

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

BMT/18/2

**Eighteenth Session
Hangzhou, China, October 16 to 18, 2019**

Original: English
Date: October 9, 2019

**REPORT ON DEVELOPMENTS IN UPOV CONCERNING BIOCHEMICAL AND MOLECULAR
TECHNIQUES**

Document prepared by the Office of the Union

Disclaimer: this document does not represent UPOV policies or guidance

The Annex of this document contains a copy of a presentation “Report on Developments in UPOV concerning Biochemical and Molecular Techniques” to be made by the Office of the Union at the eighteenth session of the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular.

[Annex follows]

Working Group on Biochemical and Molecular Techniques
and DNA-Profiling in Particular (BMT)
Eighteenth Session

Report on developments in UPOV concerning Biochemical and Molecular Techniques

Office of the Union

Hangzhou, China, October 16 to 18, 2019

UPOV

International Union for the Protection of New Varieties of Plants

Preview

Developments in UPOV:

- General
 - Membership & statistics
 - Calendar UPOV meetings 2019
 - Communicating the benefits of UPOV
- Biochemical and molecular techniques
 - Current guidance
 - Developments since BMT/17 in 2018
 - The Concept of Essentially Derived Varieties
 - The Role of UPOV in Variety Identification

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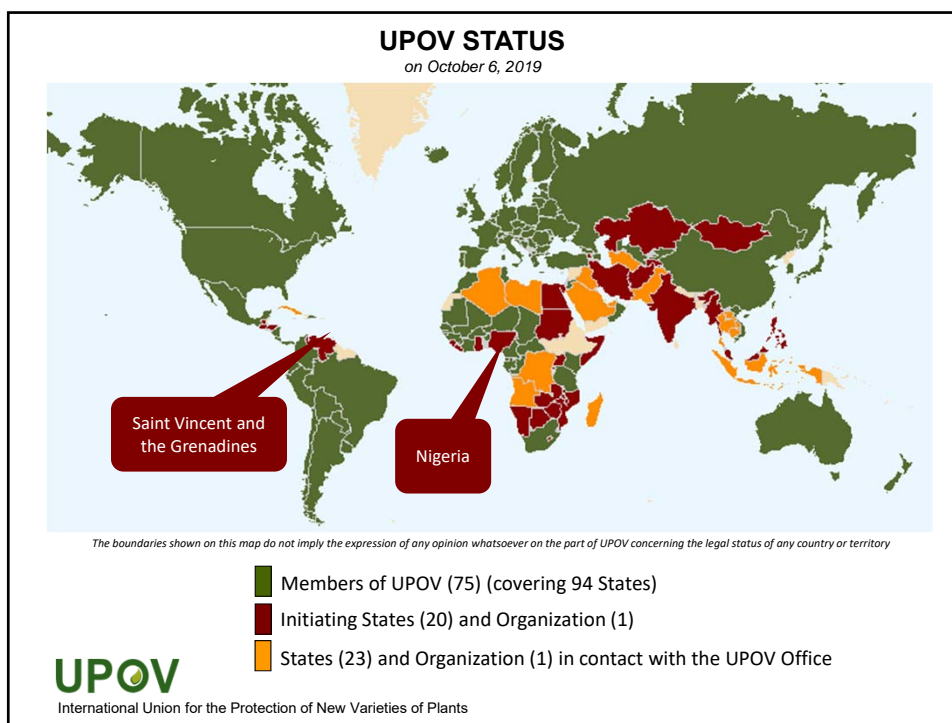
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UPOV Membership



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

1991 Act: 58 members
Other Acts: 17 members
[94 States covered by UPOV Convention]



First Examination of Laws by the Council by correspondence

Positive decision on the Draft Law of Nigeria

The Council took a **positive decision** on the conformity of the “**Plant Variety Protection Bill of Nigeria**” (“Draft Law”) with the 1991 Act of UPOV Convention, which allows Nigeria once the Draft Law is adopted with no changes and the Law is in force, to deposit its instrument of accession to the 1991 Act.

Positive decision on the Draft Law of Saint Vincent and the Grenadines

The Council took a **positive decision** on the conformity of the “**Plant Breeders’ Protection Bill 2019 of Saint Vincent and the Grenadines**” (“Draft Law”) with the 1991 Act of the UPOV Convention, which allows Saint Vincent and the Grenadines once the Draft Law is adopted with no changes and the Law is in force, to deposit its instrument of accession to the 1991 Act.

UPOV

International Union for the Protection of New Varieties of Plants

Examination of Laws by the Council (53rd session)

UPOV STATUS

on October 6, 2019

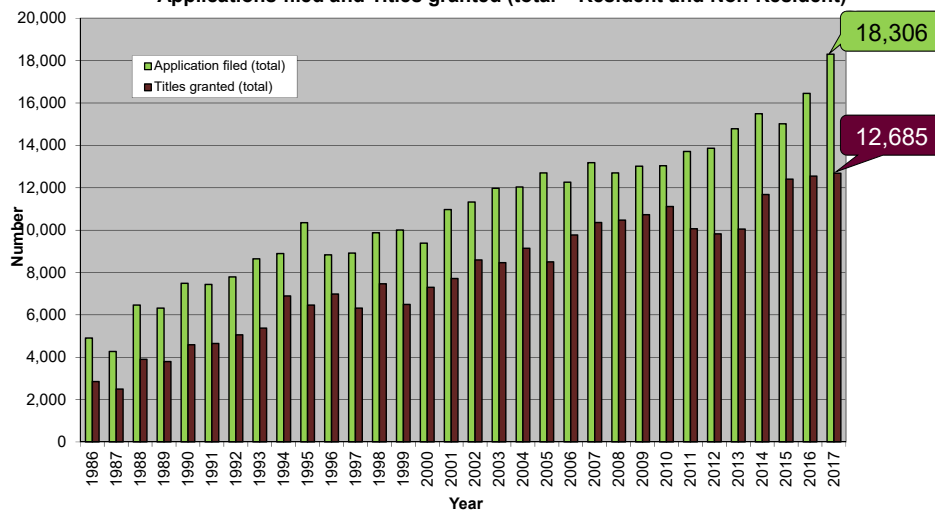


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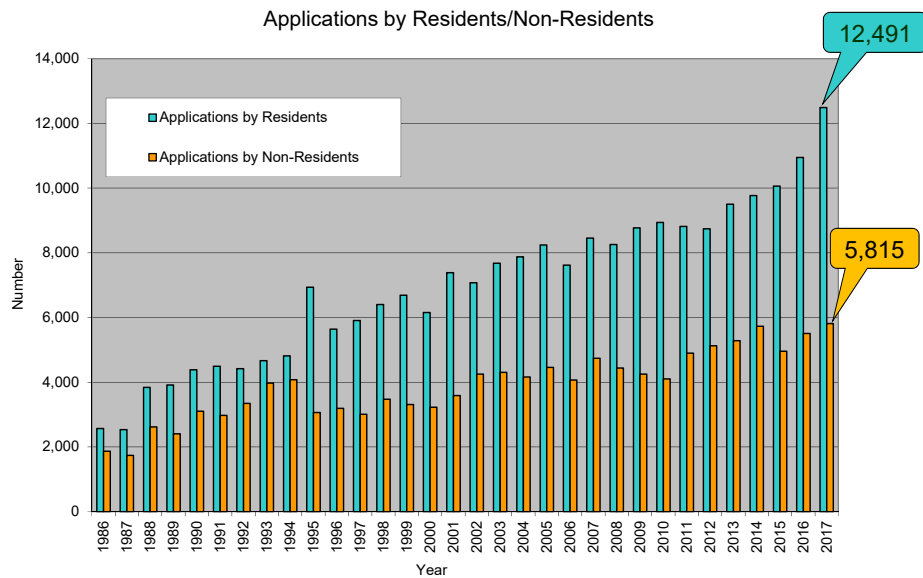
- Members of UPOV (75) (covering 94 States)
- Initiating States (20) and Organization (1)
- States (23) and Organization (1) in contact with the UPOV Office

Plant variety protection statistics (C/52/7 Rev.)

Applications filed and Titles granted (total = Resident and Non-Resident)

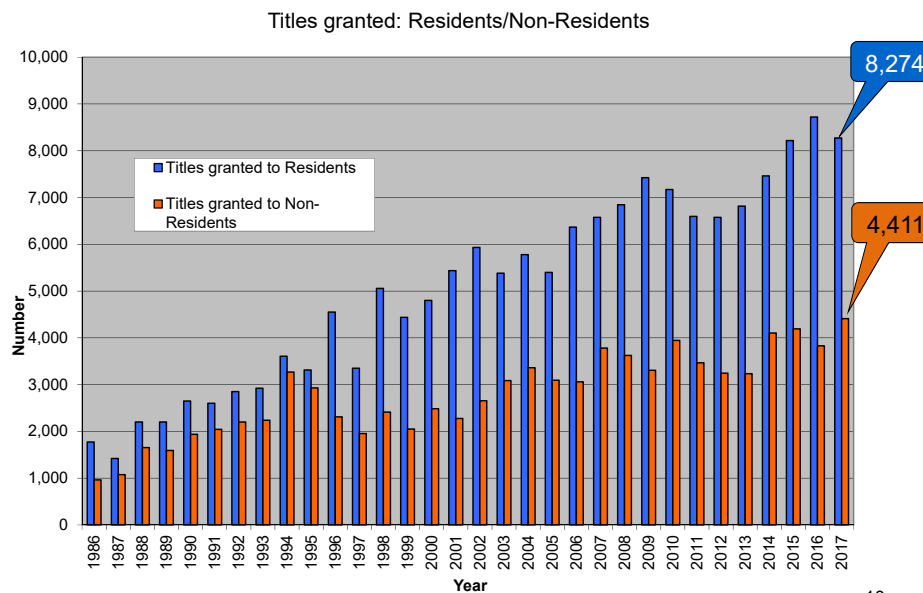


Plant variety protection statistics (C/52/7 Rev.)

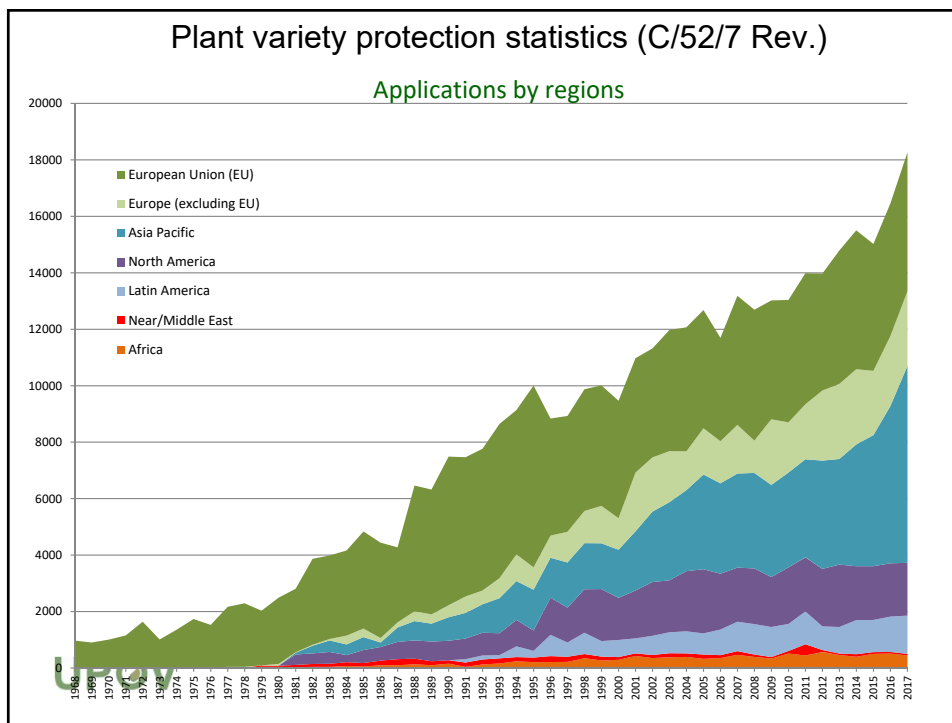
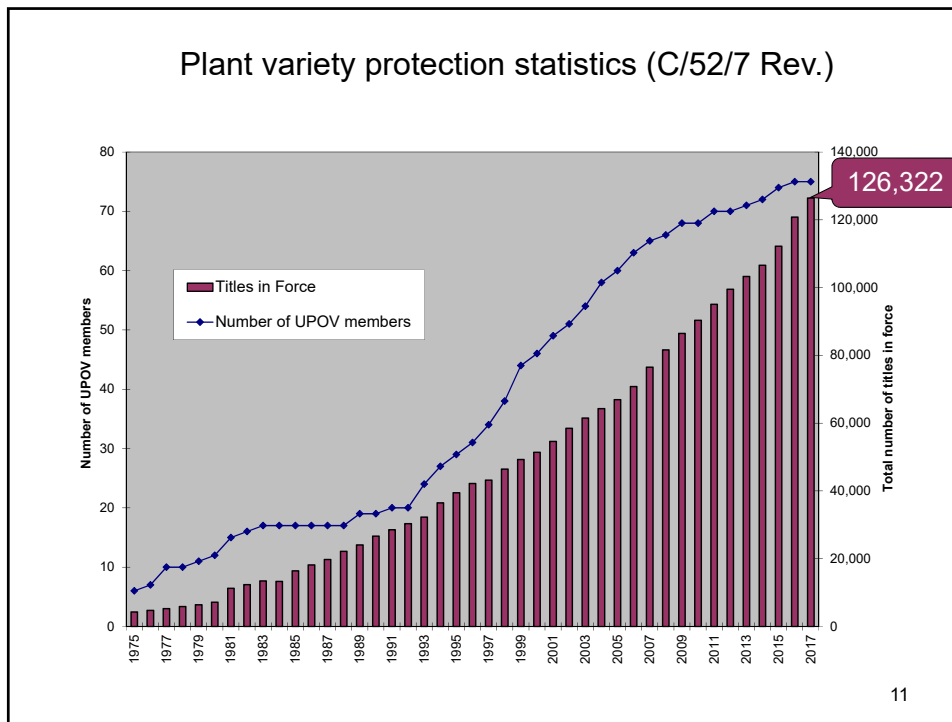


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Plant variety protection statistics (C/52/7 Rev.)



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Draft Schedule of the UPOV Technical Working Party on Automation and Computer Programs (TWP), Thirty-Seventh Session and The Working Group on Biochemical and Molecular Techniques, and DNA-profiling in particular (BMT), Eighteenth Session, Hangzhou, China					
	Monday, October 14	Tuesday, October 15	Wednesday, October 16	Thursday, October 17	Friday, October 18
08.30	[TWC/37] 1. Opening of the Session 2. Adoption of the agenda (TWP/37/1 Rev.) 3. Short reports on developments in PVP (TWP/37/2 and TWP/37/3)	7. Software, Information and databases (a) UPOV information databases (TWP/3/4 and TWP/3/4 Add.) (d) UPOV PRISMA (TWP/3/3) (f) Web services provided by UPOV and members of the Union (TWP/37/4)	7. Software, Information and databases (Cont.) (b) Variety description databases (TWP/3/2 and TWP/37/8) (c) Exchange and use of software and equipment (TWP/3/5) (e) Building a database with molecular marker information for the management of variety collections (TWP/37/6)	[Breeders' Day] 11. The use of molecular techniques in examining essential derivation 12. The use of molecular techniques in variety identification (a) RNP marker in PVP (BMT/18/15) (b) Association Analysis of SSR Markers and Agronomic Traits in Soybean (BMT/18/19)	13. Review of document UPOV/INF/17 (cont.) (BMT/18/10 & INF/17/2 Draft 2)
10.30	COFFEE	COFFEE	COFFEE	COFFEE	COFFEE
11.00	8. Statistical methods - The Combined-Over-Years Uniformity Criterion (COYU) (TWP/37/7)	4. Variety denominations (TWP/3/6) 5. TGP documents (cont.) - Characteristics which only apply to certain varieties (TWP/3/9) - RHS Colour Chart (TWP/3/11) - Characteristic-specific marker with incomplete information (TWP/3/12) 14. Guidance for TGP drafters (TWP/3/18)	15. Date and place of the next session 16. Future Program 17. Adoption of the Report (if time permits) 18. Closing	5. Molecular techniques in relation to DUS examination (a) Facilitating DUS Testing of Soybean Varieties (BMT/18/6 and BMT/18/9) (d) IMODDUS and INVITE (BMT/18/14) (e) A simple SSR based identification system for sweet potato (BMT/18/16)	15. Session to facilitate cooperation (BMT/18/5)
12.30	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
14.00	6. Assessing Uniformity by Off-Types - Risks associated with assessment of uniformity by off-types on the basis of more than one growing cycle (TWP/37/5) 11. Experience with using two locations by one year for DUS decisions (TWP/37/10)	12. Molecular Techniques (TWP/3/7)	[BMT/18] 1. Opening of the Session 2. Adoption of the agenda (BMT/18/1 Rev.) 3. Developments in UPOV (BMT/18/2) 4. Short report BMT developments (BMT/18/3) 7. Variety description DBs including DBs containing molecular data (BMT/18/6) 8. Management of databases and exchange of data and material 9. Methods of analysis of molecular data	5. Molecular techniques in relation to DUS examination (cont.) (c) Innovat (BMT/18/12) (f) Use of molecular markers in Argentina (BMT/18/17) (g) Essential information for 'character-specific molecular markers' in TGP (BMT/18/18) 14. Revision of document TGP/15 (BMT/18/7)	16. Date and place of next session 17. Future program
15.30	COFFEE	COFFEE	COFFEE	COFFEE	COFFEE
16.00	9. Image analysis (TWP/37/9) 5. TGP documents (TWP/31 Rev. and TWP/37/11) - Data Processing for Assessment of Distinctness and for Producing Variety Descriptions (TWP/3/10) 10. Differences in notes for the assessment of distinctness (TWP/3/13)	13. Cooperation in examination (TWP/3/14)	10. Software tool for marker selection using the traveling salesman algorithm (BMT/18/11) 13. Review of document UPOV/INF/17 "Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction" (BMT/18/10 and INF/17/2 Draft 2)	14. Revision of document TGP/15 (cont.) 6. Cooperation between international organizations (BMT/18/4) (a) Horizontal methods for molecular biomarker analysis (BMT/18/13) (b) OECD Seed Schemes (BMT/18/20) (c) ISTA (BMT/18/21)	18. Report of the session (if time permits) 19. Closing of the session
18.00					

Cooperation between the TWC and BMT

The TC received the following proposal from the Chairpersons of the TWC and BMT for matters to be considered on **Wednesday, September 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.

Seminar on the impact of policy on essentially derived varieties (EDVs) on breeding strategy

To be held in Geneva, on the morning of October 30, 2019

Welcome address and opening

SESSION I: TO AN EDV CONCEPT FOR THE PRESENT AND THE FUTURE

- Plant breeding and the EDV concept: challenges of the past, opportunities for the future?
- UPOV guidance on EDV

SESSION II: IMPACT OF EDV CONCEPT ON PLANT BREEDING

- Outlook for agricultural crops
- Outlook for ornamental plants
- Outlook for vegetables
- Outlook for fruit
- Panel discussion and questions

Closing remarks

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UPOV Distance Learning Courses:
Registration open

Stakeholder features

- Breeders
- Farmers and Growers
- Policy makers
- General Public

UPOV PRISMA
PBR Application Tool

CENI Database

UPOV Lex

Plant Variety Database (PLUTO)

Quick Links

- Introduction to UPOV
- Benefits of UPOV
- UPOV Collection
- UPOV PRISMA (Information)
- Test Guidelines
- Distance Learning Courses
- Seminars & Symposia
- FAQs

Welcome

The International Union for the Protection of New Varieties of Plants (UPOV) is an intergovernmental organization with headquarters in Geneva (Switzerland).

UPOV was established by the International Convention for the Protection of New Varieties of Plants. The Convention was adopted in Paris in 1961 and it was revised in 1972, 1978 and 1991.

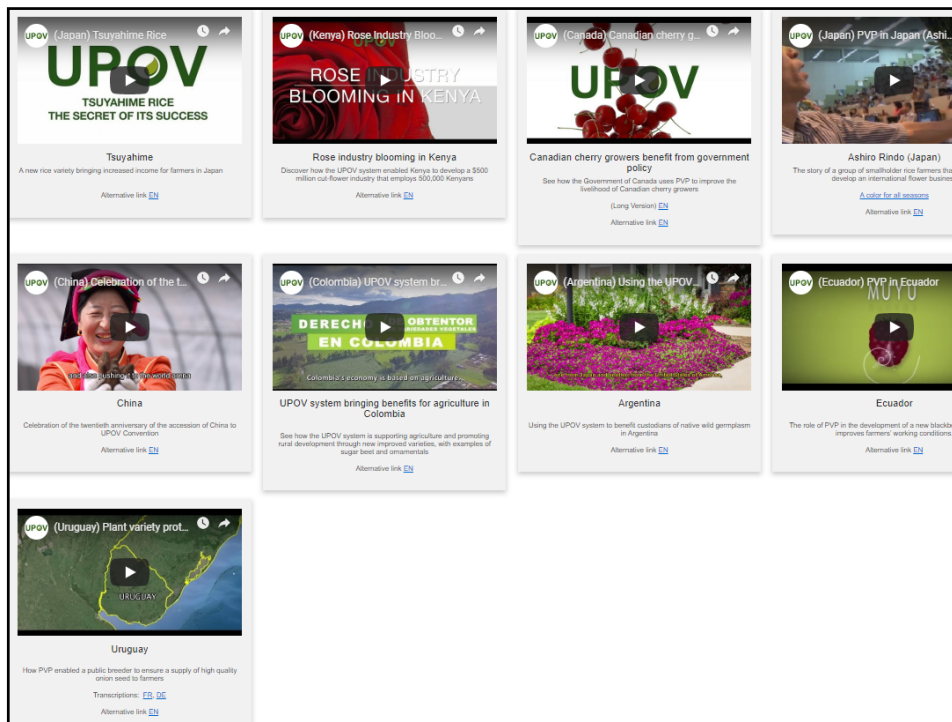
UPOV's mission is to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.

▲ Top of page

Benefits of UPOV

UPOV

www.upov.int



UPOV Videos



Celebration of the twentieth anniversary of the accession of China to UPOV Convention

Languages available: EN audio
Subtitles: EN

Peter Button (UPOV) UPOV Worldw...
Interview: Peter Button, Vice Secretary-General
Overview of the Benefits of the UPOV system

Anthony Parker (UPOV) Impact of U...
Interview: Anthony Parker, Vice Secretary-General
Explains importance of UPOV

Director Nguyen Thanh MINH of the...
Interview: Director Nguyen Thanh Minh, Plant Variety Protection Office of Viet Nam
Explains importance of UPOV

HFFA Research GmbH

The socio-economic benefits of UPOV membership in Viet Nam:
An ex-post assessment on plant breeding and agricultural productivity after ten years
Corresponding author: Steffen Noleppa

Available in English, Thai and Vietnamese!

hffa
RESEARCH

HFFA Research Paper 03/2017

Socio-economic benefits of UPOV membership in
An ex-post assessment on plant breeding and agricultural productivity after 10 years
(Corresponding author: Steffen Noleppa) by HFFA Research GmbH

UPOV

UPOV Social Media

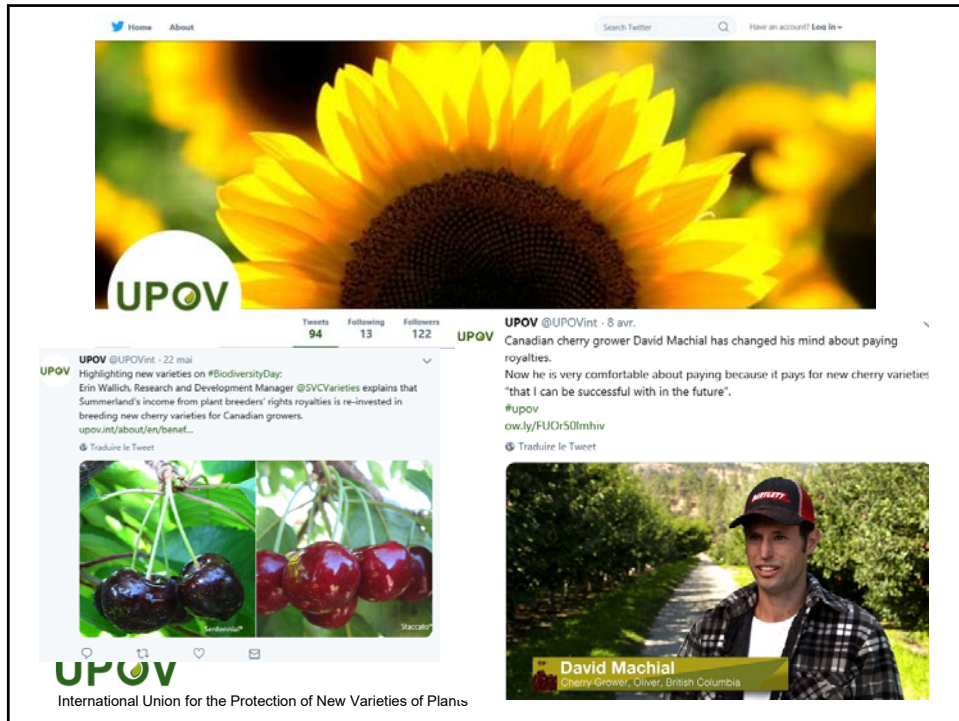


UPOV@UPOVint **PeterButton@vsgupov**



UPOV
International Union for the Protection of New Varieties of Plants

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International Union for the Protection of New Varieties of Plants



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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) (2013)
UPOV/INF/18/1	Possible Use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability (2011)

UPOV/INF/17/1 (INFormation document)

“Guidelines for DNA Profiling: Molecular Marker Selection and Database Construction (“BMT Guidelines”)

The purpose of this document (BMT Guidelines) is to provide guidance for developing harmonized methodologies with the aim of generating high quality molecular data for a range of applications. The BMT Guidelines are also intended to address the construction of databases containing molecular profiles of plant varieties [...]

FAQ

FAQ: 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:

FAQ: Does UPOV allow molecular techniques (DNA profiles) in the DUS examination? (cont.)

- (a) Molecular markers can be used as a method of examining DUS characteristics that satisfy the criteria for characteristics set out in the General Introduction if there is a reliable link between the marker and the characteristic.
- (b) A combination of phenotypic differences and molecular distances can be used to improve the selection of varieties to be compared in the growing trial if the molecular distances are sufficiently related to phenotypic differences and the method does not create an increased risk of not selecting a variety in the variety collection which should be compared to candidate varieties in the DUS growing trial.

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TGP/15/1 (Technical Guidelines Protocol)

“Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)”

The purpose of this document is to provide guidance on the use of biochemical and molecular markers in the examination of Distinctness, Uniformity and Stability (DUS) on the basis of the models in document UPOV/INF/18 that have received a positive assessment and for which accepted examples have been provided.



Model 1: Characteristic-specific molecular markers

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

On the basis that:

[...]

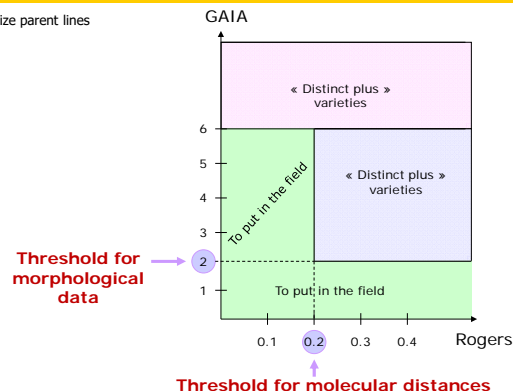
- there is verification of the reliability of the link between the marker and the characteristic;

- 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



Preview

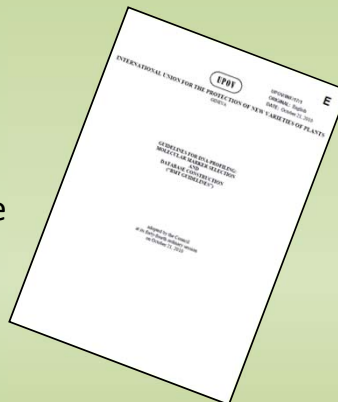
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Review of BMT Guidelines

- UPOV/INF/17 “Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction (‘BMT Guidelines’)”
- Revisions were proposed on basis of joint comments provided by EU, France and the Netherlands
 - a number of deletions, additions and editorial changes



Proposed changes to BMT Guidelines

- In particular:

- **delete** section 1 “Selection of Molecular Marker Methodology”
 - **add** new section 2 “Phase 2: Selection of the Detection Method”
 - **do not add** New Section 6: Phase 4: Database Management”
 - **do not add** New Section C: “Definitions”
- TC/54 agreed with the proposal BMT/17, for the EU, France and the Netherlands to prepare a new draft of UPOV/INF/17 for consideration at the BMT/18

⇒ To be considered

under the agenda item 10: Review of document UPOV/INF/17

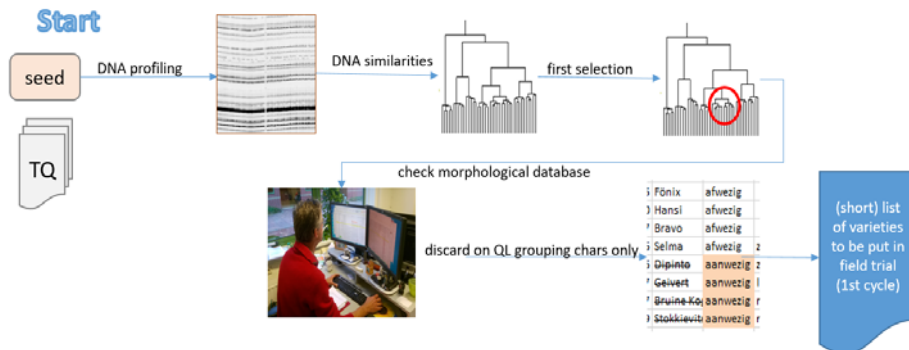
Inclusion of a new model “Genetic selection of similar varieties for the first growing cycle”

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 [...]

A draft of document **TGP/15/2 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)** [...]

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**

New Model 3: Genetic selection of similar varieties for the first growing cycle



New Model 3: Genetic selection of similar varieties for the first growing cycle

1st growing cycle

Side-by-side comparisons
and complete description



'paper check'
morphological
database



discard on all
chars

Extra similar varieties needed?

Clearly D and no extra similar varieties:
positive conclusion
after 1st cycle

Not clearly
Distinct and/or
extra similar
varieties
needed: normal
2nd growing
cycle

Model 1: Characteristic-specific molecular markers



*New Example: Characteristic-specific molecular marker
with incomplete information on state of expression*

Fusarium race 0 ex 1

UPOV characteristics		Genes	I	I2	I3	I7
tomato	tomato rootstock	Races				
48.1 *	24.1 *	0 (ex 1)	R	R	R	R
48.2 *	24.2 *	1 (ex 2)	S	R	R	R
48.3	24.3 *	2 (ex 3)	S	S	R	R

⇒ To be considered at BMT/18
under the agenda item 14 “Revision of document TGP/15”

Session to facilitate cooperation

At the BMT/17, **Discussion groups** had been 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**.

The TC/54 agreed that the results of the coordination session in the BMT be reported to the other Technical Working Parties (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 and **explore areas for cooperation**.

⇒ To be considered
under the agenda item 15 “Session to facilitate cooperation”

Cooperation between international organizations

The TC/54 agreed 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/INF/16 “Exchangeable Software”, subject to the approval of the Council and in coordination with OECD and ISTA; and
- (c) the BMT to develop lists of possible joint initiatives with OECD and ISTA in relation to molecular techniques for consideration by the TC.

⇒ To be considered under the agenda item 6
“Cooperation between international organizations”

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ESSENTIALLY DERIVED VARIETIES

- Purpose and concept
- Protection of EDVs
- Protection of Initial Variety
- Implementation
- UPOV guidance

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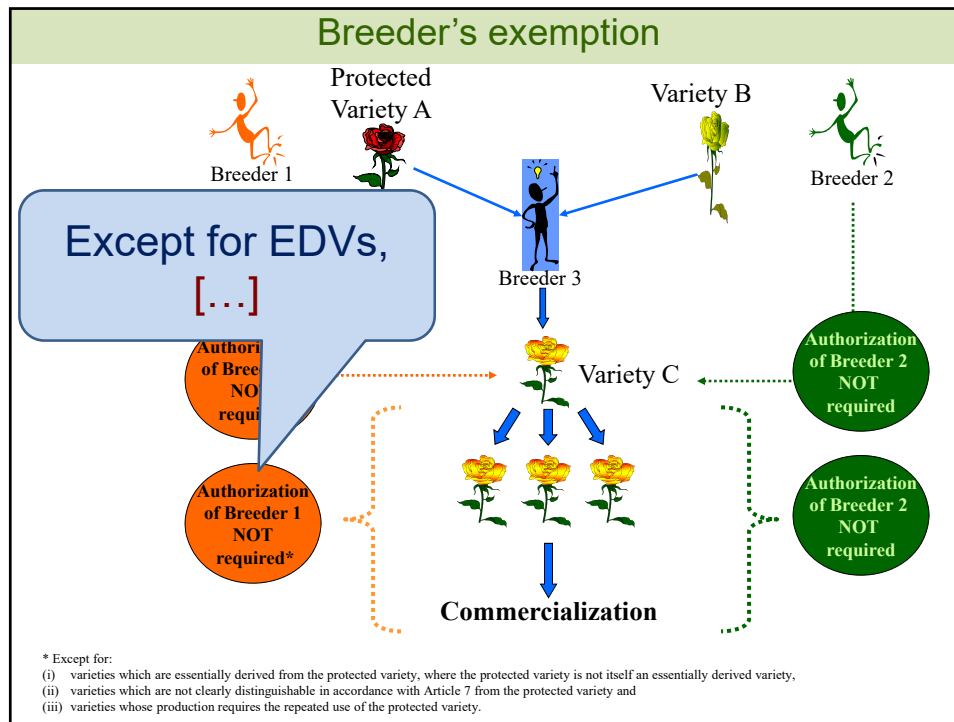
ESSENTIALLY DERIVED VARIETIES

PURPOSE:

to ensure sustainable progress in plant breeding development by:

- providing effective protection for the breeder and
- encouraging cooperation between breeders and developers of new technologies such as genetic modification

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ESSENTIALLY DERIVED VARIETIES

Article 14(5):

(a) The provisions of paragraphs (1) to (4)* shall also apply in relation to

(i) **varieties which are essentially derived** from the protected variety, where the protected variety is not itself an essentially derived variety,

*** = COMMERCIALIZATION**

ESSENTIALLY DERIVED VARIETIES

...a variety shall be deemed to be **ESSENTIALLY DERIVED** from another variety ("the **INITIAL VARIETY**") **when**

- (i) it is **predominantly derived from the INITIAL VARIETY**, or from a variety that is itself predominantly derived from the initial variety, **while retaining the expression of the essential characteristics** that result from the genotype or combination of genotypes of the **INITIAL VARIETY**,
- (ii) it is **clearly distinguishable** from the **INITIAL VARIETY** and
- (iii) **except for the differences which result from the act of derivation, it conforms to the INITIAL VARIETY in the expression of the essential characteristics** that result from the genotype or combination of genotypes of the initial variety.

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ESSENTIALLY DERIVED VARIETIES

May be obtained for example by:

- **selection** of a natural or induced **mutant**
- **selection** of a **somaclonal variant**
- **selection** of a **variant individual** from plants of the initial variety
- **back-crossing**
- transformation by **genetic engineering**

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ESSENTIALLY DERIVED VARIETIES

- Purpose and concept
- **Protection of EDVs**
- Protection of Initial Variety
- Implementation
- UPOV guidance

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ESSENTIALLY DERIVED VARIETIES

Can EDVs be protected?

same conditions (novelty, DUS)



YES

Can EDVs be commercialized?

authorization of the
PBR holder of the **INITIAL VARIETY**
and
PBR holder of **EDV** required



AUTHORIZATION
NEEDED

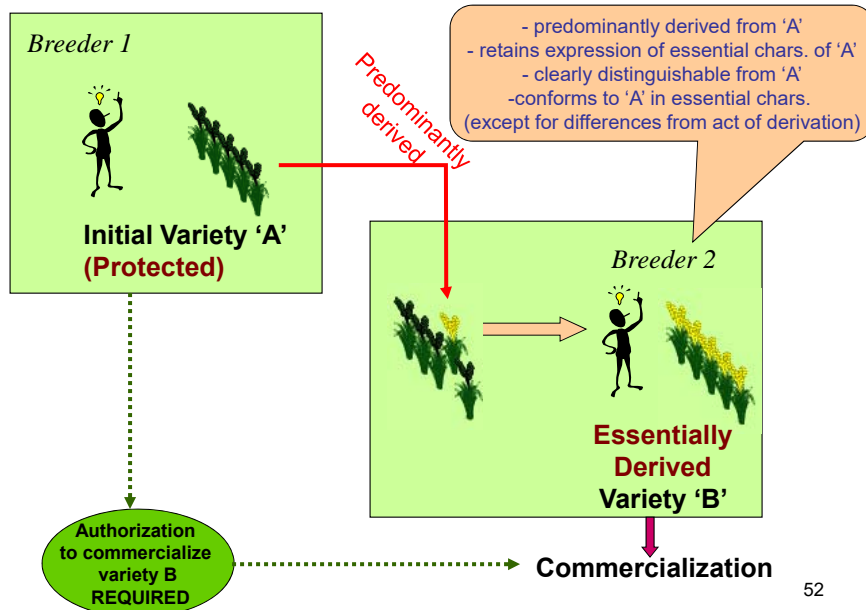
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ESSENTIALLY DERIVED VARIETIES

- Purpose and concept
- Protection of EDVs
- **Protection of Initial Variety**
- Implementation
- UPOV guidance

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ESSENTIALLY DERIVED VARIETIES



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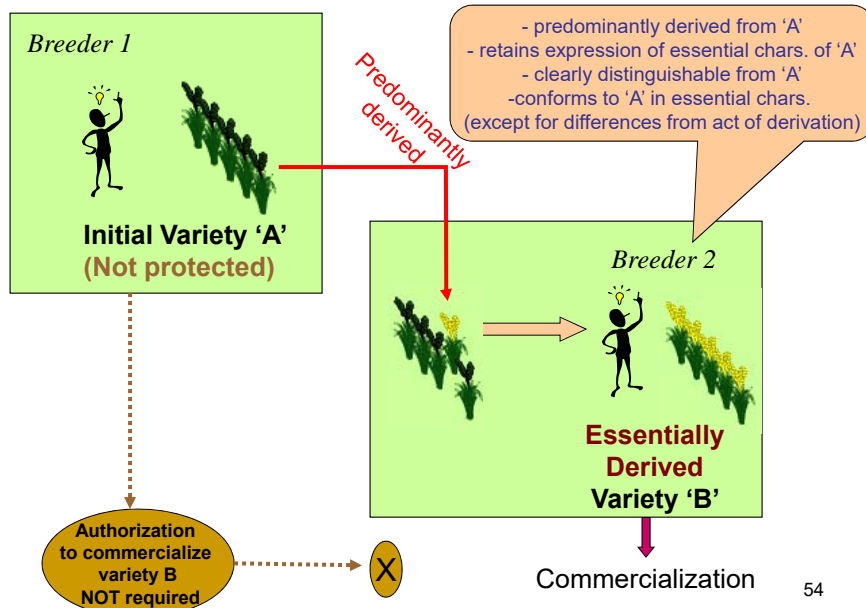
ESSENTIALLY DERIVED VARIETIES

...a variety shall be deemed to be essentially derived from another variety ("the **initial variety**")

INITIAL variety
is not restricted to
PROTECTED variety

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ESSENTIALLY DERIVED VARIETIES



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ESSENTIALLY DERIVED VARIETIES

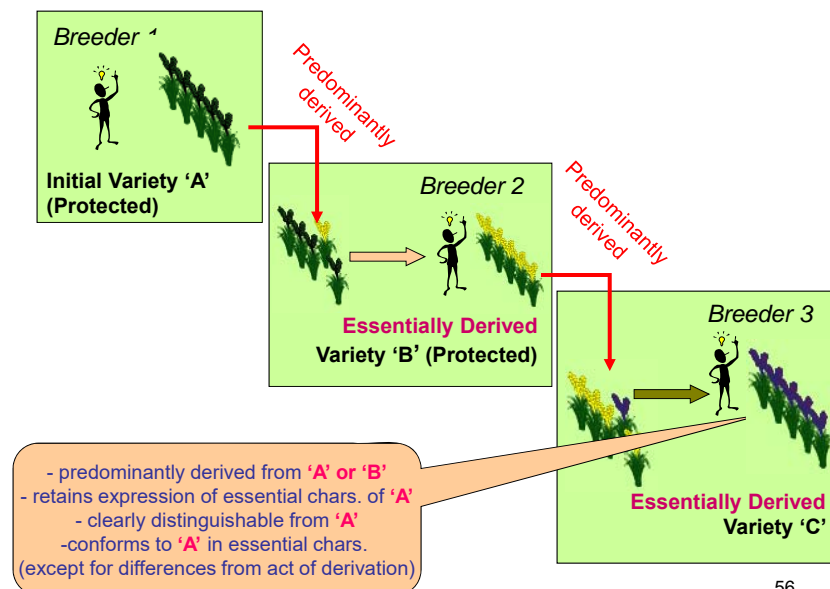
Article 14(5):

(a) The provisions of paragraphs (1) to (4) shall also apply in relation to

(i) varieties which are essentially derived from the protected variety, where the protected variety is not itself an essentially derived variety

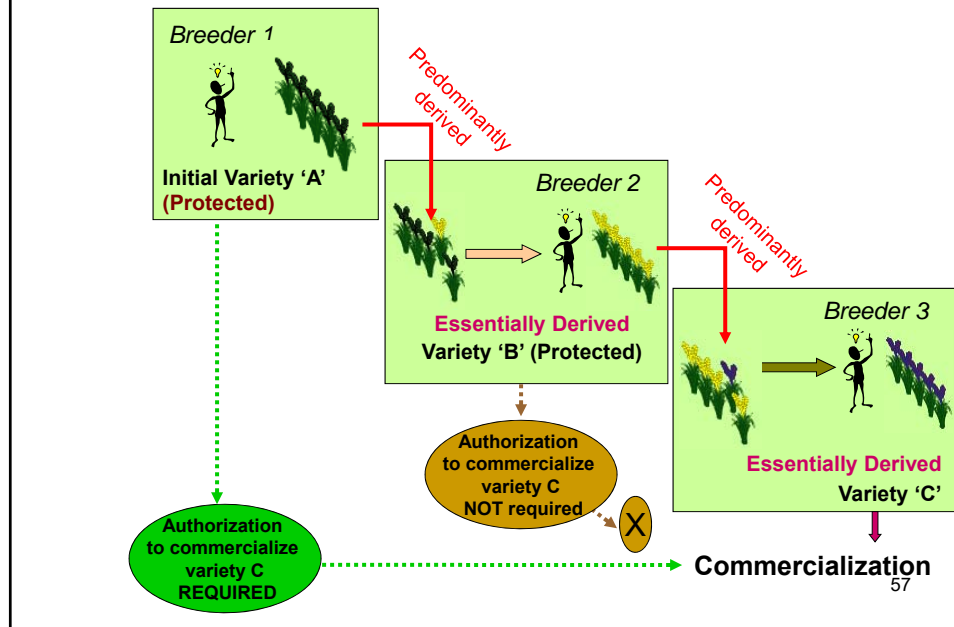
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ESSENTIALLY DERIVED VARIETIES

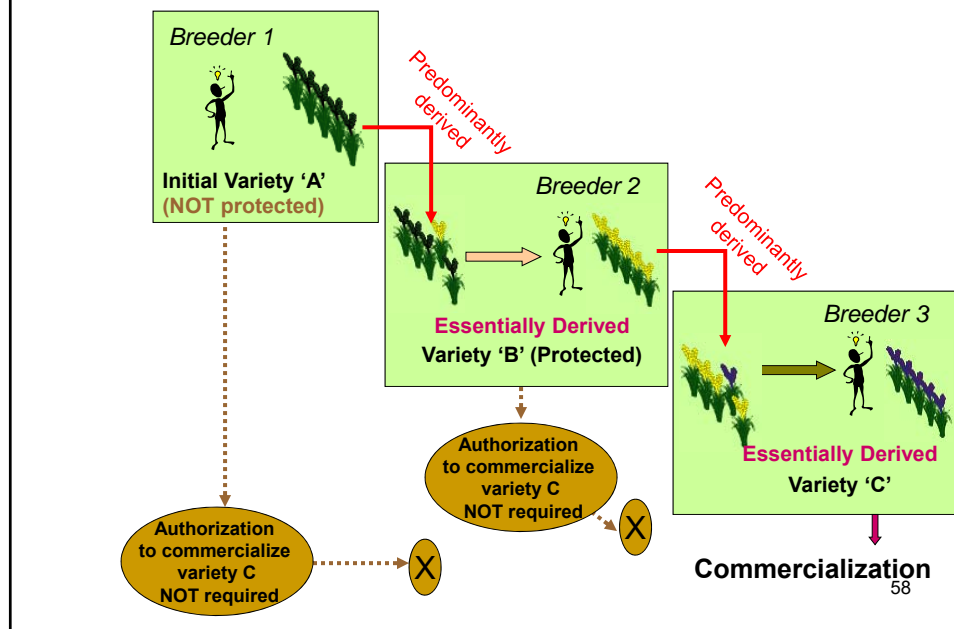


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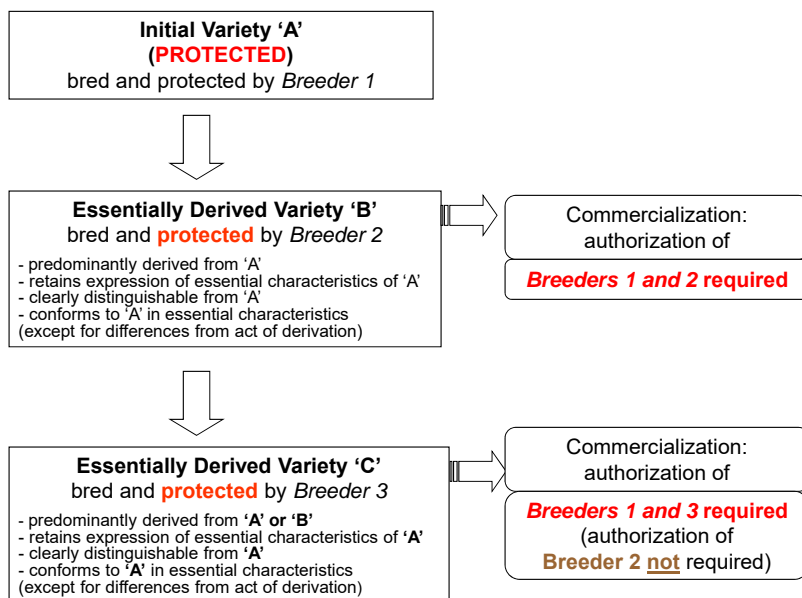
ESSENTIALLY DERIVED VARIETIES



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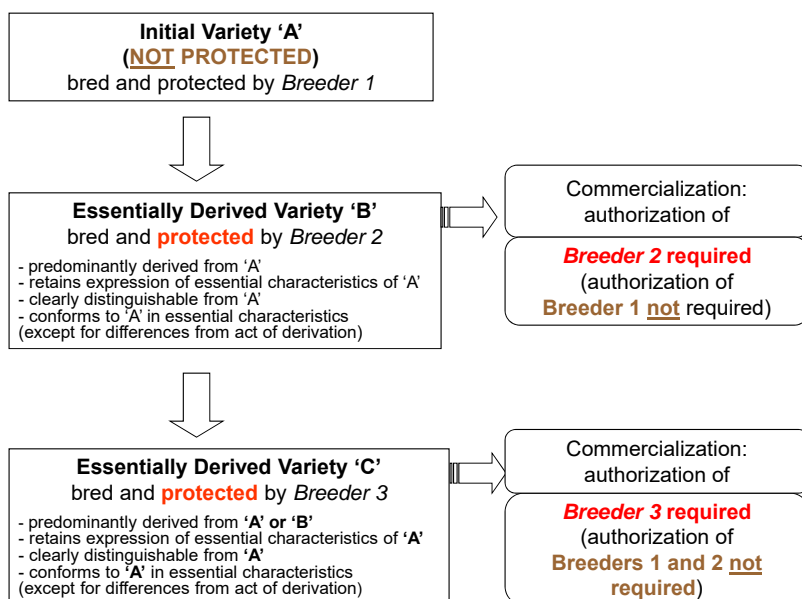


ESSENTIALLY DERIVED VARIETIES



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ESSENTIALLY DERIVED VARIETIES



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ESSENTIALLY DERIVED VARIETIES

- Purpose and concept
- Protection of EDVs
- Protection of Initial Variety
- **Implementation**
 - With regard to establishing whether a variety is an essentially derived variety, a **common view expressed by members of the UPOV** is that the existence of a relationship of essential derivation between protected varieties is a **matter for the holders of plant breeders' rights in the varieties concerned.**
- UPOV guidance



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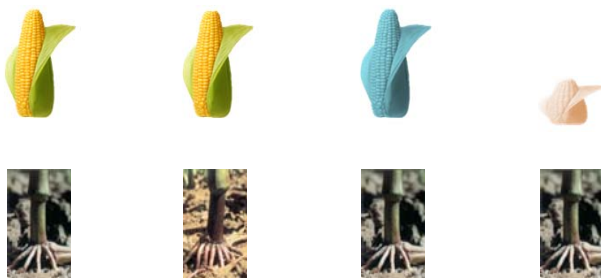
ESSENTIALLY DERIVED VARIETIES

- Purpose and concept
- Protection of EDVs
- Protection of Initial Variety
- Implementation
- **UPOV guidance**

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UPOV/EXN/EDV/2

ESSENTIALLY DERIVED VARIETY?



(Photo: istockphoto/valentinarr)

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 - The Role of UPOV in Variety Identification

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VARIETY IDENTIFICATION

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

– [...]

“(viii) Provide a **forum for discussion on the use of biochemical and molecular techniques in the consideration of** essential derivation and **variety identification.**”

VARIETY IDENTIFICATION

- UPOV does not directly address variety identification - it is concerned with distinctness (related but not the same);
- The variety description can play a role in variety identification

Variety description developed at the
time of the grant of the breeder's right
(original variety description)

Purposes:

- (a) to describe the characteristics of the variety;
and
- (b) to identify and list similar varieties and
differences from these varieties;

combined with the information on the basis for (a)
and (b), namely:

Variety description developed at the
time of the grant of the breeder's right (Continued)
(original variety description)

Purposes:

- (a) to describe the characteristics of the variety; and
- (b) to identify and list similar varieties and differences from these varieties;

combined with the information on the basis for (a) and (b), namely:

- Date and document number of UPOV Test Guidelines;
- Date and/or document number of Reporting Authority's test guidelines;
- Reporting Authority;
- Testing station(s) and place(s);
- Period of testing;
- Date and place of issue of document;
- Group: (Table: Characteristics; States of Expression; Note; Remarks);
- Additional Information:
 - (a) Additional Data
 - (b) Photograph (if appropriate)
 - (c) RHS Colour Chart version used (if appropriate)
 - (d) Remarks

Variety description developed at the
time of the grant of the breeder's right (Continued)
(original variety description)

**Status in relation to the verification of the conformity of plant material to a
protected variety for enforcement of the breeder's right:**

"While the UPOV Convention requires members of the Union to provide for appropriate legal remedies for the effective enforcement of breeders' rights, it is a **matter for breeders** to enforce their rights." (UPOV/EXN/ENF/1)

the **description** of the variety characteristics **and** the basis for **distinctness from the most similar** variety are **linked** to the circumstances of the DUS examination, namely:

- Date and document number of UPOV Test Guidelines;
- Date and/or document number of Reporting Authority's test guidelines;
- Reporting Authority;
- Testing station(s) and place(s);
- Period of testing;
- Date and place of issue of document;
- Group: (Table: Characteristics; States of Expression; Note; Remarks);
- Additional Information:
 - (a) Additional Data
 - (b) Photograph (if appropriate)
 - (c) RHS Colour Chart version used (if appropriate)
 - (d) Remarks

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