UPOV

International Union for the Protection of New Varieties of Plants

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Technical Working Party for Ornamental Plants and Forest Trees
Fifty-First Session
Christchurch, New Zealand, February 18 to 22, 2019

Technical Working Party for Vegetables
Fifty-Third Session
Seoul, Republic of Korea, May 20 to 24, 2019

Technical Working Party for Fruit Crops
Fiftieth Session
Budapest, Hungary, June 24 to 28, 2019

Technical Working Party for Agricultural Crops
Forty-Eighth Session
Montevideo, Uruguay, September 16 to 20, 2019

Technical Working Party on Automation and Computer Programs
Thirty-Seventh Session
Hangzhou, China, October 14 to 16 (morning), 2019

TWP/3/7

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MOLECULAR TECHNIQUES

Document prepared by the Office of the Union

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EXECUTIVE SUMMARY

1. The purpose of this document is to report developments concerning 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 TWPs are invited to:

(a) note the report on developments in the TWPs and BMT, as set out paragraphs 7 to 72 of this document;

(b) note the draft agenda for the BMT at its eighteenth session, as set out in paragraph 73 of this document;

(c) note that the European Union, France and the Netherlands will be invited to prepare a new draft of document UPOV/INF/17 for consideration at the eighteenth session of the BMT, as set out in paragraph 75 of this document;

(d) note that the UPOV and OECD may make progress on the matters previously agreed by the TC, as set out in paragraph 77 of this document;

(e) note that ISTA will be invited to join the initiatives set out in paragraph 77 of this document, when in a position to do so;

(f) note that the Office of the Union will prepare a draft of a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA, for consideration by the BMT, at its eighteenth session, on the basis of relevant texts from the World Seed Partnership and the frequently asked question on the use of molecular techniques in the examination of DUS, as set out in paragraph 79 of this document;

(g) consider elements for the inventory on the use of molecular marker techniques, by crop, proposed by the Office of the Union, as set out in paragraph 81 of this document;

(h) note that, on the basis of the comments received from the TWPs and BMT, proposed elements for the inventory on the use of molecular marker techniques, will be presented for consideration by the TC at its fifty-fifth session, as set out in paragraph 82 of this document;

(i) note that, subject to agreement by the TC at its fifty-fifth session, a circular will be issued to request the member of the Union to complete the survey as a basis to develop the inventory on the use of molecular marker techniques, by crop, after coordination with the OECD Seed Schemes Bureau, as set out in paragraph 83 of this document;

(j) note that the BMT its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC at its fifty-fifth session, as set out in paragraph 84 of this document;

(k) note that the Model “Combining Phenotypic and Molecular Distances in the Management of Variety Collections” of document TGP/15, Section 2.2, will be revised at a later stage once an additional threshold level has been implemented in France, as set out in paragraph 87 of this document;

(l) note that the TC agreed with the inclusion of a new model “Genetic selection of similar varieties for the first growing cycle: example French Bean” in document TGP/15 on the basis of the proposal by the Netherlands revised by the TC-EDC, as presented in Annex II to this document;

(m) note that a draft of document TGP/15/2 “Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)” incorporating the new model will be presented to the seventy-sixth session of the CAJ, to be held on October 30, 2019, and if agreed by the CAJ, a draft of document TGP/15/2 will be presented for adoption by the Council at its fifty-third ordinary session, to be held on November 1, 2019, on that basis;

(n) note that the text from document UPOV/INF/18/1 will be introduced in document TGP/15 to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic, as set out in paragraph 93 of this document;

(o) note that document TGP/15 will include an explanation in that it is the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic is satisfied in order to include a method in the Test Guidelines, as set out in paragraph 94 of this document;

(p) note that matters concerning characteristic-specific markers with incomplete information on state of expression are considered in document TWP/3/12;

(q) note the results of the coordination session at the seventeenth session of the BMT, as set out in paragraphs 62 to 71 of this document;

(r) form discussion groups for the main crops at each TWP to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation, in order to build on the BMT outcomes and feed into the future work of the BMT, as set out in paragraph 97 of this document; and

(s) note that the TC agreed the items for discussion on Wednesday, October 16, 2019, to facilitate discussion and cooperation between the TWC and BMT, the TWC and BMT will consider the items, as set out in paragraph 101 of this document.

3. 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
TWPs:	Technical Working Parties
TWV:	Technical Working Party for Vegetables
OECD:	Organization for Economic Co-operation and Development
ISTA:	International Seed Testing Association

4. The structure of this document is as follows:

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

5. The role of the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT) is reproduced in the Annex to this document.

6. The seventeenth session of the BMT was held in Montevideo, Uruguay, from September 10 to 13, 2018. 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 September 12, 2018.

Papers presented

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

Preparatory information

Preparatory Information (document BMT/17/4)

Reports on developments in UPOV concerning biochemical and molecular techniques

Reports on developments in UPOV (document BMT/17/2)

Short presentations on new developments in biochemical and molecular techniques by DUS experts, biochemical and molecular specialists, plant breeders and relevant international organizations

New developments in biochemical and molecular techniques CPVO report on IMODDUS: latest developments (document BMT/17/23)

New developments in biochemical and molecular techniques CPVO report on IMODDUS: Update on R&D projects co-funded by CPVO (document BMT/17/24)

Report of work on molecular techniques in relation to DUS examination

Test of the potential use of SNPs markers on oilseed rape varieties (document BMT/17/8)

Use of Molecular Marker Techniques in DUS Testing and Enforcement of Breeder's Right in the Republic of Korea (document BMT/17/14 Rev.)

Do resistance markers for tomato fulfil the requirements of TGP/15? (document BMT/17/21)

Use of SNP markers for soybean variety protection purposes in Argentina (document BMT/17/22)

The United States Molecular Marker Working Group: Background for the use of DNA markers in DUS (documents BMT/17/17 and BMT/17/17 Add.)

Use of DNA-Based Markers in Testing for Distinctness, Uniformity and Stability (DUS) and Enforcement of Plant Breeders Rights (PBR) (document BMT/17/20)

Revision of document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)"

Revision of document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" (document BMT/17/7)

Guidance on the use of Biochemical and Molecular Markers in the examination of Distinctness, Uniformity and Stability (DUS) (document TGP/15/2 Draft 1)

Cooperation between international organizations

Cooperation between International Organizations (document BMT/17/3)

DNA-based methods for variety testing: ISTA approach (document BMT/17/6)

Variety description databases including databases containing molecular data

Construction of a European Potato database with varieties of common knowledge and its implementation in the potato DUS testing system

Part I: Construction, maintenance and use of the common database (document BMT/17/11)

Part II: Generation of molecular data (document BMT/17/12)

A DNA database for Rose: Development and validation of a SNP marker set (document BMT/17/15 and BMT/17/15 Add.)

Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction ('BMT Guidelines')"

Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction ('BMT Guidelines')" (documents BMT/17/10 and BMT/17/10 Add.)

Guidelines for DNA-Profiling: Molecular marker selection and database construction ("BMT Guidelines") (document UPOV/INF/17/2 Draft 1)

The use of molecular techniques in examining essential derivation[1]

Do new breeding techniques lead to Essentially Derived Varieties? (documents BMT/17/9 and BMT/17/9 Add.)

The use of molecular techniques in variety identification[1]

Implementation of SNP markers to identify soybean varieties commercialized in Uruguay (document BMT/17/13)

Corn Hybrid parental identification: The Use of Hybrid Monomorphic Profile compared to Pericarp Genotyping (document BMT/17/16)

Variety identification in soybeans using SNPs (document BMT/17/18)

Presentation of a set of 11 SNPs capable of discriminating 80 soybean varieties from a reference collection (document BMT/17/19)

Session to facilitate cooperation

Session to facilitate cooperation in relation to the use of molecular techniques (document BMT/17/5)

Report of work on molecular techniques in relation to DUS examination

8. The BMT, at its seventeenth session, agreed that the method presented in document BMT/17/21 "*Do resistance markers for tomato fulfil the requirements of TGP/15*" was consistent with the model "Characteristic-Specific Molecular Markers" in document TGP/15. The BMT agreed to propose that a new example be added to document TGP/15, on the basis of the example provided by the Netherlands, to illustrate a situation where the characteristic-specific marker did not provide complete information on the state of expression of a characteristic (see document BMT/17/25 "Report", paragraphs 11 and 12).

9. The BMT agreed to propose that paragraph 3.1.4 (reproduced below) from document UPOV/INF/18/1 be introduced in document TGP/15 to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic. When considering whether to include the method in the Test Guidelines, the BMT further proposed that TGP/15 include an explanation that it would be the responsibility of the respective Technical Working Party (TWP) and the Technical Committee (TC) to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied.

> "3.1.4 In considering the model and example, as presented in Annex 1 of this document, the TC emphasized the importance of meeting the assumptions. In that regard, it clarified that it is a matter for the relevant authority to consider if the assumptions are met (see document TC/45/16 "Report", paragraph 152)."

[1] This agenda item was discussed on Wednesday, September 12, 2018 ("Breeders-Day").

Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction ('BMT Guidelines')

10. The background to this matter is provided in document TWP/2/7 Rev. "Molecular Techniques", paragraph 20 to 24.

11. The BMT, at its seventeenth session, considered documents BMT/17/10 and BMT/17/10 Add. "Review of document UPOV/INF/17 'Guidelines for DNA-profiling: Molecular Marker Selection and Database Construction ("BMT Guidelines")'" and UPOV/INF/17/2 Draft 1 "Guidelines for DNA-Profiling: Molecular marker selection and database construction ('BMT Guidelines')" (see document BMT/17/25 "Report", paragraphs 15 and 50).

Section A. Introduction

12. The BMT agreed to amend the first sentence of the text of the Introduction to read as follows:

> "The purpose of this document (BMT Guidelines) is to provide guidance on harmonized ~~for developing harmonized methodologies~~ principles for the use of DNA based markers with the aim of generating high quality molecular data for a range of applications."

Section B. General Principles

13. The BMT agreed to revise document UPOV/INF/17 on the basis of the joint comments from the European Union, France and the Netherlands.

Section 1. Selection of a Molecular Marker Methodology

14. The BMT agreed to delete Section 1.

Section 2. Selection of Molecular Markers

15. The BMT agreed to amend the title of Section 2 to read "1. Phase 1: Selection of Molecular Markers" and renumber the section accordingly.

Section 2.1 (a)

16. The BMT agreed that the text proposed by the European Union, France and the Netherlands should be abbreviated to refer only to the need to achieve a balance between the number of markers and the resolution or discriminative power according to the objective and taking into account the error-rate. It was agreed that the figure should be omitted.

Section 2.1 (c)

17. The BMT agreed to amend Section 2.1 (c) to read as follows:

> "Coverage of the genome and the linkage should reflect the objectives. Knowing the position of the selected markers on the genome (i.e. map position) is not essential but enables the selection of markers that may be linked together to be avoided."

New Section 1.1 (d)

18. The BMT agreed to add new Section 1.1 (d). The BMT also agreed that the European Union, France and the Netherlands should revise their proposal to list the possible sources without assessment of their suitability, because this would be influenced by the circumstances.

New Sections 1.1 (f) to (k)

19. The BMT agreed to add new Sections 1.1 (f) to (k) and to move new Section 1.1 (h) “Avoidance of linkage disequilibrium” next to new Section 1.1 (c).

Section 2.2 Criteria for specific types of molecular markers

20. The BMT agreed to delete the Section 2.2.

New Sections 1.2 and 1.3

21. The BMT agreed not to include new Sections 1.2 and 1.3 proposed by the European Union, France and the Netherlands.

New Section 2

22. The BMT agreed to add a new Section 2 “Phase 2: Selection of the Detection Method” without the following text “As a prerequisite, whatever the source of material, the method for sampling and DNA extraction should be standardized and documented”.

New Section 2.1

23. The BMT agreed to add a new Section 2.1 “Genotyping methods - general criteria” with the following subsection 2.1.1. With regards to the subsection 2.1.1, the BMT agreed to avoid classifying the criteria as “Mandatory criteria” or “Optional criteria” and to delete “(e) Applicable for both diploid species and polyploidy species”. The BMT also agreed to include a new item “sustainability of databases” to subsection 2.1.1. The BMT agreed not to include a new subsection 2.1.2, concerning improvements in technology.

New Section 2.2

24. The BMT agreed that the European Union, France and the Netherlands should combine the proposed elements in new Section 2.1.

Section 3. Access to the Technology

25. The BMT agreed to renumber Section 3 to Section 2.3.

New Section 2.4

26. The BMT agreed that the European Union, France and the Netherlands should shorten the proposed text and present it in a preamble at the beginning of the document.

Section 4. Material to be Analyzed

27. The BMT agreed to move current texts and subsections in Section 4 to a new Section 5.2 “Requirements of the plant material”.

Section 4.4

28. The BMT agreed with the text proposed by the European Union, France and the Netherlands in Section 4.4, except that the third sentence should be replaced by a reference to document TGP/5: Section 1 concerning transfer of material.

Section 5. Standardization of Analytical Protocols

29. The BMT agreed to delete current Section 5 and replace with a new Section 4 “Phase 4: Harmonization and Validation of the Marker Set and Method”.

Section 5.1

30. The BMT agreed to delete current Section 5.1 and replace with a new Section 4.1 “Harmonisation and validation – general criteria”. The BMT also agreed that the European Union, France and the Netherlands should revise proposed texts under the new Section 4.1 to clarify that usage of validated methods will lead to harmonized results.

Section 5.2

31. The BMT agreed to delete current Section 5.2 and replace with a new Section 4.2 “Performance criteria”. With regards to the proposed texts under the new Section 4.1, the BMT agreed to list the criteria without the additional explanatory information.

Section 5.3

32. The BMT agreed to delete current Section 5.3 and replace with a new Section 3 “Phase 3: Evaluation of the Selected Marker Set and Detection Method (fit for purpose validation of the marker set and technological validation of the method)”. With regards to the proposed subsection 3.1.1 under the new Section 3, the BMT agreed that the European Union, France and the Netherlands should revise the texts in order to explain the need to use a suitable set of varieties to develop marker sets and a further set of varieties to evaluate the marker set. With regards to the proposed subsection 3.1.2, the BMT agreed that the European Union, France and the Netherlands should review the text.

New Section 4.3

33. The BMT agreed to add a new section 4.3 “Consistence criteria - harmonization of markers and methods in different laboratories Performance criteria”. The BMT also agreed that the European Union, France and the Netherlands should review this new section in order to avoid duplication with previous sections.

Section 6. Databases

34. The BMT agreed to introduce a new Section 6. “Data exchange” after Section 5 “Databases”. With regards to the texts proposed by the European Union, France and the Netherlands, the BMT agreed that the European Union, France and the Netherlands should remove the wording “shared databases” from their revised proposal on databases and should provide the full names for “VCF” and “BCF” in the list of acronyms.

New Section 5.3

35. The BMT agreed that the European Union, France and the Netherlands should avoid a recommendation for “open-source tools” in Section 5.3 (d), replace the word “cultivar” with “variety” and provide the meaning of “bam” and “CRAM” in the list of acronyms.

Section 6.1

36. The BMT agreed to renumber Section 6.1. as new Section 5.4. With the proposed text, the BMT agreed that the European Union, France and the Netherlands should delete the link to the standard and review whether it should be indicated as a preferred method.

Section 6.2

37. The BMT agreed to renumber Section 6.2. as Section 5.5 and to add the following sentences to the end of the current texts “For variants obtained from sequencing data, storing VCF files in a relational or no SQL

database is recommended. In this case, each database record for a variant has a defined genome version, chromosome, position, reference allele".

Section 6.3

38. The BMT agreed to renumber Section 6.3. as Section 5.6.

Section 6.3.1 (b)

39. The BMT agreed to amend the title of Section 6.3.1 (b) to read "Reference genome position / Locus code:" with the following texts "Preferably, a genome assembly version, chromosome and position should be provided if a reference genome is available for the species concerned, e.g. SL2.50ch05:63309763 for tomato *Solanum lycopersicum* assembly version 2.50 on chromosome 5 position 63309763. If no reference genome is available or the location is unknown, a name or code of the locus for the species concerned can be used, e.g. gwm 149, A2, etc."

Section 6.3.1 (c)

40. The BMT agreed to amend the title of Section 6.3.1 (c) to read "Genotype" with the following texts "For SNP genotypes, the allele composition of the SNP or MNP should be given, e.g. A/T or A/A. For other techniques, genotype indicates the name or code of the allele of a given locus for the species concerned, e.g. 1, 123, etc." The BMT agreed that the European Union, France and the Netherlands should provide the meaning of "MNP" in the list of acronyms.

Section 6.3.1 (d)

41. The BMT agreed to amend the title of Section (d) to read "Allele depths / Data value:" with the following texts "For SNPs obtained from next generation sequencing data this should indicate the depth of coverage for alleles e.g. 10/20 for an A/T allele in which the A is covered by 10 reads and the T by 20. Otherwise, indicates a data value for a given sample on a given locus-allele, e.g. 0 (absence), 1 (presence), 0.25 (frequency) etc.".

New section 6. "Phase 4: Database Management"

42. The BMT agreed not to include the proposal to add the new Section 6.

Section 7. Summary

43. The BMT agreed that the summary would need to be revised in accordance with the changes to the structure and content of the document.

New section C "DEFINITIONS"

44. The BMT agreed not to add a new section C "DEFINITIONS".

GLOSSARY

45. The BMT agreed that the glossary should become a list of acronyms providing the meanings of abbreviations but should not provide explanations of any terms.

46. The BMT agreed to propose to the TC that the European Union, France, Netherlands to prepare a new draft of INF/17 for consideration of the eighteenth session of the BMT.

Cooperation between international organizations

47. The background to this matter is provided in document TWP/2/7 Rev. “Molecular Techniques”, paragraph 26 to 31.

48. The BMT, at its seventeenth session, considered document BMT/17/3 “Cooperation between International Organizations” (see document BMT/17/25 “Report”, paragraphs 54 and 55).

49. The BMT noted that International Seed Testing Association (ISTA) was not in a position to agree to the proposed joint activities with UPOV and Organization for Economic Co-operation and Development (OECD) at that time and agreed to propose to the TC that UPOV and OECD should make progress on the matters previously agreed by the TC, namely:

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

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

(c) the 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.

50. The BMT agreed that ISTA should be welcomed to join the above initiatives as and when it was in a position to do so.

Proposal to revise document TGP/15 “Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)”

Revision of the model “Combining phenotypic and molecular distances in the management of variety collections”

51. The background to this matter is provided in document TWP/2/7 Rev. “Molecular Techniques”, paragraph 12 to 15.

52. Developments concerning this matter at the forty-seventh session of the Technical Working Party for Agricultural Crops (TWA), held in Naivasha, Kenya, from May 21 to 25, 2018, are reported in document TC/54/23 “Revision of document TGP/15”, paragraphs 9 to 15.

53. The BMT, at its seventeenth session, considered documents BMT/17/7 “Revision of document TGP/15 ‘Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)’” and TGP/15/2 Draft 1. Document BMT/17/7 contained a revised proposal from France for the revision of document TGP/15, Section 2.2, in response to the comments made by the TWA at its forty-seventh session.

54. The BMT considered the revision of the example of parent lines in maize prepared by the experts from France. The BMT noted that the establishment of an additional threshold for genetic distance below GAIA distance 2 had not been implemented in France at that time. The BMT noted that the nature of document TGP/15 was to present examples of the use of molecular markers in DUS examination among UPOV members. The BMT agreed to recommend that the example in document TGP/15, Section 2.2, be revised at a later stage once the additional threshold level had been implemented in France (see document BMT/17/25 “Report”, paragraph 58).

Proposal for inclusion of a new model "Genetic selection of similar varieties for the first growing cycle"

55. The background to this matter is provided in document TWP/2/7 Rev. "Molecular Techniques", paragraph 16 to 19.

56. The BMT, at its seventeenth session, considered documents BMT/17/7 "Revision of document TGP/15 'Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)'" and TGP/15/2 Draft 1.

57. The BMT considered the new application model "Genetic Selection of Similar Varieties for the First Growing Cycle" and agreed that it should be proposed for inclusion in document TGP/15 on the basis of a simplified version of draft text presented in document TGP/15/2 draft 1. The BMT agreed that the proposal to be put forward for approval by the TC should contain the description of the method without comparison to other approaches. The BMT also agreed to invite the Netherlands to review whether the schematic explaining the process was necessary and/or might be simplified (see document BMT/17/25 "Report", paragraph 59).

The use of molecular techniques in variety identification

58. The BMT, at its seventeenth session, considered document BMT/17/18 "Variety identification in soybeans using SNPs" and received a presentation by Mr. Barry K. Nelson (Corteva™ Agriscience), a copy of which was provided as document BMT/17/18 Add. (see document BMT/17/25 "Report", paragraphs 65 and 66).

59. The BMT welcomed the offer from Mr. Nelson (Corteva™ Agriscience) to explore the possibility to make a software tool for marker selection using the traveling salesman algorithm available to others for further development. It was agreed that any experts wishing to explore that with Mr. Nelson would contact him directly and that he would be invited to report on developments to the BMT at its eighteenth session.

Session to facilitate cooperation in relation to the use of molecular techniques

60. The background to this matter is provided in document TWP/2/7 Rev. "Molecular Techniques", paragraph 32 to 37.

61. The BMT, at its seventeenth session, considered document BMT/17/5 "Session to facilitate cooperation in relation to the use of molecular techniques" (see document BMT/17/25 "Report", paragraphs 68 to 78).

62. Discussion groups were formed for: maize and soybeans; other agricultural crops; fruit crops and forest trees; ornamental plants; and vegetables, for BMT participants to exchange information on their work and explore areas for cooperation.

63. The BMT was informed of the following outcomes of the discussions:

Maize and Soybean

Summary of crop interest

Maize	United States of America
Soybean	Argentina, Brazil, Canada, United States of America, CropLife

Plans for cooperation

- Argentina to consult whether the selected subset of markers from the 6K Illumina chip could be shared with Brazil and United States of America. In case possible, United States of America would test the discriminating power of the subset on a different variety collection. Argentina and United States of America would also consider establishing a common subset of markers suitable for different technologies (e.g. Genotyping by Sequencing).
- United States of America breeders to coordinate with Brazilian breeders to formulate a proposal to be presented to the Brazilian Plant Variety Protection Office (SNPC) for a study on the use of molecular markers in DUS examination for soybeans (e.g. similar to the study conducted in Argentina).
- CropLife to collaborate with the initiative from the United States of America for the establishment of marker sets and methods to support DUS examination.

Proposals for UPOV initiatives

64. The coordination group on maize and soybeans agreed that the UPOV Office should follow up with participants on the possible test of discriminating power of the subset of molecular markers selected by Argentina and the possible establishment of a common subset of markers suitable for different technologies.

Other agricultural crops

Summary of crop interest

Barley	Canada, Czech Republic, France, Germany, United Kingdom
Cotton	Brazil
Durum wheat	Italy, European Union
Hemp	Netherlands
Lucerne	France
Oats	Canada
Oilseed Rape	Canada, France, Germany, United Kingdom, Corteva
Potato	Canada, European Union, Finland, Germany, Netherlands, United Kingdom
Rice	Japan, Republic of Korea
Ryegrass	Belgium, Netherlands, United Kingdom
Sorghum	France
Sunflower	France
Wheat	Canada, Czech Republic, Estonia, France, Italy, United Kingdom, Corteva

Plans for cooperation

- Potato: Canada and the Republic of Korea to approach the partners in the European Potato Database to discuss their possible involvement in the database.
- Rice: Japan and the Republic of Korea to discuss cooperation between China, Japan and the Republic of Korea in the East Asia Plant Variety Protection Forum.
- Ryegrass: Belgium, Czech Republic and the Netherlands to share information on their work and plans.

Proposals for UPOV initiatives

65. The coordination group on other agricultural crops agreed that it would be useful to introduce an item at the eighteenth session of the BMT for participants to provide information on how they managed cooperation between partners and service providers, including confidentiality, access to data and material, authorization for work to be performed and availability of results and information to partners.

Vegetables

Summary of crop interest

Cabbage	Republic of Korea
Chinese cabbage	China, Republic of Korea
Cucumber	Netherlands, Republic of Korea, BASF
Eggplant	Italy
French bean	Netherlands
Lettuce	Australia, Canada, Netherlands, Republic of Korea, BASF, Croplife International, Sakata Seed Sudamerica
Melon	China, Netherlands, Republic of Korea, BASF, Sakata Seed Sudamerica
Onion	Italy, Netherlands, BASF
Oriental melon	Republic of Korea
Pea	Netherlands, United Kingdom
Pepper	China, Italy, Netherlands, Republic of Korea, BASF, Croplife International, Sakata Seed Sudamerica
Pumpkin	Republic of Korea, Sakata Seed Sudamerica
Radish	Republic of Korea, BASF
Shallot	Netherlands
Squash	Italy, Sakata Seed Sudamerica
Tomato	China, Italy, Netherlands, Republic of Korea, BASF, Croplife International, Sakata Seed Sudamerica
Water melon	China, Italy, Republic of Korea, BASF, Croplife International

Proposals for UPOV initiatives

66. The coordination group on vegetable crops agreed that it would be useful to introduce an item at the BMT, inviting breeders, lawyers and policy makers to discuss ownership matters, and establish criteria to make possible for exchanging materials and DNA information among UPOV members.

Fruit crops and forest trees

Summary of crop interest

Apple	Canada, European Union, France, Netherlands, Republic of Korea, CIOPORA
Apricot	France
Blueberry	Netherlands, Republic of Korea, United Kingdom
Cherry	France
Citrus	CIOPORA
Elm (Ulmus)	Netherlands
Fraxinus	Netherlands
Japanese Plum	France
Peach	France, Republic of Korea
Pear	France
Raspberry	Netherlands, United Kingdom
Strawberry	China, France, Netherlands

Proposals for UPOV initiatives

67. The coordination group on fruit crops and forest trees agreed the importance of ownership matters in order to facilitate international cooperation in relation to the use of molecular techniques.

Ornamental plants

Summary of crop interest

Chrysanthemum	Netherlands
Gypsophila	Netherlands
Helleborus	Netherlands
Hydrangea	France
Lilium	Netherlands
Phalaenopsis	Netherlands
Rose	China, Netherlands, CIOPORA
Tree Peony	China

Plans for cooperation

- Rose: After finalizing cooperation between the Netherlands and CIOPORA, China could explore the possibility to cooperate on validating between labs.

Proposals for UPOV initiatives

68. The coordination group on ornamental plants, at its second round, agreed that it would be useful to organize sessions to share experiences on how to overcome the ownership matters in order to facilitate international cooperation in relation to the use of molecular techniques.

69. The coordination group on ornamental plants agreed that it would be useful to establish common databases to facilitate international cooperation in relation to the use of molecular techniques.

70. Taking into account the reports of the cooperation sessions, the BMT noted the common interest to address issues concerning cooperation between partners and service providers, including confidentiality, access to data and material, authorization for work to be performed and availability of results and information to partners and agreed to add this as an agenda item for it eighteenth session in order for experts, including breeders, to present information on their experiences (see proposed agenda item 8 “Management of databases and exchange of data and material” for the eighteenth session of the BMT).

71. The BMT agreed to propose to the TC that the results of the coordination session in the BMT be reported to the other Technical Working Parties (TWPs) and that the TWPs be invited to undertake a similar session to build on the BMT outcomes and feed into the future work of the BMT. The BMT agreed that the information on crop interest by participants at the sixteenth session of the BMT should be added to the above in the document to be prepared for the TWPs and the eighteenth session of the BMT.

Future program

Date and place of next session

72. The BMT welcomed the invitation of China to hold its eighteenth session in Hangzhou, China, from October 16 to 18, 2019, back-to-back with the Technical Working Party on Automation and Computer Programs (TWC) session in order to facilitate the discussions on areas of mutual interests, with the elements of the preparatory workshop included in the session (see document BMT/17/25 “Report”, paragraph 79).

Program for the eighteenth session

73. During its eighteenth session, the BMT planned to discuss the following items (see document BMT/17/25, paragraph 80):

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. Management of databases and exchange of data and material[2] (papers invited)
9. Methods for analysis of molecular data (papers invited)
10. Report on developments of a software tool for marker selection using the traveling salesman algorithm
11. The use of molecular techniques in examining essential derivation[2] (papers invited)
12. The use of molecular techniques in variety identification[2] (papers invited)
13. Review of document UPOV/INF/17 “Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction
14. Revision of document TGP/15 “Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)”
15. Session to facilitate cooperation
16. Date and place of next session
17. Future program

[2] Breeders’ Day

18. Report of the session (if time permits)

19. Closing of the session

74. The TWPs are invited to note:

(a) the report on developments in the TWPs and BMT, as set out paragraphs 7 to 72 of this document; and

(b) the draft agenda for the BMT at its eighteenth session, as set out in paragraph 73 of this document.

DEVELOPMENTS AT THE FIFTY-FOURTH SESSION OF THE TECHNICAL COMMITTEE

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

75. The TC, at its fifty-fourth session, held in Geneva, on October 29 and 30, 2018, agreed with the proposal by the BMT at its seventeenth session for the European Union, France and the Netherlands to prepare a new draft of document UPOV/INF/17 for consideration at the eighteenth session of the BMT (see document TC/54/31 “Report”, paragraph 264).

76. The TWPs are invited to note that the European Union, France and the Netherlands will be invited to prepare a new draft of document UPOV/INF/17 for consideration at the eighteenth session of the BMT, as set out in paragraph 75 of this document.

Cooperation between international organizations

77. The TC agreed that UPOV and OECD should make progress on the matters previously agreed by the TC (see document TC/54/31 “Report”, paragraphs 267 to 271), namely:

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

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

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

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

79. With regard to the matter set out in paragraph 77(a) above, the TC agreed to request the BMT to develop a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA. In that regard, the Office of the Union will prepare a draft for consideration by the BMT, at its eighteenth session, on the basis of relevant elements from the World Seed Partnership and the frequently asked question on the use of molecular techniques in the examination of DUS.

80. With regard to the matter set out in paragraph 77(b) above, the TC agreed to invite the BMT and the TWPs to develop an inventory on the use of molecular marker techniques, by crop, with a view to developing a joint OECD/UPOV/ISTA document containing that information, in a similar format to document UPOV/INF/16 “Exchangeable Software”.

81. The TWPs may wish to consider the following elements for the inventory on the use of molecular marker techniques, by crop, which have been developed in consultation with the OECD:

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

82. On the basis of the comments received from the TWPs and BMT, proposed elements for the inventory on the use of molecular marker techniques, will be presented for consideration by the TC at its fifty-fifth session, to be held in Geneva on October 28 and 29, 2019.

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

84. With regard to the matter set out in paragraph 77(c) above, the BMT, at its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC at its fifty-fifth session.

85. The TC noted the information provided by the representative of OECD that a joint ISTA/UPOV/OECD workshop was anticipated to be organized in conjunction with the ISTA Seed Congress to be held in India in 2019.

86. The TWPs are invited to:

(a) note that UPOV and OECD may make progress on the matters previously agreed by the TC, as set out in paragraph 77 of this document;

(b) note that ISTA will be invited to join the initiatives set out in paragraph 77 of this document, when in a position to do so, as;

(c) note that the Office of the Union will prepare a draft of a joint document explaining the principal features of the systems of the OECD, UPOV and ISTA, for consideration by the BMT, at its eighteenth session, on the basis of relevant texts from the World Seed Partnership and the frequently asked question on the use of molecular techniques in the examination of DUS, as set out in paragraph 79 of this document.

(d) consider elements for the inventory on the use of molecular marker techniques, by crop, proposed by the Office of the Union, as set out in paragraph 81 of this document;

(e) note that, on the basis of the comments received from the TWPs and BMT, proposed elements for the inventory on the use of molecular marker techniques, will be presented for consideration by the TC at its fifty-fifth session, as set out in paragraph 82 of this document;

(f) note that, subject to agreement by the TC at its fifty-fifth session, a circular will be issued to request the member of the Union to complete the survey as a basis to develop the inventory on the use of molecular marker techniques, by crop, after coordination with the OECD Seed Schemes Bureau, as set out in paragraph 83 of this document; and

(g) note that the BMT its eighteenth session, will be invited to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC at its fifty-fifth session, as set out in paragraph 84 of this document.

Revision of document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)"

Revision of the model "Combining phenotypic and molecular distances in the management of variety collections"

87. The TC, at its fifty-fourth session, agreed with the BMT that the Model "Combining Phenotypic and Molecular Distances in the Management of Variety Collections" of document TGP/15, Section 2.2, should be revised at a later stage once an additional threshold level has been implemented in France (see document TC/54/31 "Report", paragraph 289).

88. The TWPs are invited to note that the Model "Combining Phenotypic and Molecular Distances in the Management of Variety Collections" of document TGP/15, Section 2.2, will be revised at a later stage once an additional threshold level has been implemented in France, as set out in paragraph 87 of this document.

Proposal for inclusion of a new model "genetic selection of similar varieties for the first growing cycle"

89. The TC, at its fifty-fourth session, agreed with the inclusion of a new model "Genetic selection of similar varieties for the first growing cycle: example French Bean" in document TGP/15 on the basis of the proposal by the Netherlands revised by the Enlarged Editorial Committee (TC-EDC), as presented in Annex II to this document (see document TC/54/31, paragraph 291).

90. A draft of document TGP/15/2 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" incorporating the new model "Genetic selection of similar varieties for the first growing cycle: example French Bean" will be presented to the seventy-sixth session of the Administrative and Legal Committee (CAJ), to be held on October 30, 2019.

91. Subject to agreement by the CAJ at its seventy-sixth session, a draft of document TGP/15/2 will be presented for adoption by the Council, at its fifty-third ordinary session, to be held in Geneva on November 1, 2019.

92. The TWPs are invited to note that:

(a) the TC agreed with the inclusion of a new model "Genetic selection of similar varieties for the first growing cycle: example French Bean" in document TGP/15, as presented in Annex II to this document; and

(b) a draft of document TGP/15/2 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" incorporating the new model will be presented to the seventy-sixth session of the CAJ, to be held on October 30, 2019, and if agreed by the CAJ, a draft of document TGP/15/2 will be presented for adoption by the Council at its fifty-third ordinary session, to be held on November 1, 2019, on that basis.

Report of work on molecular techniques in relation to DUS examination

93. The TC agreed that the following text from document UPOV/INF/18/1 "Possible use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" should be introduced in document TGP/15 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic (see document TC/54/31 "Report", paragraphs 272, 273 and 275):

> "3.1.4 In considering the model and example, as presented in Annex 1 of this document, the TC emphasized the importance of meeting the assumptions. In that regard, it clarified that it is a matter for the relevant authority to consider if the assumptions are met (see document TC/45/16 "Report", paragraph 152)."

94. The TC considered the proposal by the BMT and agreed to include an explanation in document TGP/15 that it would be the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic was satisfied in order to include a method in the Test Guidelines.

95. The TC agreed with the proposal by the BMT that a new example be added to document TGP/15 to illustrate a situation where the characteristic-specific marker did not provide complete information on the state of expression of a characteristic, on the basis of the proposal by the Netherlands presented in document BMT/17/21 "Do resistance markers for tomato fulfil the requirements of TGP/15". The TC agreed to invite the experts from the Netherlands to prepare a proposal to be presented to the TWPs and BMT and agreed that the resultant proposal should be presented to the TC, at its fifty-fifth session. Developments concerning this proposal are presented in document TWP/3/12 "Characteristic-specific markers with incomplete information on state of expression".

96. The TWPs are invited to note that:

(a) the text from document UPOV/INF/18/1 will be introduced in document TGP/15 to clarify that it was the responsibility of the authority to decide on the reliability of the link between the gene and the expression of the characteristic, as set out in paragraph 93 of this document;

(b) document TGP/15 will include an explanation that it is the responsibility of the respective TWP and the TC to assess whether the reliability of the link between the gene and the expression of the characteristic is satisfied in order to include a method in the Test Guidelines, as set out in paragraph 94 of this document; and

(c) matters concerning characteristic-specific markers with incomplete information on state of expression are considered in document TWP/3/12.

Session to facilitate cooperation in relation to the use of molecular techniques

97. The TC, at its fifty-fourth session, agreed that the results of the coordination session in the BMT, as set out in paragraphs 62 to 71 of this document, be reported to the other TWPs. The TC agreed to invite the TWPs to undertake a similar session to build on the BMT outcomes and feed into the future work of the BMT. The TC agreed that discussion groups should be formed for the main crops at each TWP to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation (see document TC/54/31 "Report", paragraph 281).

98. The TWPs are invited to:

(a) note the results of the coordination session at the seventeenth session of the BMT, as set out in paragraphs 62 to 71 of this document; and

(b) form discussion groups for the main crops at each TWP to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation, in order to build on the BMT outcomes and feed into the future work of the BMT, as set out in paragraph 97 of this document.

Future program

99. The TC, at its fifty-fourth session, agreed the draft agenda for the BMT at its eighteenth session, as set out in paragraph 73 of this document (see document TC/54/31 "Report", paragraphs 283 to 286).

100. The TC received the following proposal from the Chairpersons of the TWC and BMT for matters to be considered on Wednesday, October 16, 2019, in order to facilitate discussion and cooperation between the TWC and BMT. The TC noted that the TWC would meet on the morning of September 16 and the BMT would meet later that day and the items below would be considered at the TWC or BMT session as appropriate.

101. The TC agreed the following items for Wednesday, October 16, 2019:

Reports on developments in UPOV concerning biochemical and molecular techniques (document to be prepared by the Office of the Union)
Variety description databases (document to be prepared by the Office of the Union and documents invited)
Management of databases and exchange of data and material (papers invited)
Building a database with molecular marker information for the management of variety collections (documents invited)
Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction
Methods for analysis of molecular data (papers invited)
Exchange and use of software and equipment (document to be prepared by the Office of the Union and documents invited) - Report on developments of a software tool for marker selection using the traveling salesman algorithm
DNA markers as supporting information for DUS decisions in potatoes (document to be prepared by the Netherlands)
A single tool for DUS computation process (document to be prepared by France)

102. The TC noted that the exact timings for discussion of the items during that day would depend on the number of discussion papers received.

103. The TWPs are invited to note that the TC agreed the items for discussion on Wednesday, October 16, 2019, to facilitate discussion and cooperation between the TWC and BMT, as set out in paragraph 101 of this document.

[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

PROPOSAL AGREED BY THE TECHNICAL COMMITTEE (TC) TO AMEND DOCUMENT TGP/15/2 DRAFT 1 "GUIDANCE ON THE USE OF BIOCHEMICAL AND MOLECULAR MARKERS IN THE EXAMINATION OF DISTINCTNESS, UNIFORMITY AND STABILITY (DUS)" NEW MODEL: "GENETIC SELECTION OF SIMILAR VARIETIES FOR THE FIRST GROWING CYCLE"

Genetic Selection of Similar Varieties for the First Growing Cycle

The Technical Committee (TC), at its fifty-fourth session, held in Geneva on October 29 and 30, 2018 agreed to amend document TGP/15/2 Draft 1 "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" for the inclusion of a new model "Genetic selection of similar varieties for the first growing cycle", as follows:

New Section 2.3 "Genetic Selection of Similar Varieties for the First Growing Cycle"

2.3 Genetic Selection of Similar Varieties for the First Growing Cycle (see Annex III)

2.3.1 This approach involves a step to check for genetic similarity before the first growing cycle.

2.3.2 In cases where the minimum duration of tests is normally two growing cycles, a selection of similar varieties in the variety collection for comparison with candidate varieties in the first growing cycle is made according to genetic similarity. As a next step, the information provided by the applicant in the Technical Questionnaire (TQ) is used to see if some of the genetically similar varieties do not have to be compared in a growing trial because of differences in DUS characteristics.

2.3.3 On the basis of the variety description of DUS characteristics produced in the first growing cycle, a further search is made of varieties in the variety collection to identify any similar varieties that were not compared in the first growing cycle and which should be compared with the candidate variety in the second growing cycle.

2.3.4 Annex III to this document "Genetic Selection of Similar Varieties for the First Growing Cycle" provides an example of the genetic selection of similar varieties for the first growing cycle.

ANNEX III "MODEL: GENETIC SELECTION OF SIMILAR VARIETIES FOR THE FIRST GROWING CYCLE"

EXAMPLE: FRENCH BEAN

prepared by an expert from the Netherlands

1. Introduction

1.1 This approach involves a step to check for genetic similarity before the first growing cycle.

1.2 In cases where the minimum duration of tests is normally two growing cycles, a selection of similar varieties in the variety collection for comparison with candidate varieties in the first growing cycle is made according to genetic similarity. As a next step, the information provided by the applicant in the Technical Questionnaire (TQ) is used to see if some of the genetically similar varieties do not have to be compared in a growing trial because of differences in DUS characteristics.

1.3 On the basis of the variety description of DUS characteristics produced in the first growing cycle, a further search is made of varieties in the variety collection to identify any similar varieties that were not compared in the first growing cycle and which should be compared with the candidate variety in the second growing cycle.

2. Procedure

Determine genetic similarity

2.1 The DNA-profile of the candidate variety is produced as soon as plant material is received.

2.2 The DNA-profile is compared with the profiles of all varieties in the variety collection and genetically similar varieties are identified.

Technical Questionnaire information

2.3 The information provided by the applicant in the Technical Questionnaire (TQ) is then used to see if there are clear differences in DUS characteristics from some of the genetically similar varieties so that they do not need to be compared with candidate varieties in a growing trial.

Field trial

First growing cycle:

2.4 The candidate and the genetically similar varieties selected by the procedure above are grown in the same field trial. A complete description of the DUS characteristics of the candidate variety is produced and is compared to the descriptions of all varieties in the variety collection using a database containing descriptions produced at the same location in previous years.

2.5 Possible outcomes:

If the candidate variety is not distinct from the genetically similar varieties on the basis of DUS characteristics, the test will be continued for another growing cycle.

In any case, the description of the candidate variety produced in the first growing cycle is compared to the descriptions of the varieties in the variety collection using a database containing descriptions produced at the same location.

(a) If the candidate variety is found to be distinct from all varieties grown in the first growing cycle and to all other varieties in the variety collection at the end of the first growing cycle and it fulfills the uniformity and stability requirements the DUS test may be concluded after the first growing cycle.

(b) In all other cases a second growing cycle is performed.

Second growing cycle

2.6 In the second growing cycle, the candidate variety is grown with the all varieties in the variety collection from which it was not found to be distinct at the end of the first growing cycle.

2.7 At the end of the second growing cycle, an assessment of DUS is made. If it is not possible to reach a decision on DUS at the end of the second growing cycle, a further growing cycle may be conducted.

[End of Annex II and of document]