

**Working Group on Biochemical and Molecular Techniques
and DNA-Profiling in Particular**

BMT/19/10

**Nineteenth Session
Alexandria, United States of America, September 23 to 25, 2020**

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SESSION TO FACILITATE COOPERATION

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EXECUTIVE SUMMARY

1. The purpose of this document is to recall the outcomes of discussion groups formed in 2019 to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation.

2. The BMT is invited to note:

(a) that the TWPs and BMT, at their sessions in 2019, formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation;

(b) the outcomes of discussions at the TWPs and BMT on facilitating cooperation in relation to the use of molecular techniques, as presented in the Annex to this document; and

(c) that participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation.

3. The following abbreviations are used in this document:

- BMT: Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular
- ISTA: International Seed Testing Association
- OECD: Organization for Economic Co-operation and Development
- TC: Technical Committee
- TWA: Technical Working Party for Agricultural Crops
- TWC: Technical Working Party on Automation and Computer Programs
- TWF: Technical Working Party on Fruit Crops
- TWO: Technical Working Party on Ornamental Plants and Forest Trees
- TWPs: Technical Working Parties
- TWV: Technical Working Party for Vegetables

4. The structure of this document is as follows:

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ANNEX SESSION TO FACILITATE COOPERATION IN RELATION TO THE USE OF MOLECULAR TECHNIQUES

BACKGROUND

5. The background to this matter is provided in document BMT/18/5.
6. At their sessions in 2019, the TWO, TWV, TWF, TWA and TWC considered document TWP/3/7 "Molecular Techniques". Each TWP undertook a coordination session to build on the outcomes from the seventeenth session of the BMT and feed into the work of the eighteenth session of the BMT. Discussion groups were 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 documents TWO/51/12 "Report", paragraphs 52 and 53, TWV/53/14 "Report", paragraph 57, TWF/50/13 "Report", paragraph 75, TWA/48/9 "Report", paragraphs 72 and 73, and TWC/37/12 "Report", paragraphs 73 and 92)..
7. The BMT, at its eighteenth session, considered document BMT/18/5 "Session to facilitate cooperation" and formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation (see document BMT/18/21 "Report", paragraphs 38 and 41).
8. The outcomes of discussions held at the TWPs and BMT, at their sessions in 2019, are reproduced in the Annex to this document

Consideration by the Technical Committee

9. The TC, at its fifty-fifth session¹, noted that, at their sessions in 2019, the TWPs and the BMT had formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation. The TC noted the outcomes of discussions at the TWPs, as reproduced in the Annex to this document, which had been reported to the BMT, at its eighteenth session (see document TC/55/25 "Report", paragraph 192).

NEXT STEPS

10. Participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation on the basis of a poll to be conducted during the BMT session.

11. *The BMT is invited to note:*

(a) that the TWPs and BMT, at their sessions in 2019, formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation;

(b) the outcomes of discussions at the TWPs and BMT on facilitating cooperation in relation to the use of molecular techniques, as presented in the Annex to this document; and

(c) that participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation.

[Annex follows]

¹ Held in Geneva on October 28 and 29, 2020

2019 SESSION TO FACILITATE COOPERATION IN RELATION TO THE USE OF MOLECULAR
TECHNIQUES

Technical Working Party for Ornamental Plants and Forest Trees

12. The following information was provided by TWO participants (see document TWO/51/12 "Report", paragraphs 52 and 53):

Australia	<ul style="list-style-type: none"> • DNA information may be used in some cases of infringement action; • currently considering constituting DNA collection for native species
China	<ul style="list-style-type: none"> • crop interest: forestry sector and woody ornamentals, <i>Fraxinus</i> in particular; • currently developing databases with DNA information for Rose, Poplar and Tree Peony
European Union:	<ul style="list-style-type: none"> • applicants for new varieties of Rose can request for a fee to have a DNA sample extracted and stored; similar procedure for fruit crops under consideration
France	<ul style="list-style-type: none"> • crop interest: Hydrangea; • currently testing a set of molecular markers for Hydrangea varieties
Netherlands	<ul style="list-style-type: none"> • crop interest: <i>Chrysanthemum</i>, <i>Gypsophila</i>, <i>Helleborus</i>, <i>Lilium</i>, <i>Phalaenopsis</i> and Rose; • currently building a DNA database for <i>Fraxinus</i> and <i>Ulmus</i>; • DNA information used for varietal identity; • possible future development of databases with DNA information for ornamental plants

The TWO agreed that possible UPOV initiatives could include the development of guidance on collecting DNA samples, ownership of material collected and how to facilitate the use of material or information.

Technical Working Party for Vegetables

Following subgroup discussions, the following information was provided by TWV participants (see document TWV/53/14 "Report", paragraph 57):

Summary of crops and authorities currently using (or under development) biochemical and molecular techniques in the vegetable sector

Tomato	China, European Union, (France), (Italy), Netherlands, Republic of Korea
Pepper	China, (France), Republic of Korea
Watermelon	Republic of Korea
Melon	(France), Republic of Korea
Lettuce	France, (Italy), Japan, (Netherlands), Republic of Korea
Cabbage	European Union, Netherlands, Republic of Korea
Mushroom	Japan
French bean	Netherlands
Pea	(Netherlands), (United Kingdom)
Onion	Netherlands
Eggplant	(China)

Summary of current use of biochemical and molecular techniques in the vegetable sector

Use:
Management of reference collections
Selection of similar varieties/ grouping characteristics
Variety identification
Enforcement of IP Rights/ infringement
Check specific characteristics (e.g. male sterility, disease resistance: as replacement or addition to bioassay)
Techniques:
SSRs
SNPs
Electrophoresis (Isoenzyme)

Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the vegetable sector

Encourage sharing of data & techniques
Facilitate cooperation & training
Encourage exchange of DNA/market set (no living organisms) and seeds
Ensuring consistency among UPOV members in the use of BMT
Identify focal point for molecular techniques in DUS examination for each UPOV member and make this information available via the UPOV website
Develop guidance on collecting DNA samples, ownership of material exchanges (confidentiality)
Update guidance on how to use information and exchange DNA material
Explore the possibility to build a "UPOV" DNA database, "UPOV" marker set
Develop guidance and/or training for specialized courts/ experts
Set up comparative trials (e.g. Harmores project)
Encourage and promote the work of the BMT as platform to improve cooperation and encourage participation from members
Encourage and improve cooperation with breeders and their representatives

Technical Working Party for Fruit Crops

Following subgroup discussions, the following information was provided by TWF participants (see document TWF/50/13 "Report", paragraph 75):

Summary of crops and authorities currently using biochemical and molecular techniques in the fruit sector

Czech Republic	Grapevine
France	Apple, Peach, Pear, Sweet Cherry, Apricot, Japanese Plum
Germany	Pear, Apple, Strawberry, Sweet Cherry, Sour Cherry
Republic of Korea	Apple, Grapevine, Peach, Pear, Strawberry
Morocco	Citrus, Date Palm
Italy	Grapevine
Hungary	Grapevine, Peach, Cherry, Sour Cherry, Apricot, Plum,
Spain	Almond, Apricot, Avocado, Banana, Cherimoya, Citrus, Fig tree Grapevine, Hazelnut Mango, Peach, Pear, Pineapple, Strawberry, Sweet Cherry, Walnut,
Japan	Apple, Citrus, Pineapple, Japanese Pear, Sweet Cherry, Strawberry, Grapevine

Summary of current use of biochemical and molecular techniques in the fruit sector

Use:
Management and description of variety collections
Genetic distance and molecular profiling
Uniformity assessment
Research purposes
Enforcement
Identification of varieties for certification scheme purposes.
Techniques:
SSR
SNPs

Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the fruit sector

Develop and share common databases (identifying a leading country and coordinator)
Sharing techniques
Harmonize projects/markers/methods/procedures
Exchange of knowledge and techniques
Encourage crop experts to attend BMT meetings

Technical Working Party for Agricultural Crops

The following information was provided by TWA participants (see document TWA/48/9 "Report", paragraphs 72 and 73):

Summary of crop and authorities currently using (or under development) molecular techniques in the agricultural sector

Argentina	Soya Bean, Cotton, Rice, Wheat, Barley
Australia	Sugarcane, Wheat, Cotton
Brazil	Soya Bean
Canada	Potato
China	Maize, Wheat, Cotton, Rape Seed, Sunflower, Potato, Sorghum, Rice, Soya Bean
Czech Republic	Maize, Wheat, Barley
Dominican Republic	Rice, Sugarcane, Cacao
European Union	Potato, Maize, Rape Seed
Germany	Potato, Maize, Rape Seed
Italy	Soya Bean, Rice, Khorasan Wheat
Japan	French bean, Adzuki Bean, Tea, Sunflower, Maize, Potato
Kenya	Tea, Tomato, Maize
Republic of Korea	30 crops
Slovakia	Potato
United Kingdom	Potato, Rape Seed
United States of America	Maize, Soya Bean
Uruguay	Soya Bean, Maize, Wheat

Summary of current use of molecular techniques in the agricultural sector

Techniques:
CAPS (JP)
Elisa (IT, UY)
MNP (CN)
PCR (IT, KE, UY)
QPCR (UY)
RAPID STS (JP)
SNP (AR, AU, CN, DE, GB, IT, JP, KR, QZ, US, UY)
SSR (BR, CN, CZ, DK*, GB, IT, JP, KR, QZ, SK) *sporadic use
Use:
DUS examination, incl. selection of similar varieties and management of variety collections (CN, CZ, KR, QZ)
complementary tool for uniformity (AR, IT)
databases for Potato (CA, DE, GB, NL, QZ, SK)
database for Maize, Rape Seed (QZ)
sample authentication (GB)
variety purity in certified seeds (IT, KR)
GMO detection (AR, IT, KR, UY)
Bt gene detection (AU)
virus assessment (KR)
variety identification (AR, BR, CN, DK, IT, UY)
market control of seed trade (UY)
enforcement (AR, JP)

Summary of possible areas of cooperation for the use of molecular techniques in the agricultural sector

International collaboration for the constitution of common databases
Addressing practical aspects such as access rights, financial issues, incl. benefit sharing and material transfer agreements
Provision of training to UPOV members on the use of BMTs in DUS examination
Sharing sets of markers and protocols to reduce size of variety collections
Cooperation on testing varieties with similar genetic background
Addressing confidentiality issues

Technical Working Party on Automation and Computer Programs

The following information was provided by TWC participants (see document TWC/37/12 "Report", paragraphs 73 and 92):

Summary of crop and authorities currently using biochemical and molecular techniques

Argentina	Soybean
Brazil	<i>Eucalyptus</i> , Soybean
China	Broccoli, Cauliflower, Chinese cabbage, Eggplant, Lettuce, Maize, Pepper, Rice, Rose, Sorghum, Strawberry, Walnut, Wheat, Fruit trees, Ornamentals, Soybean, Cotton, and other 29 crops
Denmark	Barley, Oats, Rye, Wheat, Forage grasses
European Union	Lettuce, Maize, Potato, Wheat, Vegetable, Barley, Sunflower
France	Maize, Oilseed rape
Italy	Soybean, Rice
Japan	Rice, Green tea, Strawberry, Japanese pear, French bean, Sweet cherry, Apple, Lettuce
Netherlands	French bean, <i>Phalaenopsis</i> , Potato, Rose, Tomato
Republic of Korea	Chinese cabbage, Cucumber, Lettuce, Melon, Pepper, Pumpkin, Radish, Rice, Tomato
Russian Federation	Maize, Potato, Soybean, Sunflower, Wheat
United Kingdom	Barley, Potato, Oilseed rape

Summary of current use of biochemical and molecular techniques

Use:
Management of variety collection and selection of similar varieties
Validation of male sterility and disease resistance
Validation of DUS/VCU samples
Variety identification
Research purposes
Breeding
Techniques:
ALFP (NL)
CAPS (JP)
MNP (CN)
OSR-SSR (FR)
PRG-SNPs (NL)
RAPID – STS (JP)
SSR (BR, CN, DK, GB, IT, JP, KR, NL, QZ)
SNPs (AR, CN, FR, DK, GB, NL, QZ)

Summary of databases with molecular marker information, by crops

Argentina	Soybean (under development)
China	Apple, Cotton, Maize (for research), Pepper, Rice, Rose, Sorghum, Soybean, Walnuts, Wheat, Fruit trees
Denmark	Barley, Wheat, Forage grasses
European Union	Potato
France	Maize
Italy	Soybean
Netherlands	French bean, <i>Phalaenopsis</i> , Potato
United Kingdom	For research

Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular

Maize and Soybean

Summary of crop interest

Maize	China, Germany, Kenya, Russian Federation, ISTA, SAA
Soybean	Argentina, Brazil, China, ISTA

Plans for cooperation

- Argentina will publish a set of 4004 SNP markers for the management of variety collections in Soybean and will inform Brazil and the United States of America with a view to their testing the discriminating power of this set.
- Brazil to discuss with the Brazilian breeders association the proposal on the use of molecular markers in DUS examination for soybeans (e.g. similar to the study conducted in Argentina).
- China to make the new Maize 6H-60K SNP chip available for testing .

Summary of current use of biochemical and molecular techniques

Germany: isoenzymes for management of variety collection and DUS examination (maize)
China: Maize 6H-60K SNP chip for consideration of essential derivation; protocol for variety identification in maize and soybean; creation of a database and selection of similar varieties; general protocol for variety identification using SSR
Argentina: SNP for management of variety collection and variety identity
Brazil: SSR for variety identity
SAA: genetic similarity in soybean varieties
ISTA: electrophoresis, seed proteins, SSR (ISTA Rules, Chapter 8)

Proposals on confidentiality and access to data

- DNA-fingerprint data to be treated as confidential;
- Variety identification data using a small number of SNP markers could be made publicly available
- Consent by the breeder should be required before sharing of DNA-based information;
- Breeders should be informed about the publication of variety identification by SNPs;
- Parental line information should be treated as confidential

Other agricultural crops

Summary of crop interest

Barley	Argentina, Estonia, Germany, Italy, United Kingdom, ISTA
<i>Cannabis sativa</i>	Estonia, Italy, Netherlands, United Kingdom
Cotton	Argentina, ISTA
Perennial Ryegrass	Germany, Netherlands, New Zealand, United Kingdom
Potato	Estonia, Germany, Netherlands, Russian Federation, United Kingdom
Rice	Argentina, China, Italy, Japan, ISTA
Sunflower	Russian Federation
Sweet Potato	United Kingdom
Wheat	Argentina, China, Estonia, Germany, Italy, United Kingdom, ISTA

Plans for cooperation

- Ryegrass: Belgium, Czech Republic and the Netherlands to share information on their work and plans;
- Oilseed rape: France, Germany, CPVO and the United Kingdom to develop a set of molecular markers for the management of variety collections;
- INVITE and INNOVAR (scope of 10 crops) participating countries to develop markers sets for variety testing;
- Argentina to contact BMT participants on sets of markers for Barley, Cotton, Rice and Wheat.

Summary of current use of biochemical and molecular techniques

Netherlands and the United Kingdom: SNPs for management of variety collections
China: 90K SNP chip for wheat; development of testing standard for SSR in wheat; creation of a database for wheat varieties; SSR markers for selection of similar varieties and variety purity
Germany: electrophoresis for Barley, Wheat and Oat, Ryegrass, Potato for DUS examination
Italy: electrophoresis in maize, sunflower, wheat, barley for DUS examination and variety identification; SSR for variety hybridity in Rice and variety identification
Japan: RAPD-STS markers for infringement cases in French Bean and Rice
Russian Federation: SSR for identification in Sunflower and Potato.
United Kingdom: electrophoresis for Barley, Wheat and Oat, Ryegrass, for DUS examination; SSR and SNP for sample validation and variety identification
ISTA: maize, wheat and soybean: SSR and electrophoresis; barley: SSR; Other crops: electrophoresis

Proposals for confidentiality and access to data

Participants at the discussion group on other agricultural crops agreed with the proposals by the discussion group on Maize and Soybean.

Vegetables

Summary of crop interest

Cabbage	China, Republic of Korea
Chinese cabbage	China, Republic of Korea
Cucumber	China, Netherlands, Republic of Korea
Eggplant	Italy
French bean	Netherlands
Lettuce	Australia, Italy, Netherlands, Republic of Korea
Melon	China, Netherlands, Republic of Korea
Onion	Italy, Netherlands
Oriental melon	Republic of Korea
Pea	Netherlands, United Kingdom
Pepper	China, Italy, Netherlands, Republic of Korea
Pumpkin	Republic of Korea
Radish	Republic of Korea
Shallot	Netherlands
Squash	Italy
Tomato	China, France, Italy, Japan, Netherlands, Republic of Korea
Watermelon	China, Italy, Republic of Korea

Summary of current use of biochemical and molecular techniques

<u>Use:</u>
Research (NL)
TGP/15 Model 1 (JP, NL, FR)
French bean example (NL)
Variety identifications (CN, IT, NL)
<u>Techniques:</u>
AFLP (NL)
Capillary electrophoresis fragment analysis (IT)
MNP (CN)

SNPs (NL, CN, IT)
SSR (CN, IT)
Taqman (NL)
Whole genome sequencing / GBS (CN, NL)

Proposals for confidentiality and access to data

The discussion group on vegetables agreed to propose inviting breeders, observer organizations and other participants to make presentations on ownership matters during the breeders' day at the nineteenth session of the BMT.

Ornamental plants

Summary of crop interest

<i>Bougainvillea</i>	China
<i>Camellia</i>	China
<i>Chrysanthemum</i>	China, Netherlands
<i>Gypsophila</i>	Netherlands
<i>Helleborus</i>	Netherlands
<i>Hibiscus</i>	China
<i>Hydrangea</i>	France
<i>Lilium</i>	China
<i>Phalaenopsis</i>	Netherlands
Rose	China, Netherlands, CIOPORA
Tree Peony	China

Plans for cooperation

- Rose: China, Netherlands and CIOPORA to discuss a methodology for validating a set of molecular markers between laboratories.
- Chrysanthemum, Rose, Tree peony: China to explore cooperation on developing molecular markers with other UPOV members.

Summary of current use of biochemical and molecular techniques

<u>Use:</u>
Variety identification (CN)
Research (CN, FR)
<u>Techniques:</u>
SSR (CN, FR)
SNPs (CN)

Proposals on confidentiality and access to data

- To develop an agreement template with breeders for the use of molecular data. The template should include a requirement for a description of the intended use of the data.

Fruit crops and forest trees

Summary of crops of interest

Citrus	China, Italy, Spain
Persimmon	Spain, Republic of Korea
Peach	Italy, Hungary, Spain
Strawberry	Italy, Hungary, Spain
Goji Berry	China
Walnut	China

Plans for cooperation

Citrus – under consideration	Spain to propose collaboration initiative with Italy
Persimmon	Spain, Republic of Korea
Peach	Italy, Hungary
Strawberry – under consideration	Italy, Hungary

Summary of current use of biochemical and molecular techniques

Australia: possible use of microsatellites in some enforcement cases.
China: SSR markers for variety identification in Apple, Chinese Dates, Citrus, Apricot, Goji Berry and Fraxinus
European Union: collaboration on epigenetic markers in apple;
Japan: considering the use of SSR for enforcement for grapes and CAPS for citrus.
Republic of Korea: SSR for Apple, Peach, Grape, Pear and persimmon.
Spain: SSR for variety identification; use of SNP for research, including DUS testing

Proposals on confidentiality and access to data

New Zealand has published position on access and use of plant material including molecular data. For example, molecular data would only be provided with permission of breeder.

[End of Annex and of document]