6th Seed Congress of the Americas

UPOV Guidance on Molecular Techniques

Leontino Taveira
Technical/Regional Officer
(Latin America and the Caribbean)
UPOV

OVERVIEW

Molecular techniques

- Introduction to UPOV
- UPOV guidance on molecular techniques
- Coordination with other international organizations
- Possible future developments
- Summary (FAQs)

UPOV: INDEPENDENT INTERGOVERNMENTAL ORGANIZATION

The International Convention for the Protection of New Varieties of Plants

established in 1961

The International Union for the Protection of New Varieties of Plants

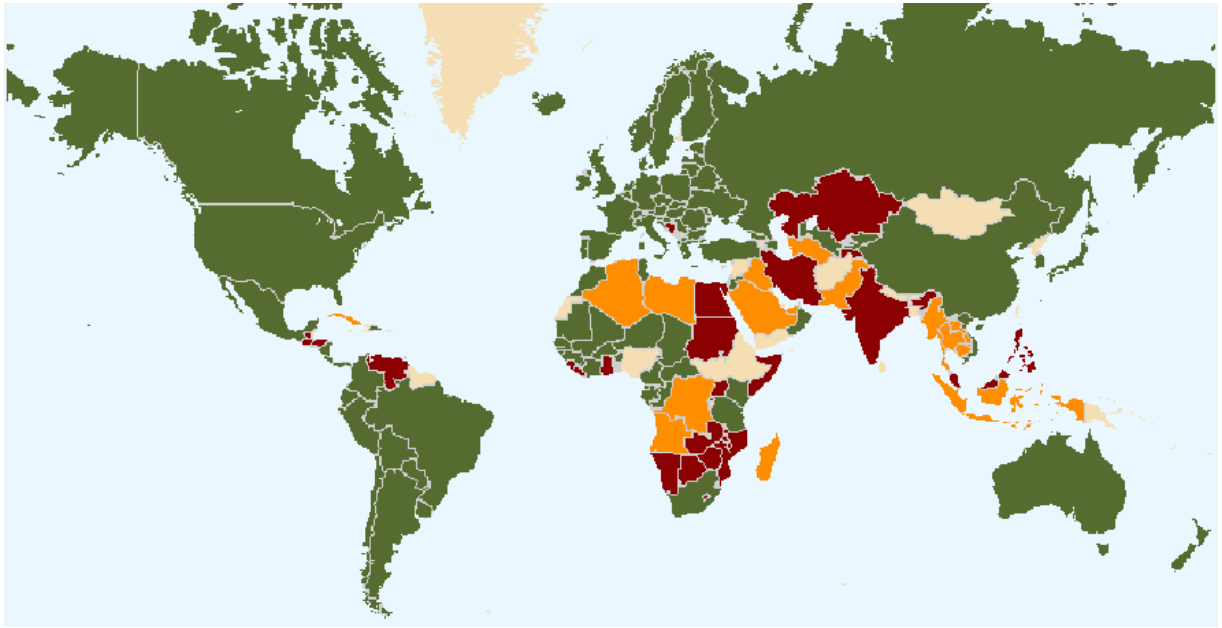
Union internationale pour la protection des obtentions végétales

UPOV MISSION STATEMENT

"To provide and promote an *effective system* of plant variety protection, with the aim of encouraging the development of *new varieties of plants*, for the *benefit of society*"

- **Members of the Union**
  - States
  - Intergovernmental Organization(s)
- **Organs established by the Convention**
  - Council
  - Other Bodies
  - Office of the Union

UPOV status



Members of UPOV (74) covering 93 States

Initiating States (16) and Organization (1)

States (24) and Organization (1) in contact with the UPOV Office

The boundaries shown on this map do not imply the expression of any opinion whatsoever on the part of UPOV concerning the legal status of any country or territory

UPOV

UPOV MISSION STATEMENT

"To provide and promote an **effective system of plant variety protection (PVP)**, […]"

CONDITIONS FOR GRANTING A BREEDER'S RIGHT

Criteria to be satisfied

- NOVELTY
- DISTINCTNESS
- UNIFORMITY
- STABILITY
- VARIETY DENOMINATION
- FORMALITIES
- PAYMENT OF FEES

} "DUS"

NO OTHER CONDITIONS!

IMPORTANCE OF HARMONIZED APPROACH WITHIN UPOV

⇒ To facilitate cooperation in DUS testing

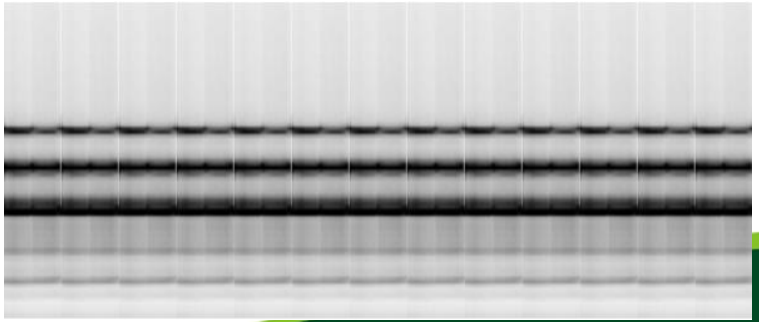
e.g. purchase of DUS reports

⇒ To establish internationally recognized variety descriptions (effective protection)

Self-pollinated varieties

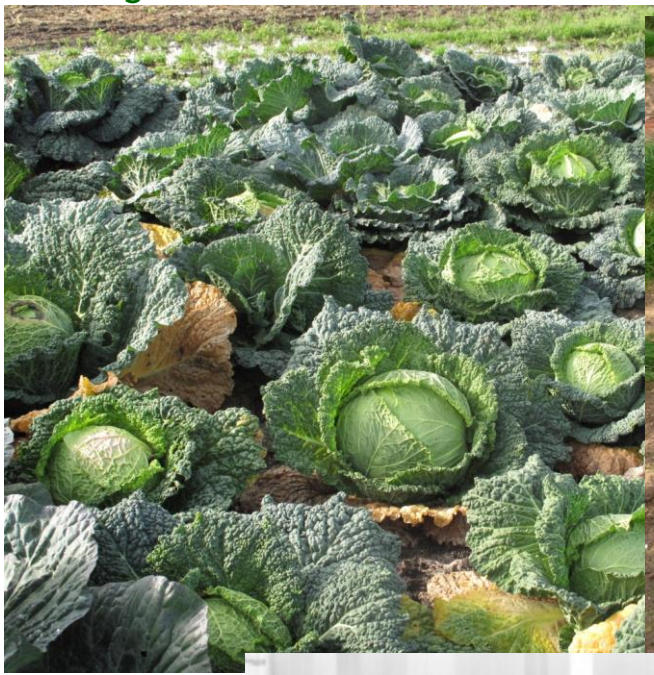
Lettuce

Wheat

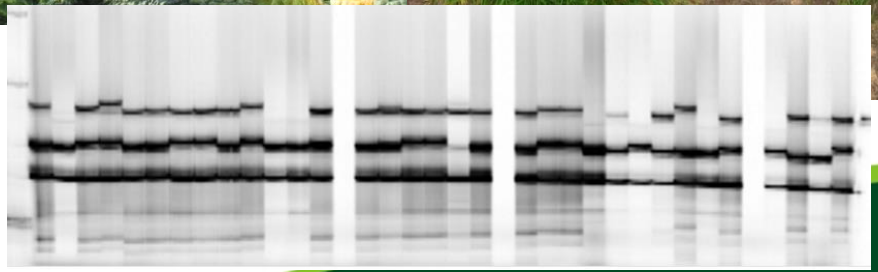


Cross-pollinated varieties

Cabbage



Ryegrass



OVERVIEW

Molecular techniques

- Introduction to UPOV
- UPOV guidance on molecular techniques
- Coordination with other international organizations
- Possible future developments
- Summary (FAQs)

15

STATUS OF UPOV DOCUMENTS CONCERNING MOLECULAR TECHNIQUES

Document reference	Title
UPOV/INF/17/1	**Guidelines for DNA Profiling: Molecular Marker Selection and Database Construction ("BMT Guidelines") (2010)**

Document reference	Title
TGP/15	**Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)**
UPOV/INF/18/1	**Possible Use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability (2011)**

UPOV/INF/18
POSSIBLE APPLICATION MODELS

MODELS WITH A POSITIVE ASSESSMENT

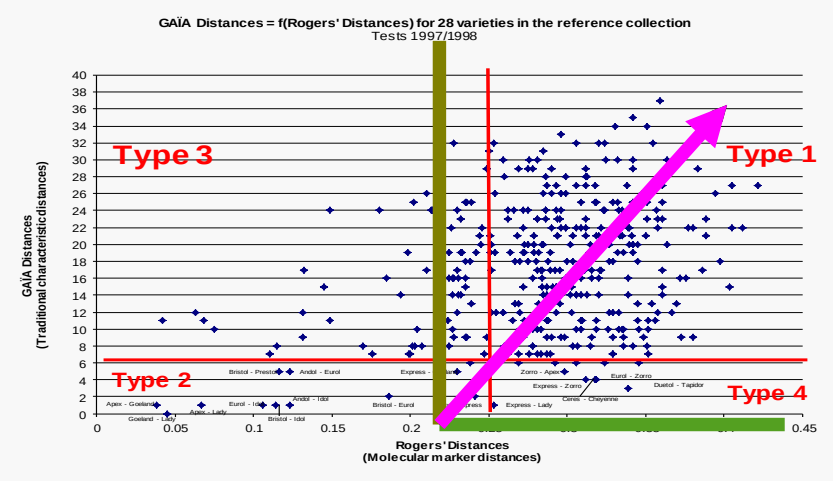
- Characteristic-specific molecular markers
- Combining phenotypic and molecular distances in the management of variety collections

- Calibrated molecular distances in the management of variety collections

MODELS WITHOUT A POSITIVE ASSESSMENT

- Use of molecular marker characteristics

Calibrated molecular distances in the management of variety collections



	Distinctness plus (Traditional characteristics)	Distinctness plus (Molecular markers)
Type 1	Yes	Yes
Type 2	No	No
Type 3	Yes	No
Type 4	No	Yes

Model 1: Characteristic-specific molecular markers

Example: gene specific marker for herbicide tolerance introduced by genetic modification

On the basis that:

[…]

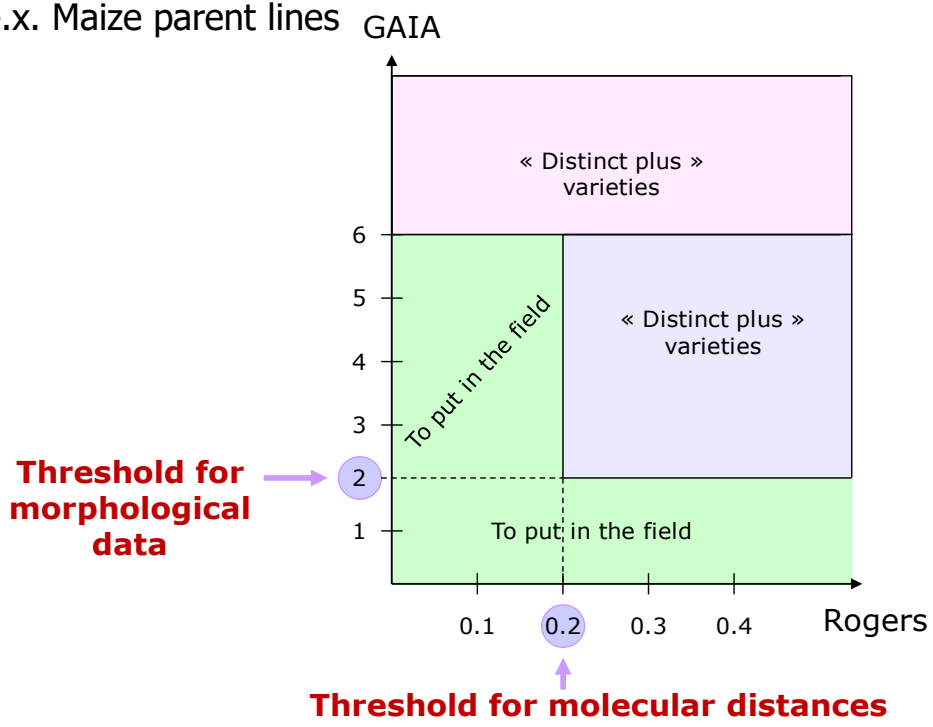
- there is verification of the reliability of the link between the marker and the characteristic;

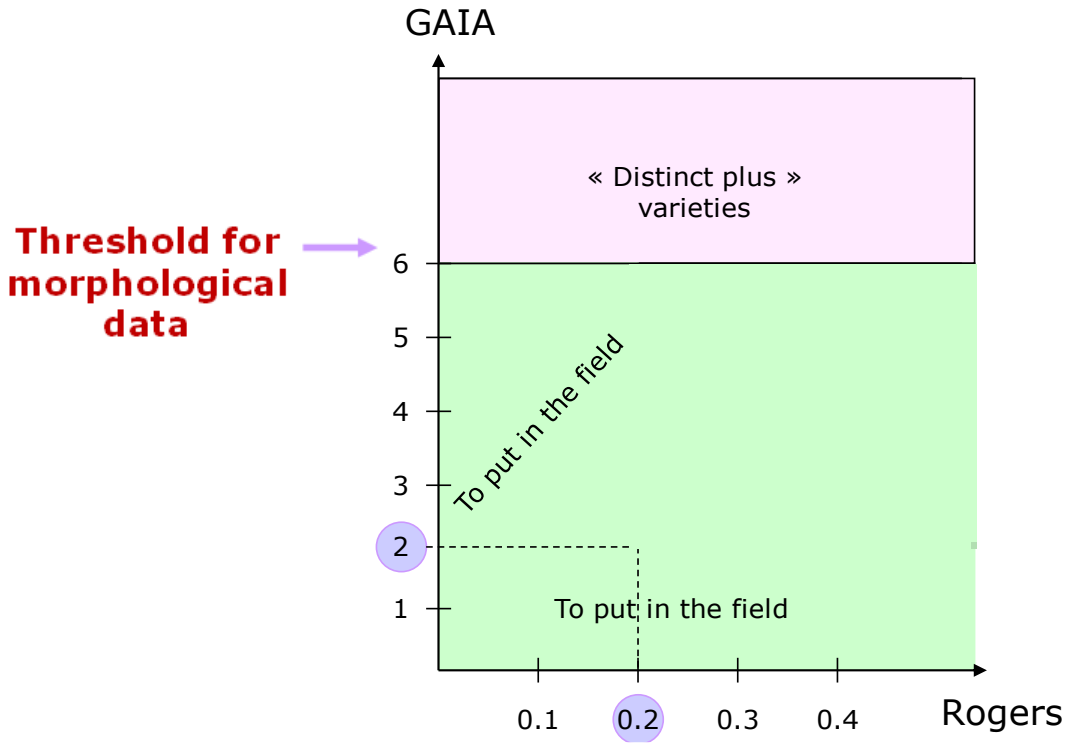
- different markers for the same characteristic are different methods for examining the same characteristic;

[…]

Model 2: Combining phenotypic and molecular distances in the management of variety collections

e.x. Maize parent lines




GAIA
« Distinct plus »
varieties
Threshold for
morphological
data
6
5
4
3
2
1
To put in the field
To put in the field
0.1
0.2
0.3
0.4
Rogers

OVERVIEW

Molecular techniques

- Introduction to UPOV
- UPOV guidance on molecular techniques
- Coordination with other international organizations
- Possible future developments
- Summary (FAQs)

28

WORKSHOP 1

Agreed:

2. to propose an inventory by UPOV, OECD and ISTA of the use of molecular marker techniques, by crop, with a view to developing a document containing that information, in a similar format to UPOV document UPOV/INF/16 “Exchangeable Software”.

WORKSHOP 2

OECD Annual Meeting approved:

2. to carry out a joint inventory by UPOV, OECD, AOSA and ISTA of the use of molecular marker techniques, by crop, with a view to developing a document containing that information. The OECD will contribute to the document by sharing the ongoing list of molecular techniques used by NDAs and continuously collected by the Secretariat.

WORKSHOP 1

Agreed:

3. to propose to invite UPOV, OECD and ISTA to develop lists of possible joint initiatives in relation to molecular techniques. It was noted that, in the case of UPOV, the list could be drafted by the BMT at its fifteenth session, subject to approval by the Technical Committee.
   - The UPOV TC, at its fifty-second session, agreed that the BMT should include the development of a list of terminology (definitions) used by OECD, UPOV and ISTA in the list of joint initiatives
   - The UPOV BMT, at its fifteenth session, agreed that possible future collaboration between UPOV, OECD and ISTA might include the harmonization of terms and methodologies used for different crops and the possible development of standards, after agreement by these organizations.

OVERVIEW

Molecular techniques

- Introduction to UPOV
- UPOV guidance on molecular techniques
- Coordination with other international organizations
- Possible future developments
- Summary (FAQs)

36

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

The BMT is a group open to DUS experts, biochemical and molecular specialists and plant breeders, whose role is to:

- **Review general developments** in biochemical and molecular techniques;
- Maintain an awareness of relevant **applications** of biochemical and molecular techniques **in plant breeding**;
- Consider the possible application of biochemical and molecular techniques **in DUS testing** and report its considerations to the TC;
- If appropriate, establish **guidelines** for biochemical and molecular **methodologies** and their harmonization;
- Develop guidelines regarding the management and harmonization of **databases** of biochemical and molecular information, in conjunction with the TWC;
- Provide a **forum for discussion** on the use of biochemical and molecular techniques in the consideration of **essential derivation** and **variety identification**.

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

The BMT is a group open to DUS experts, biochemical and molecular specialists and plant breeders, whose role is to:

- **Review general developments** in biochemical and molecular techniques;
- Maintain an awareness of relevant **applications** of biochemical and molecular techniques **in plant breeding**;
- Consider the possible application of biochemical and molecular techniques **in DUS testing** and report its considerations to the TC;
- If appropriate, establish **guidelines** for biochemical and molecular **methodologies** and their harmonization;
- Develop guidelines regarding the management and harmonization of **databases** of biochemical and molecular information, in conjunction with the TWC;
- Provide a **forum for discussion** on the use of biochemical and molecular techniques in the consideration of **essential derivation** and **variety identification**.

Presentation at the Fifty-First session of the Technical Committee
Geneva, March 2015
http://www.upov.int/edocs/mdocs/upov/en/tc_51/tc_51_presentation_2.pdf

Marker-Assisted Selection of 'Similar Variety' in DUS Testing

March 2015.

The Selection of 'Similar Varieties' in DUS testing

Sources to Selecting

- Parent varieties
- Varieties bred from the same parent cross
- Varieties sharing a parental line
- A series of varieties
- Broadly distributed varieties
- Well-known varieties

Clues to Selecting

- Reference collection
- Image database
- Catalogues
- Googling…
- Variety descriptions
- Working references
- Applicant (in application form)
- Information providers

- Maker-assisted selection of 'similar variety'

NEXT MEETING:

Working Group on Biochemical and Molecular Techniques and DNA-Profiling in Particular (BMT/16)

November 7 to November 10, 2017

(*La Rochelle, France*)

OVERVIEW

Molecular techniques

- Introduction to UPOV
- UPOV guidance on molecular techniques
- Coordination with other international organizations
- Possible future developments
- Summary (FAQs)

42

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

- For a variety to be protected, it needs to be clearly distinguishable from all existing varieties on the basis of characteristics that are physically expressed, e.g. plant height, time of flowering, fruit color, disease resistance etc.
- The DNA-profile is not the basis for obtaining the protection of a variety, although this information may be used as supporting information.
- A more detailed explanation is provided in the FAQ Does UPOV allow molecular techniques (DNA profiles) in the examination of Distinctness, Uniformity and Stability ("DUS")?

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

- It is important to note that, in some cases, varieties may have a **different DNA profile but be phenotypically identical**, whilst, in other cases, varieties which have a **large phenotypic difference may have the same DNA profile** for a particular set of molecular markers (e.g. some mutations).
- In relation to the use of molecular markers that are not related to phenotypic differences, the concern is that it might be possible to use a **limitless number of markers to find differences** between varieties at the genetic level that are **not reflected in phenotypic** characteristics.

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

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

Model 1 Molecular markers can be used as a method of examining DUS characteristics that satisfy the criteria for characteristics set out in the General Introduction if there is a **reliable link between the marker and the characteristic**.

Model 2 A **combination of phenotypic differences and molecular distances** can be used to improve the **selection of varieties to be compared in the growing trial** if the molecular distances are sufficiently related to phenotypic differences and the method does not create an increased risk of not selecting a variety in the variety collection which should be compared to candidate varieties in the DUS growing trial.

leontino.taveira@upov.int

Thank you for your attention!