOV website at *http://www.upov.int/restrict/en/bmt_cropsubgroups/potato_2.htm*. With regard to proposals to the TWA and the BMT, the Crop Subgroup for Potato concluded as follows (see document BMT-TWA/Potato/2/7 "Report", paragraphs 16 to 19):

Molecular techniques in the examination of distinctness, uniformity and stability

9. At the proposal of the Chairperson, Mrs. Beate Rücker (Germany), the Crop Subgroup for Potato agreed the following conclusions in relation to the possible use of molecular information in relation to the DUS examination:

(a) molecular information alone should not be used for the assessment of distinctness, but might be considered in combination with morphological information in relation to the management of reference collections;

(b) the use of molecular markers could improve the management of reference collections used for DUS examination, in particular in relation to improving the coverage of reference collections; and

(c) the creation of a database containing both molecular and phenotypic data would be a necessary step for the use of molecular data in the management of reference collections. In that respect, it was also noted that there was still a need for work to be done on the harmonization of descriptions of morphological characteristics in order to be able to use such data from different sources. The next steps should include an assessment of the way in which the molecular and phenotypic data might be used, in particular in relation to the thresholds which might be applied. In that respect, there was recognition of the need for expertise in both morphological and molecular aspects. In considering such an approach, the Crop Subgroup for Potato expressed a favorable response to the approach developed by the experts from France for maize in document BMT/10/14, whilst noting that the issues facing reference collections of potato were somewhat different to those in maize.

Molecular techniques in variety identification

10. The Chairperson noted that consideration of the purpose of the variety identification was an important aspect and the levels of molecular information required for variety identification could be different. She noted that molecular tools were already being

successfully used for variety identification and had been very effective. In relation to variety identification, uniformity and stability was not a problem.

Essentially derived varieties

11. It was noted that there was no work by the international breeders' organizations in developing essentially derived variety (EDV) thresholds for potato.

Exchangeable database of molecular markers

12. The Crop Subgroup for Potato agreed that it would be useful for the experts working on the Community Plant Variety Office of the European Community (CPVO) project and at the French Federation of Potato Seed Growers (FNPPPT), to cooperate in order to investigate the compatibility of data obtained using different technologies.

Crop Subgroup for Rose

13. The Crop Subgroup for Rose held its second session in Angers, France, on April 18, 2007. All documents considered at that session can be found on the UPOV website at *http://www.upov.int/restrict/en/bmt_cropsubgroups/rose_1.htm*. With regard to proposals to the TWO and the BMT, the Crop Subgroup for Rose concluded as follows (see document BMT-TWO/Rose/2/6 "Report", paragraphs 30 and 32 to 34):

Possible use of molecular techniques in the DUS examination

14. The Crop Subgroup for Rose concluded that there was not an urgent requirement to introduce molecular markers in the DUS examination of rose, but noted that the use of molecular markers in combination with morphological characteristics could be useful for the management of reference collections.

Variety identification

15. The Crop Subgroup for Rose agreed on the importance of considering the following matters at the UPOV level:

(a) whether it would be useful for authorities to attach a DNA fingerprint to the official variety description;
(b) for which crops DNA fingerprints attached to the official variety description might be of most interest and why; and
(c) whether it would be useful for authorities to conserve DNA samples.

Exchangeable databases

16. Concerning the development of an exchangeable database, the Crop Subgroup for Rose was informed that the TC, at its forty-third session held in March 2007, had invited BMT Crop Subgroups for Rose, for Potato and for Oilseed Rape to consider how to take that matter forward.

17. An expert from France reported that, at the Congress of the International Seed Testing Association (ISTA) to be held in Brazil in May 2007, the ISTA Variety Committee would

discuss a protocol for variety identification, and observed that a link between the work being done within ISTA and that taking place within UPOV would be important.

18. The Crop Subgroup for Rose agreed to hold its third session in association with the eleventh session of the BMT.

19. The third session of the Crop Subgroup for Rose was scheduled to be held in Madrid, Spain, on the afternoon of September 15, 2008. However, in the absence of interest by rose breeders to participate, that third session has since been cancelled.

Crop Subgroup for Maize

20. The Crop Subgroup for Maize held its second session in Chicago, United States of America, on December 3, 2007. All documents considered at that session can be found on the UPOV website at *http://www.upov.int/restrict/en/bmt_cropsubgroups/maize.htm*. With regard to proposals to the TWA and the BMT, the Crop Subgroup for Maize concluded as follows (see document BMT-TWA/Maize/2/12 "Report", paragraphs 19 to 23):

Molecular techniques in the examination of distinctness, uniformity and stability

21. The Crop Subgroup for Maize agreed to propose that the TWA, the TC and the CAJ discuss the acceptability of the approach presented in documents BMT/10/14 and BMT-TWA/2/11, and suggested that the approach might be put forward for consideration at the BMT Review Group as a potential option for the use of molecular markers in DUS examination. It noted that a possible timetable for that process could be for the TWA, TC and CAJ to consider the proposal at their respective sessions in 2008, with a view to convening a possible meeting of the BMT Review Group in April 2009.

22. The Crop Subgroup for Maize agreed that its discussions on document BMT-TWA /Maize/2/8, concerning the discriminatory power of morphological characteristics, should be reported to the TWA.

Molecular techniques in variety identification

23. The Chairperson, Mrs. Beate Rücker (Germany), observed that there had been substantial work on variety identification by breeders and research centers and noted that molecular markers were already being used by breeders in relation to possible cases of infringement.

Essentially derived varieties

24. The Chairperson noted the substantial progress which had been made within the International Seed Federation (ISF) on the matter of EDVs and welcomed the opportunity which the Crop Subgroup for Maize had provided, by means of good breeder participation, to receive a comprehensive explanation of the developments which had taken place.

25. The Crop Subgroup for Maize agreed that its next session could take place in Autumn/Winter 2009, tentatively in conjunction with the maize and sorghum breeders' meeting in the United States of America. It anticipated that such a timetable would allow for the collection of further substantial data in relation to the approach presented in documents

BMT/10/14 and BMT-TWA/Maize/2/11 and would also allow a report of the views of the TWA, TC, CAJ and BMT Review Group on that approach.

Technical Committee and Administrative and Legal Committee conclusions concerning the proposals made by the Crop Subgroups

26. At its forty-fourth session, the TC considered the conclusions of the Crop Subgroups for Rose, Potato and Maize and agreed to:

(a) invite ISTA and OECD to make a presentation on their joint work on harmonization in the development of sets of markers which might be used for variety verification, at the eleventh session of the BMT;

(b) the proposal for the Crop Subgroup for Rose to hold its third session in conjunction with the eleventh session of the BMT, at which time the matters raised in paragraph 25 of document TC/44/7 would be considered further;

(c) propose to the CAJ that the approach presented in documents BMT/10/14 and BMT-TWA/Maize/2/11 be put forward for consideration at the BMT Review Group as a potential option for the use of molecular markers in DUS examination; and

(d) the proposal for the Crop Subgroup for Maize to hold its next session in late 2009, tentatively in conjunction with the maize and sorghum breeders' meeting in the United States of America, as set out in paragraph 34 of document TC/44/7.

27. The CAJ, at its fifty-seventh session, agreed with the proposal of the TC, that the approach presented in documents BMT/10/14 and BMT-TWA/Maize/2/11 should be put forward for consideration at the BMT Review Group as a potential option for the use of molecular markers in DUS examination. It noted that the meeting of the BMT Review Group was anticipated to be held between the TC and the CAJ sessions, on the evening of April 1, 2009.

TECHNICAL WORKING PARTIES (TWPs)

Technical Working Party for Agricultural Crops (TWA)

28. At its thirty-sixth session, held in Budapest, Hungary, from May 28 to June 1, 2007, the TWA considered a report on developments in UPOV concerning the use of molecular techniques, as set out in document TWA/36/2. That document included a report on the second session of the Crop Subgroup for Potato.

29. An expert from the United Kingdom informed the TWA that NIAB was working on the use of molecular techniques for variety identification in potato. The TWA agreed that it would be useful for that expert to contact the coordinator of the CPVO project who was discussing with the *Institut national de la recherche agronomique* (INRA, France) the possibility to cooperate in order to investigate the compatibility of data obtained using different technologies.

30. The Chairman of the Crop Subgroup for Ryegrass, Mr. Michael Camlin (United Kingdom), reported that the Office of the Union had been invited to make a

presentation at the EUCARPIA Fodder Crops and Amenity Grasses Section in August 2007 on the situation in UPOV concerning the possible use of molecular techniques. He anticipated that that presentation might stimulate a meeting of the Crop Subgroup for Ryegrass.

31. The TWA noted that it had been invited to propose a new Chairperson for the Crop Subgroup for Wheat and Barley. The TWA agreed to propose Mr. Michael Camlin (United Kingdom) as Chairman. Mr. Camlin proposed that the Office of the Union should seek information from members of the Union and observers on the need for a meeting of the Crop Subgroup for Wheat and Barley.

Technical Working Party for Vegetables (TWV)

32. At its forty-first session, held in Nairobi, Kenya, from June 11 to 15, 2007, the TWV considered a report on developments in UPOV concerning the use of molecular techniques, as set out in documents TWV/41/2 and TWV/41/9. The TWV noted that Annex II to document TWV/41/9 contained information provided on developments in the Netherlands.

33. With regard to the report on the development and evaluation of molecular markers linked to disease resistance genes for tomato DUS testing, reported by the CPVO, the TWV was informed that it was planned to present the results of the project at the eleventh session of the BMT, to be held in 2008.

34. In respect of the work reported by the Netherlands in Annex II to document TWV/41/9, the reporting expert from the Netherlands concluded that there was a need for a lot more work to be done before molecular tools could be considered in a DUS context. He also noted that there would be difficulties in developing techniques for minor crops because of the lack of information concerning molecular markers. However, he noted that there was potential for the use of molecular techniques for variety identification purposes, although care would be needed in such uses.

35. The expert from Spain presented the information provided in Annex II to document TWV/41/9 and explained that the next step in the use of molecular techniques in support of DUS testing of *Capsicum annuum* varieties would be to increase the number of molecular markers and number of varieties studied, with more complete results expected to be available at the end of 2008.

36. The expert from France reported that most of the work on molecular markers in France was focused on agricultural crops, such as maize and oilseed rape. However, in peas, microsatellite markers were being used to verify the correspondence of DUS and Value for Cultivation and Use (VCU) samples, with field plots only being used to check inconsistencies. Work was also being done in Endive / Chicory to investigate the clustering of varieties. He also reported on studies being conducted on tomato in relation to resistance to *Verticillium*, where breeders were working to develop durable, polygenic resistance.

Technical Working Party for Ornamental Plants and Forest Trees (TWO)

37. At its fortieth session, held in Kunming, China, from July 2 to 6, 2007, the TWO considered a report on developments in UPOV concerning the use of molecular techniques, as set out in document TWO/40/2, and received an oral report from Mr. Joost Barendrecht

(Netherlands), Chairman of the Crop Subgroup for Rose. The TWO noted the information provided in document TWO/40/2 and in the oral report made by Mr. Barendrecht.

Technical Working Party for Fruit Crops (TWF)

38. At its thirty-eighth session, held in Jeju, Republic of Korea, from July 9 to 13, 2007, the TWF considered a report on developments in UPOV concerning the use of molecular techniques, as set out in document TWF/38/2. The TWF noted the information provided in that document.

Technical Working Party on Automation and Computer Programs (TWC)

39. At its twenty-fifth session, held in Sibiu, Romania, from September 3 to 6, 2007, the TWC received a report on developments within UPOV concerning molecular techniques, on the basis of document TWC/25/2.

40. The expert from the Netherlands noted that paragraph 13 of document TWC/25/2 recalled that the TC had agreed to investigate the possibility of a practical exercise, involving a small number of crops, in the development of an exchangeable database and observed that the TWC might be able to provide assistance on techniques for checking repeatability. An expert from the United Kingdom reported on a project on oilseed rape, financed by the CPVO. He explained that, in that project, the biggest problems in harmonization had been with morphological data rather than with molecular data. An expert from Germany considered that it was necessary to develop a harmonized structure for exchanging data as well as harmonizing the data itself, before developing any database. He added that the TWC could provide guidance in that process of harmonization. An expert from France reported that a database containing descriptions of maize varieties from France, Germany and Spain had been developed.

41. The TWC agreed to invite experts from France, Germany and Spain to make a presentation at the next session of the TWC on the development and operation of the maize database and the benefits which it offered for the participating partners.

42. An expert from France reported that ISTA was working on harmonization in the development of sets of markers which might be used for variety verification. He noted that different numbers of markers might be necessary for different purposes such as description purposes, assessment of essential derivation and DUS examination. The TWC agreed to suggest that ISTA should be invited to make a presentation on that initiative at the eleventh session of the BMT.

Technical Committee conclusions

43. At its forty-fourth session, the TC noted the reports of discussions in the TWPs and approved Mr. Michael Camlin (United Kingdom) as Chairman of the Crop Subgroup for Wheat and Barley.

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

44. In order to encourage the presentation of information in relation to the use of molecular techniques in the consideration of essential derivation and in variety identification, the BMT agreed at its tenth session, held in Seoul, Republic of Korea, from November 21 to 23, 2006, that it would be appropriate to dedicate a specific day to the agenda items "The use of molecular techniques in the consideration of essential derivation" and "The use of molecular techniques in variety identification", at the eleventh session of the BMT. In particular, breeders and other experts would be offered the possibility to attend for that specific day.

45. At its forty-third session, the TC:

(a) noted the intention, at the eleventh session of the BMT, to dedicate a specific day to the items concerning "The use of molecular techniques in the consideration of essential derivation" and "The use of molecular techniques in variety identification";

(b) agreed that specific sessions should be organized at the BMT for vegetatively propagated, self-pollinated and cross-pollinated crops and, on that basis, agreed to discontinue the Vegetatively Propagated Crop Subgroup; and

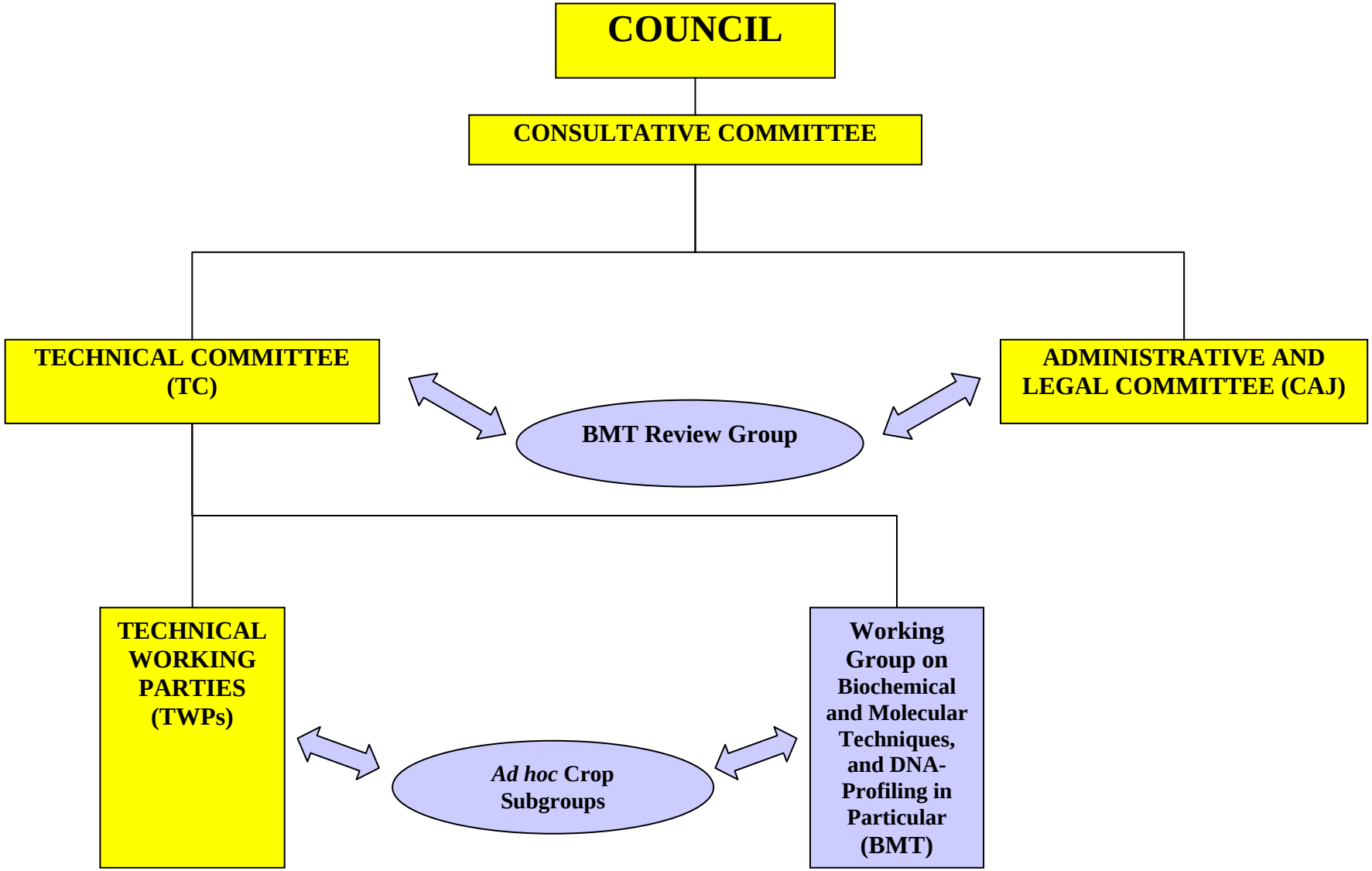
(c) agreed that relevant experts be invited to make a presentation concerning ISO and Codex guidelines, in relation to quality criteria in molecular techniques, at the eleventh session of the BMT.

46. The eleventh session of the BMT will be held in Madrid, Spain, from September 16 to 18, 2008, with a preparatory workshop on the morning of September 15. September 16 will be the "breeders' day", which will be dedicated to the items "The use of molecular techniques in the consideration of essential derivation" and "The use of molecular techniques in variety identification".

[Annex follows]

ANNEX

UPOV Structure: Biochemical and Molecular Techniques



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.

TERMS OF REFERENCE OF *AD HOC* SUBGROUP OF TECHNICAL AND LEGAL EXPERTS ON BIOCHEMICAL AND MOLECULAR TECHNIQUES ("BMT REVIEW GROUP")

(as agreed by the Administrative and Legal Committee at its forty-third session, held on April 5, 2001 (see document CAJ/43/8, paragraph 58))

1. The BMT Review Group should assess possible application models proposed by the Technical Committee, on the basis of the work of the BMT and crop subgroups, for the utilization of biochemical and molecular techniques in the examination of Distinctness, Uniformity and Stability in relation to the following:

(a) conformity with the UPOV Convention, and

(b) potential impact on the strength of protection compared to that provided by current examination methods and advise if this could undermine the effectiveness of protection offered under the UPOV system.

2. In conducting its assessment, the BMT Review Group may refer specific aspects to the Administrative and Legal Committee or the Technical Committee for clarification or further information as considered appropriate.

3. The BMT Review Group will report its assessment, as set out in paragraph 1 above, to the Administrative and Legal Committee, but this assessment will not be binding for the position of the Administrative and Legal Committee.

AD HOC CROP SUBGROUPS ON MOLECULAR TECHNIQUES (CROP SUBGROUPS)

At its thirty-sixth session, held in Geneva, from April 3 to 5, 2000, the Technical Committee agreed to the creation of the *Ad hoc* Crop Subgroups proposed by the BMT at its sixth session, held in Angers, France from March 1 to 3, 2000 (see document TC/36/11, paragraph 123).

Extract from document TC/36/3 Add.

"23. [At its sixth session, held in Angers, France from March 1 to 3, 2000] The BMT agreed that real progress could not be expected without intensive discussion in small groups on specific species. It therefore decided to propose establishing *ad hoc* crop subgroups during the eighteen month interval until the next session to make real progress in discussions on possibilities and consequences of the introduction of molecular techniques in DUS testing, the management of reference collection and the judgement of essential derivation.

"24. The BMT discussed the role of *ad hoc* crop subgroups and its relationship with the Technical Working Parties. It agreed that testing experts in the Technical Working Party should be involved with the discussion in the *ad hoc* crop subgroups. It also agreed that the chairmen of the *ad hoc* crop subgroups should be chosen from experts in the Technical Working Party in question. The role of the *ad hoc* crop subgroups would not be to make any decisions, but to prepare documents that could be a basis of further discussions in the BMT, the Technical Working Parties and the Technical Committee. The BMT confirmed that the Technical Working Parties should be the decision-making bodies for the introduction of new characteristics into DUS testing for each species.

[…]
"26. The BMT discussed the selection of species for the subgroups. A majority of experts supported two criteria, (i) the need for the introduction of molecular techniques in DUS testing (species for which a limited number of characteristics are available and species which urgently need effective methods for the management of reference collection) and (ii) the availability of DNA profiling data and on-going studies."

At its forty-third session, held in Geneva, from March 26 to 28, 2007, the Technical Committee agreed to invite the Crop Subgroups to develop proposals concerning the possible use of molecular tools for variety identification in relation to the enforcement of plant breeders' rights, technical verification and the consideration of essential derivation.

The list of Crop Subgroups established by the Technical Committee (TC) is as follows:

Crop Subgroup for:	*TWP*	*TC Session which established*
Maize	TWA	thirty-sixth session (2000)
Oilseed Rape	TWA	thirty-sixth session (2000)
Potato	TWA	thirty-eighth session (2002)
Rose	TWO	thirty-sixth session (2000)
Ryegrass	TWA	forty-second session (2006)
Soybean	TWA	thirty-eighth session (2002)
Sugarcane	TWA	thirty-eighth session (2002)
Tomato	TWV	thirty-sixth session (2000)
Wheat and Barley	TWA	thirty-sixth session (2000) / forty-second session (2006)

[End of Annex and of document]