Technical Working Party
on Automation and Computer Programs
Thirtieth Session

PREPARATORY WORKSHOP

Chisinau, Republic of Moldova
June 25, 2012

1. INTRODUCTION TO UPOV

PROGRAM

1. Introduction to UPOV
2. Overview of the General Introduction (document TG/1/3 and TGP documents)
3. Characteristics

(a) Selection of characteristics

(b) Drafting characteristics for TGs

(i) Types of expression (QL; QN; PQ), notes and distinctness
(ii) Method of observation (V/M; G/S)

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

PROGRAM

4. Situation in UPOV Concerning the possible use of Molecular Techniques in the DUS Examination
5. Exchangeable software
6. UPOV databases (PLUTO - Plant Variety Database; GENIE database)
7. The UPOV website
8. Role of UPOV Technical Working Parties (TWPs)
9. Agenda for the TWC Session
10. Feedback

2. OVERVIEW OF THE GENERAL INTRODUCTION

(DOCUMENT TG/1/3 AND TGP DOCUMENTS)

Guidance for DUS Examination

facilitates:

BEST PRACTICE (based on experience)

=> good decisions

=> good definition of the object of protection (strong protection)

=> efficiency in method of examination (learn from the best)

HARMONIZATION

=> efficiency

- mutual acceptance of DUS reports (minimize cost of examination for individual authorities)
- mutual recognition of variety descriptions (all parties speak the same "language")
- simple and cheap system for applicants (minimize cost for breeders)

THE CONDITIONS FOR GRANTING A BREEDER'S RIGHT

Criteria to be satisfied

- NOVELTY
- **D**ISTINCTNESS
- **U**NIFORMITY
- **S**TABILITY

"DUS"

UPOV provides guidance by:

- The "General Introduction" (TG/1/3)
  - General technical principles
  - Organization of DUS Testing
  - Associated "TGP" Documents (e.g. statistical methods)

= version 3

THE CONDITIONS FOR GRANTING A BREEDER'S RIGHT

Other conditions

- VARIETY DENOMINATION
- FORMALITIES
- PAYMENT OF FEES

NO OTHER CONDITIONS!

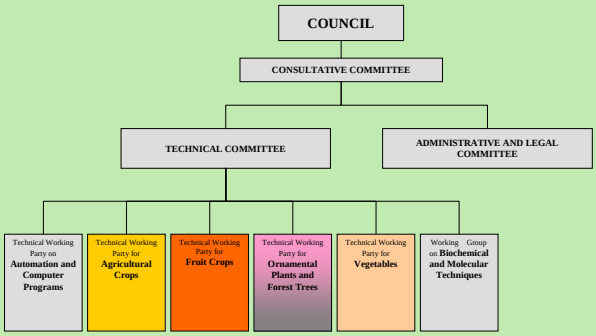
TG/1/3 General Introduction

"Associated" TGP Documents

Ref.	Title
TG/00	List of TGP Documents and Latest Issue Dates
TGP/1	General Introduction With Explanations
TGP/2	List of Test Guidelines Adopted by UPOV
TGP/3	Varieties of Common Knowledge
TGP/4	Constitution and Maintenance of Variety Collections
TGP/5	Experience and Cooperation in DUS testing
TGP/6	Arrangements for DUS testing
TGP/7	Development of Test Guidelines
TGP/8	Trial Design and Techniques Used in the Examination of DUS
TGP/9	Examining Distinctness
TGP/10	Examining Uniformity
TGP/11	Examining Stability
TGP/12	Special Characteristics
TGP/13	Guidance for New Types and Species
TGP/14	Glossary of Technical, Botanical and Statistical Terms Used in UPOV Documents
TGP/15	New Types of Characteristics

3. CHARACTERISTICS

UPOV Structure



UPOV provides guidance by:

- The "General Introduction" (TG/1/3)
  - General technical principles
  - Organization of DUS Testing
  - Associated "TGP" Documents (e.g. statistical methods)

AND

- **"Test Guidelines"**
  - **Species/Crop-specific recommendations developed by crop experts**
  - **TGP/7 "Development of Test Guidelines" adopted**

3. CHARACTERISTICS

(a) Selection of characteristics

E

TG/250/1
ORIGINAL: English
DATE: 2009-04-01

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

YAM

UPOV Code:
DIOSC_ALA; DIOSC_BAT; DIOSC_JAP

Dioscorea alata L., *Dioscorea polystachya* THUNB.; *Dioscorea japonica* Thunb.

GUIDELINES
FOR THE CONDUCT OF TESTS
FOR DISTINCTNESS, UNIFORMITY AND STABILITY

Alternative Names:

Botanical name	English	French	German	Spanish
Dioscorea alata L.	Greater yam, Asiatic greater yam, Two-months' yam, Water yam, White yam, Winged yam, Yam	Grande igname, Igname ailée, Igname de Chine	Große Jamswurzel, Wasser-Yamswurzel	Name Mayor, Ñame de agua, Tabaco
Dioscorea polystachya THUNB.; *Dioscorea batatas* Decne.	Chinese yam, Chinese potato, Cinnamon vine	Igname	Chinesische Yamswurzel	
Dioscorea japonica Thunb.	Japanese yam	Igname japonaise		

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and in associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

[Footer] These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV's Code, which can be found on the UPOV Website (www.upov.int), for the latest information.]

"CHARACTERISTICS"

- may have direct commercial relevance
  - Flower color (ornamental)
  - Fruit color
- but **commercial relevance NOT required**
  - Leaf shape

Selection of Characteristics

The basic requirements that a characteristic should fulfill before it is used for DUS testing or producing a variety description are that its expression (TG/1/3: Section 4.2.1) :

(a) **results from a given genotype** or combination of genotypes;

(b) is sufficiently **consistent and repeatable** in a **particular environment**;

(c) exhibits sufficient **variation between varieties** to be able to establish distinctness;

(d) is capable of **precise definition and recognition**;

(e) allows **uniformity requirements** to be fulfilled;

(f) allows **stability requirements** to be fulfilled, meaning that it produces consistent and repeatable results after repeated propagation or, where appropriate, at the end of each cycle of propagation.

Selection of Characteristics

Criteria	Fruit: color	Leaf: shape	Yield
(a) results from a given genotype or combination of genotypes	Yes	Yes	Yes
(b) sufficiently consistent and repeatable in a particular environment	Yes	Yes	(No)
(c) exhibits sufficient variation between varieties to be able to establish distinctness	Yes	Yes	???
(d) is capable of precise definition and recognition	Yes	Yes	(No)
(e) allows uniformity requirements to be fulfilled	Yes	Yes	???
(f) allows stability requirements to be fulfilled	Yes	Yes	???
Commercial value	Yes	No	Yes
ACCEPTABILITY	Yes	Yes	No

Selection of Characteristics

- **Yield ???**
- **Straw strength ???**

Etc.

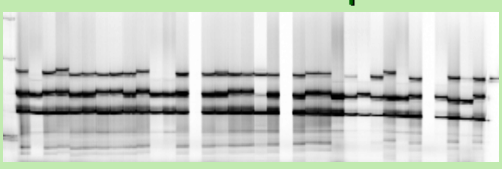
Special Characteristics: Disease Resistance

Criteria	Disease Resistance
(a) results from a given genotype or combination of genotypes	*Knowledge of nature of genetic control of resistance is important
(b) sufficiently consistent and repeatable in a particular environment	*Standardize conditions (greenhouse / laboratory) & methodology *Standardize inoculum *Ring-test
(c) exhibits sufficient variation between varieties to be able to establish distinctness	*Susceptible / Resistant OR varying degrees of resistance?
(d) is capable of precise definition and recognition	*Define and recognize races and strains
(e) allows uniformity requirements to be fulfilled	see above
(f) allows stability requirements to be fulfilled	see above
	Difficult and expensive

Selection of Characteristics

Criteria	Fruit: color	Leaf: shape	Yield
(a) results from a given genotype or combination of genotypes	Yes	Yes	
(b) sufficiently consistent and repeatable in a particular environment	Yes	Yes	
(c) exhibits sufficient variation between varieties to be able to establish distinctness	Yes	Yes	
(d) is capable of precise definition and recognition	Yes	Yes	
(e) allows uniformity requirements to be fulfilled	Yes	Yes	
(f) allows stability requirements to be fulfilled	Yes	Yes	
Commercial value	Yes	No	
ACCEPTABILITY	Yes	Yes	

Molecular Techniques?



3. CHARACTERISTICS

(b) Drafting characteristics for TGs

(i) Types of expression (QL, QN, PQ), notes and distinctness

7. Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

Char. No.	English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1. (*) (+)	**Plant: growth habit**	**Plante : port**	**Pflanze: Wuchsform**	**Planta: porte**		
QN	upright	dressé	aufrecht	erecto	Inuppink	1
	semi-upright	semi dressé	halbaufrecht	semierecto	D0158-1	2
	spreading	étalé	breitwüchsig	abierto	Sunnem 03	3
	semi-trailing	semi-étalé	halbhängend	semirrastrero	Impsaf	4
	trailing	coureux	hängend	rastrero	Organza	5
2. (*)	**Plant: height**	**Plante : hauteur**	**Pflanze: Höhe**	**Planta: altura**		
QN	short	basse	niedrig	baja	Yateye	3
	medium	moyenne	mittel	media	D0158-1	5
	tall	haute	hoch	alta	Inuppink	7

TYPE OF EXPRESSION OF CHARACTERISTICS
(**QL, QN, PQ**)

QUALITATIVE Characteristics

"Qualitative characteristics" are those that are **expressed in discontinuous states** (e.g. sex of plant: dioecious female (1), dioecious male (2), monoecious unisexual (3), monoecious hermaphrodite (4)).
These states are self-explanatory and independently meaningful. All states are necessary to describe the full range of the characteristic, and every form of expression can be described by a single state. The order of states is not important. As a rule, the **characteristics are not influenced by environment**.

Types of Expression

QL: QUALITATIVE

QN: QUANTITATIVE

PQ: PSEUDO-QUALITATIVE

Qualitative characteristic

Clematis: Leaf: type

1 simple | 2 ternate | 3 biternate | 4 triternate

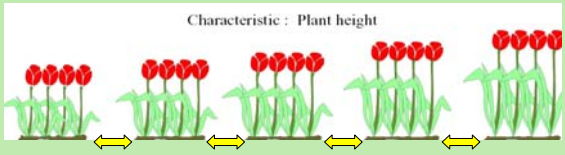
Qualitative (QL) characteristic?

Anthocyanin coloration: QL (=absent / present)?

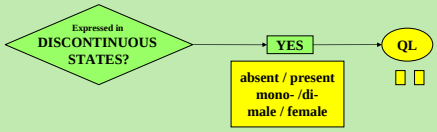
NO!

	Variety A	Variety B	Variety C
Environment A	absent	present	absent
Environment B	absent	present	present

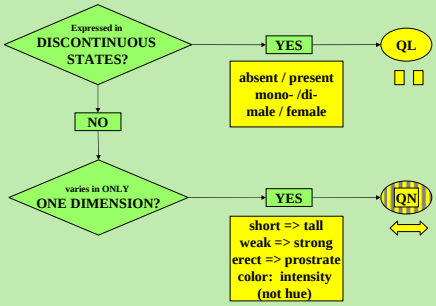
Quantitative Characteristic



QL, QN or PQ?



QL, QN or PQ?



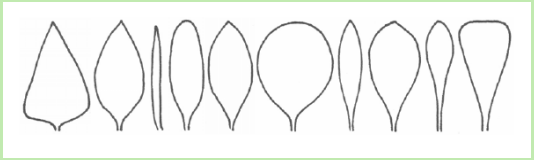
QUANTITATIVE Characteristics

"Quantitative characteristics" are those where the expression covers the full range of variation from one extreme to the other. The **expression can be recorded on a one-dimensional, continuous or discrete, linear scale**. The range of expression is divided into a number of states for the purpose of description (e.g. length of stem: very short (1), short (3), medium (5), long (7), very long (9)). The division seeks to provide, as far as is practical, an even distribution across the scale. The Test Guidelines do not specify the difference needed for distinctness. The states of expression should, however, be meaningful for DUS assessment.

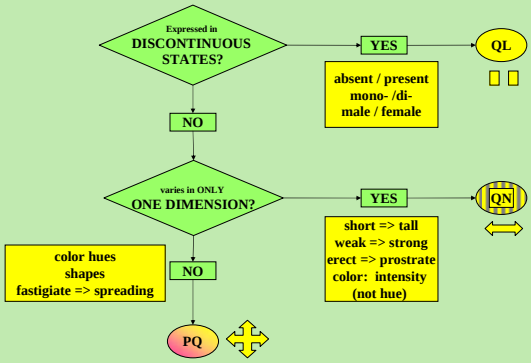
PSEUDO-QUALITATIVE Characteristics

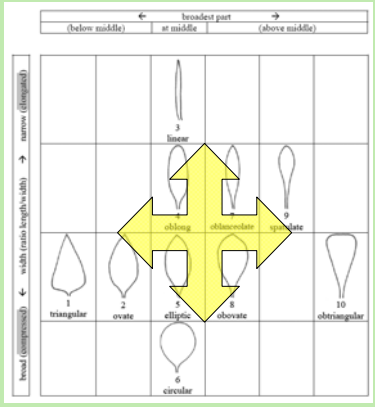
In the case of "pseudo-qualitative characteristics," the **range of expression is at least partly continuous, but varies in more than one dimension** (e.g. shape: ovate (1), elliptic (2), circular (3), obovate (4)) and cannot be adequately described by just defining two ends of a linear range. In a similar way to qualitative (discontinuous) characteristics – hence the term "pseudo-qualitative" – each individual state of expression needs to be identified to adequately describe the range of the characteristic.

Example

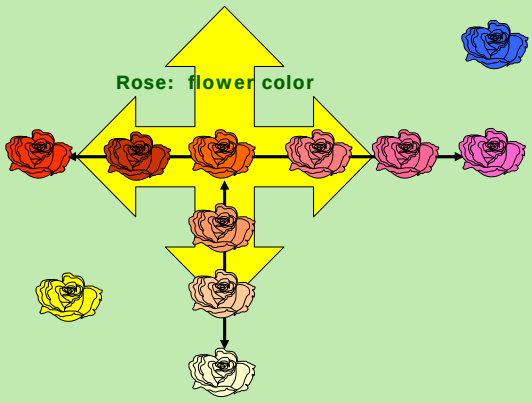


QL, QN or PQ?





EXERCISE



NOTES and DISTINCTNESS according to TYPE OF EXPRESSION (QL, PQ, QN)

Types of Expression

QL: QUALITATIVE

QN: QUANTITATIVE

PQ: PSEUDO-QUALITATIVE

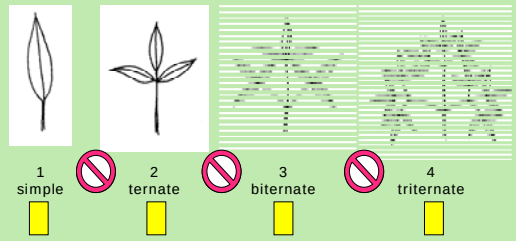
Qualitative Characteristics: distinctness

In qualitative characteristics, the difference between two varieties may be considered clear if one or more characteristics have expressions that fall into **two different states in the Test Guidelines**. Varieties should not be considered distinct for a qualitative characteristic if they have the same state of expression.

(e.g. sex of plant: dioecious female (1), dioecious male (2), monoecious unisexual (3), monoecious hermaphrodite (4)).

Qualitative characteristic

Clematis: Leaf: type



Types of Expression

QL: QUALITATIVE

QN: QUANTITATIVE

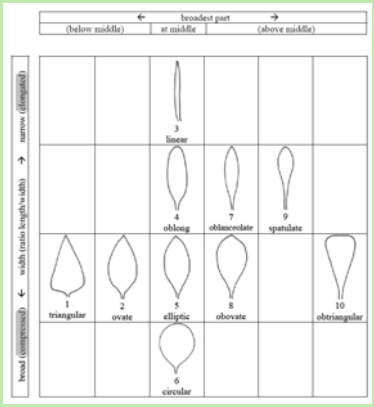
PQ: PSEUDO-QUALITATIVE

Qualitative Characteristics (special cases)

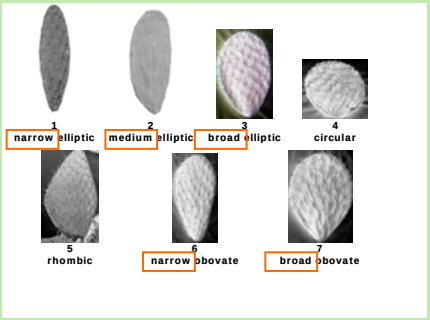
Char No.	Method of Examination	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1. (*)	MS C	**Plant: ploidy**					
QL		diploid					2
		tetraploid					4
3. (*)	VG	**Stem: anthocyanin coloration**					
QL		absent				Gumpoong	1
		present				Chunpoong, Gopoong	9

PSEUDO-QUALITATIVE Characteristics

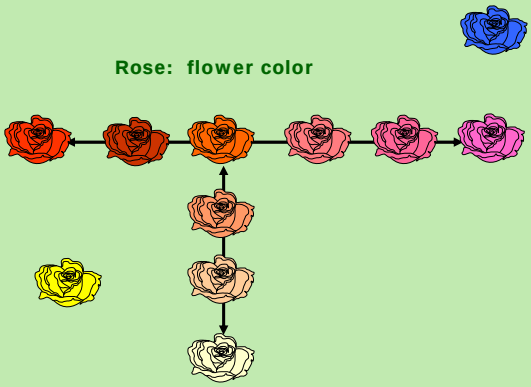
In the case of "pseudo-qualitative characteristics," the **range of expression is at least partly continuous, but varies in more than one dimension** (e.g. shape: ovate (1), elliptic (2), circular (3), obovate (4)) and cannot be adequately described by just defining two ends of a linear range. In a similar way to qualitative (discontinuous) characteristics – hence the term "pseudo-qualitative" – each individual state of expression needs to be identified to adequately describe the range of the characteristic.



Opuntia: Shape of Cladode



Rose: flower color

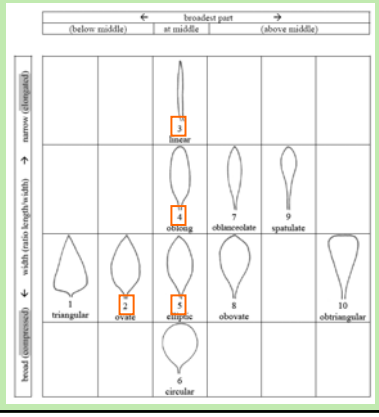


Pseudo-Qualitative Characteristics: **distinctness**

A different state in the Test Guidelines may not be sufficient to establish distinctness (see also section 5.5.2.3). However, in certain circumstances, varieties described by the same state of expression may be clearly distinguishable.

PSEUDO-QUALITATIVE Characteristics (typical examples)

	24. Flower: color of the center (+)	Fleur: couleur du centre	Farbe der Mitte	Flor: color del centro	
PQ	green	vert	grün	verde	1
	yellow	jaune	gelb	amarillo	2
	orange	orange	orange	naranja	3
	pink	rose	rosa	rosa	4
	red	rouge	rot	rojo	5
	purple	pourpre	purpura	púrpura	6



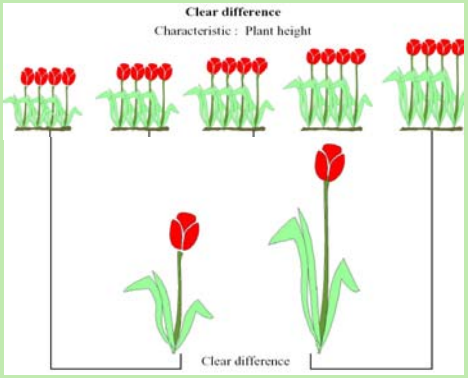
Types of Expression

QL: QUALITATIVE

QN: QUANTITATIVE

PQ: PSEUDO-QUALITATIVE

Quantitative Characteristic



QUANTITATIVE Characteristics

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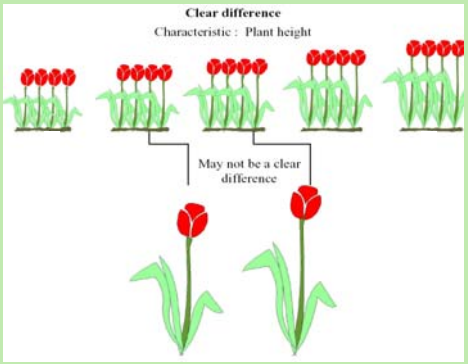
Quantitative Characteristic



Quantitative Characteristics: distinctness

Quantitative characteristics are considered for distinctness according to the method of observation and the features of propagation of the variety concerned...

Quantitative Characteristics (1-9)

weak/strong
short/long
small/large

Note	State
1	very weak (or: absent or very weak)
2	very weak to weak
3	**weak**
4	weak to medium
5	**medium**
6	medium to strong
7	**strong**
8	strong to very strong
9	very strong

Note	State
1	very small (or: absent or very small)
2	very small to small
3	**small**
4	small to medium
5	**medium**
6	medium to large
7	**large**
8	large to very large
9	very large

Quantitative Characteristics (1-9)

Standard Range Version 1	Standard Range Version 2	Standard Range Version 3	Standard Range Version 4
1 very weak (or: absent or very weak)	1 very weak (or: absent or very weak)	-	-
3 weak	3 weak	3 weak	3 weak
5 medium	5 medium	5 medium	5 medium
7 strong	7 strong	7 strong	7 strong
9 very strong	-	9 very strong	-

NOTES
versus
SIDE-BY-SIDE COMPARISON

(Quantitative characteristics)

Quantitative Characteristics (1-9)

State	Example 1 **Size relative to:**	Example 2 **Angle:**	Example 3 **Position:**	Example 4 **Length in relation to:**
1	**much smaller**	**very acute**	**at base**	**equal**
3	moderately smaller	moderately acute	one quarter from base	slightly shorter
5	**same size**	**right angle**	**in middle**	**moderately shorter**
7	moderately larger	moderately obtuse	one quarter from apex end	much shorter
9	**much larger**	**very obtuse**	**at apex**	**very much shorter**

TGP/9/1 "Examining Distinctness"

5.2 Approaches for assessing distinctness

5.2.1 Introduction

5.2.1.1 Approaches for assessment of distinctness based on the growing trial can be summarized as follows:

(a) **Side-by-side visual comparison** in the growing trial (see Section 5.2.2);

(b) **Assessment by Notes / single variety records ("Notes"):** the assessment of distinctness is based on the recorded state of expression of the characteristics of the variety (see Section 5.2.3);

(c) Statistical analysis of growing trial data:

Quantitative Characteristics (at least 3 notes)

Example 2	
1	e.g. absent or weak *(absent or weakly expressed)*
2	moderate (or medium) *(moderately expressed)*
3	strong *(strongly expressed)*

State	Example 1 **Stem: attitude**
1	erect
3	semi-erect
5	prostrate

Quantitative Characteristics: distinctness

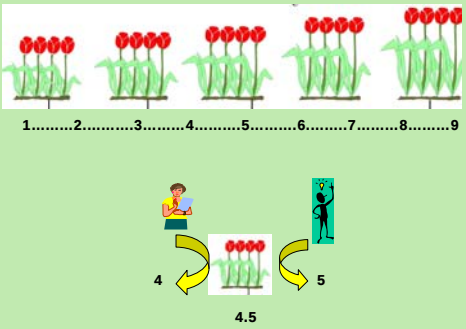
The General Introduction explains that, in the case of visually observed quantitative characteristics:

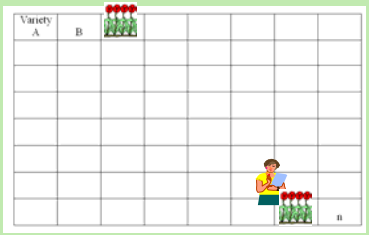
"5.5.2.2.2 **A direct comparison between two similar varieties is always recommended**, since direct pairwise comparisons are the most reliable. In each comparison, **a difference between two varieties is acceptable as soon as it can be assessed visually and could be measured, although such measurement might be impractical or require unreasonable effort**."

TGP/9/1 "Examining Distinctness"

5.2.3.1.2 Where the requirements for distinctness assessment by Notes / single variety records are met it would usually also be possible to make a side-by-side visual comparison. However, in the case of assessment by Notes / single variety records, such proximity is not required, which is a particular advantage where the growing trial contains a large number of varieties and where there are limited possibilities for ensuring that all similar varieties are grouped together in the growing trial. …

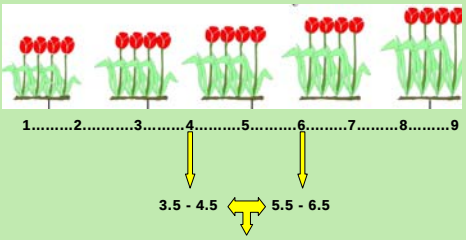
On the other hand, because the varieties are not the subject of a side-by-side visual comparison, the difference required between varieties as a basis for distinctness is, with the exception of qualitative characteristics (see below), somewhat greater.





…and comparison with descriptions in databases

"Two Note" rule…



…means at least ONE note difference!

Quantitative Characteristics: **distinctness**

Quantitative characteristics are considered for distinctness according to the method of observation and the features of propagation of the variety concerned.

Test Guidelines (TGP/7 proposed revised text)

Difference of **two Notes to represent a clear difference if** the **comparison** between two varieties is performed **at the level of Notes**:

WHY?

Quantitative Characteristics: **distinctness**

Quantitative characteristics are considered for distinctness according to the method of observation and the features of propagation of the variety concerned.

Test Guidelines (TGP/7 proposed revised text)

Difference of **two Notes to represent a clear difference if** the **comparison** between two varieties is performed **at the level of Notes**:

Quantitative Characteristics: **distinctness**

TG/233/1
Dianella Diancie, 2007-03-28
- 9 -

	English	français	Deutsch	español	Example Varieties/ Exemples/ Beispielsorten/ Variedades ejemplo	Note/ Nota
6. (*)	(a) **Leaf blade: length**	**Limbe: longueur**	**Blattspreite: Länge**	**Limbo: longitud**		
QN	short	courte	kurz	corto	Codree, Strawberry Sundae	3
	medium	moyenne	mittel	medio	Codusire	5
	long	longue	lang	largo	Balwhalapa, Balwhawhat	7

1 to 9 scale: **Notes 1 and 3**, **Notes 2 and 4**, Notes 3 and 5 **etc.** represent a clear difference

3. CHARACTERISTICS

(b) Drafting characteristics for TGs

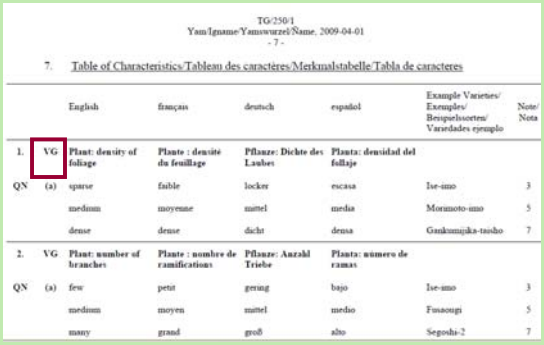
(ii) Method of observation (V/M; G/S)

Quantitative Characteristics: **distinctness**

TG/233/1
Dianella Diancie, 2007-03-28
- 9 -

	English	français	Deutsch	español	Example Varieties/ Exemples/ Beispielsorten/ Variedades ejemplo	Note/ Nota
5.	**Stem: anthocyanin coloration below inflorescence**	**Tige: pigmentation anthocyanique sous inflorescence**	**Trieb: Anthocyanfärbung unter dem Blütenstand**	**Tallo: pigmentación antocianica por debajo de la inflorescencia**		
QN	absent or weak	absente ou faible	fehlend oder gering	ausente o débil	Heccham	1
	medium	moyenne	mittel	media	Hecrace	2
	strong	forte	stark	fuerte		3

1 to 3 scale: **only Notes 1 and 3** represent a clear difference

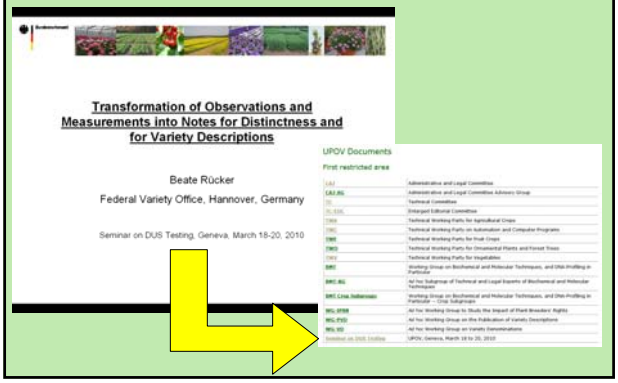


TG/250/1
Yam/Igname/Yamswurzel/Name, 2009-04-01
- 7 -

7. Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielsorten/ Variedades ejemplo	Note/ Nota
1.	VG	**Plant: density of foliage**	**Plante : densité du feuillage**	**Pflanze: Dichte des Laubes**	**Planta: densidad del follaje**		
QN	(a)	sparse	faible	locker	escasa	Ise-imo	3
		medium	moyenne	mittel	media	Morimoto-imo	5
		dense	dense	dicht	densa	Gaukumajika-taisho	7
2.	VG	**Plant: number of branches**	**Plante : nombre de ramifications**	**Pflanze: Anzahl Triebe**	**Planta: número de ramas**		
QN	(a)	few	petit	gering	bajo	Ise-imo	3
		medium	moyen	mittel	medio	Fusaotgi	5
		many	grand	groß	alto	Segoshi-2	7

Process levels other than Notes...



Transformation of Observations and Measurements into Notes for Distinctness and for Variety Descriptions

Beate Rücker

Federal Variety Office, Hannover, Germany

Seminar on DUS Testing, Geneva, March 18-20, 2010

UPOV Documents

First restricted area

Method of Observation

M: Measurement:
an objective **observation against a calibrated, linear scale** e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.);

V: Visual observation:
includes observations where the expert uses **reference points** (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. color charts).

"Visual" observation refers to the sensory observations of the expert and, therefore, also **includes smell, taste and touch**.

TGP/9/1 "Examining Distinctness"

Method of propagation of the variety	Type of expression of characteristic		
	QL (QUAL itatative)	PQ (PSEUDO qualitative)	QN (QUANT itative)
Vegetatively propagated, self-pollinated	*Notes (VG)*	*Notes (VG)* *Side-by-side (VG)*	*Notes (VG/MG/MS)* *Side-by-side (VG)* *Statistics (MG/MS)*
Cross-pollinated	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	*Statistics ([MG]/MS/VS)* *Side-by-side (VG)* *Notes (VG/MG/MS)*
Hybrids	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	**

Type of Record
(for the purposes of distinctness)

G: **single record** for a variety, or a **GROUP of plants** or parts of plants;

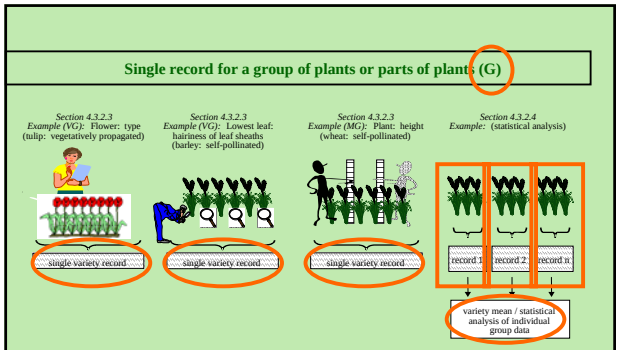
In most cases, "G" provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.

S: **records** for a number of **SINGLE**, individual **plants** or parts of plants ...

TGP/9/1 "Examining Distinctness"

V= Visual observation

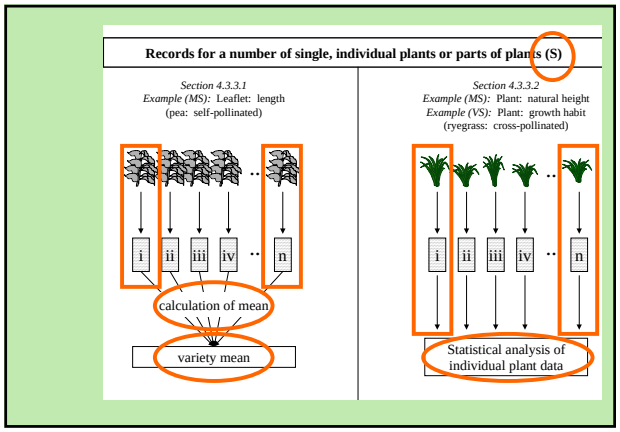
Method of propagation of the variety	Type of expression of characteristic		
	QL (QUAL itatative)	PQ (PSEUDO qualitative)	QN (QUANT itative)
Vegetatively propagated, Self-pollinated	*Notes (VG)*	*Notes (VG)* *Side-by-side (VG)*	*Notes (VG/MG/MS)* *Side-by-side (VG)* *Statistics (MG/MS)*
Cross-pollinated	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	*Statistics ([MG]/MS/VS)* *Side-by-side (VG)* *Notes (VG/MG/MS)*
Hybrids	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	**



TGP/9/1 "Examining Distinctness"

V= Visual observation or
M= Measurement

Method of propagation of the variety	Type of expression of characteristic		
	QL (QUAL itatative)	PQ (PSEUDO qualitative	QN (QUANT itative)
Vegetatively propagated, self-pollinated	*Notes (VG)*	*Notes (VG)* *Side-by-side (VG)*	*Notes (VG/MG/MS)* *Side-by-side (VG)* *Statistics (MG/MS)*
Cross-pollinated	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	*Statistics ([MG]/MS/VS)* *Side-by-side (VG)* *Notes (VG/MG/MS)*
Hybrids	*Notes (VG)* *Statistics (VS*)*	*Notes (VG)* *Side-by-side (VG)* *Statistics (VS*)*	**



EXERCISE

Legal and other considerations

- **Conformity with the UPOV Convention**
- **Potential impact on the strength of protection**

Technical considerations

- **Reliability and robustness of techniques**
- **Accessibility of the technology**
- **Harmonization of methodologies**
- **Cost of examination**
- **Implications for breeders (e.g. cost and time involved for new uniformity requirements)**

4. Situation in UPOV Concerning the possible use of Molecular Techniques in the DUS Examination

→ agenda item 4 of the main session

Harmonized approach

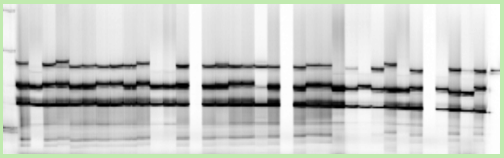
Harmonization

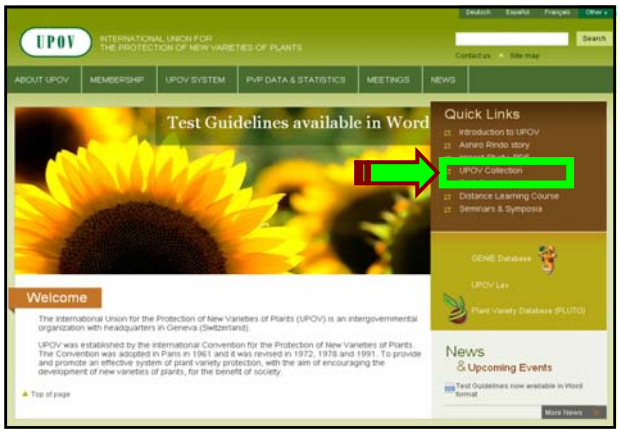
⇒ facilitates cooperation in DUS testing

e.g. purchase of DUS reports

⇒ internationally recognized variety descriptions (effective protection)

Molecular Techniques?





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UPOV

UPOV/INF/18/1
ORIGINAL: English
DATE: October 20, 2011

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

POSSIBLE USE OF MOLECULAR MARKERS IN THE EXAMINATION OF DISTINCTNESS, UNIFORMITY AND STABILITY (DUS)

adopted by the Council
at its forty-fifth ordinary session
on October 20, 2011

Model: characteristic-specific molecular markers

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

View of the BMT Review Group, Technical Committee, Administrative and Legal Committee:

on the basis of the assumptions in the proposal, acceptable within the terms of the UPOV Convention and would not undermine the effectiveness of protection offered under the UPOV system

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

Model: characteristic-specific molecular markers

Assumptions for a gene specific marker:

(a) **DUS examination**: same no. of plants, growing cycles, DUS criteria;
(b) **Linkage**: ensure that the marker is a reliable predictor;
(c) **Different markers** for same gene would be treated as different methods for examining the **same characteristic**;
(d) **Different genes** would be treated as different methods for examining the **same characteristic**;
(e) **Different markers** linked to **different regulatory elements** for the **same gene** would all be treated as different methods for examining the **same characteristic**.

matter for the relevant authority to consider if the assumptions are met

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

POSSIBLE APPLICATION MODELS

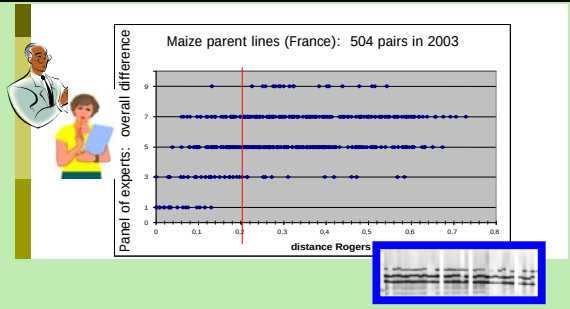
MODELS WITH A POSITIVE ASSESSMENT

- 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

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



Each data point corresponds to the LOWEST note determined by the panel of experts and the Roger's distance, for a given pair

POSSIBLE APPLICATION MODELS

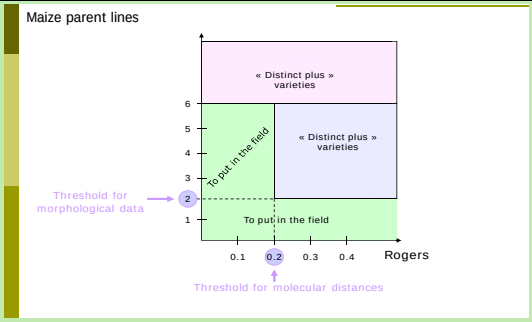
MODELS WITH A POSITIVE ASSESSMENT

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

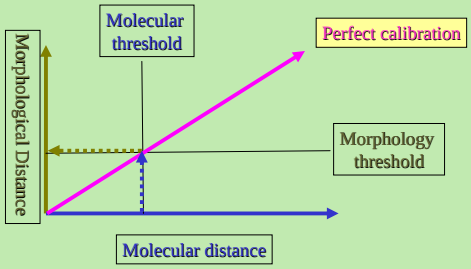
MODELS WITHOUT A POSITIVE ASSESSMENT

- Use of molecular marker characteristics

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



Model: Calibrated molecular distances in the management of variety collections



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

Example: maize parental lines

View of the BMT Review Group, Technical Committee, Administrative and Legal Committee:

where used for the management of variety collections, was acceptable within the terms of the UPOV Convention and would not undermine the effectiveness of protection offered under the UPOV system

Model: Calibrated molecular distances in the management of variety collections

View of the BMT Review Group, Technical Committee, Administrative and Legal Committee:

where used for the management of reference collections was, on the basis of the assumptions in the proposals, acceptable within the terms of the UPOV Convention and would not undermine the effectiveness of protection offered under the UPOV system

whilst recognizing the need to improve the relationship between morphological and molecular distances

Model: Calibrated molecular distances in the management of variety collections

Assumptions for calibration of threshold levels :

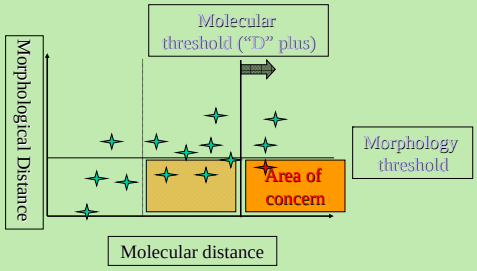
(a) **Uniformity** and **Stability**:
  (i) [molecular] **differences** calculated between varieties **take into account the variation within varieties**;
  (ii) suitable uniformity standards could be developed for molecular markers **without requiring varieties, in general, to be more uniform**

(b) would only be used for the establishment of a **"Distinctness plus" threshold** in the management of reference collections;

(c) would meet all the normal requirements for any characteristic to be used in the DUS examination and, in particular, would be checked to ensure they are **sufficiently consistent and repeatable**.

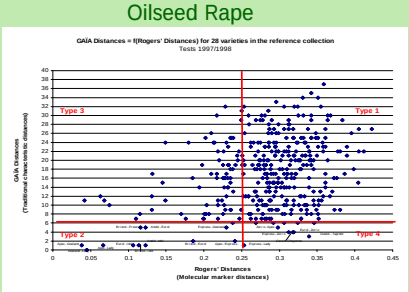
matter for the relevant authority to consider if the assumptions are met

Model: Calibrated molecular distances in the management of variety collections
Example: ***?***



Model: Calibrated molecular distances in the management of variety collections
Example: ***?***

Oilseed Rape



POSSIBLE APPLICATION MODELS

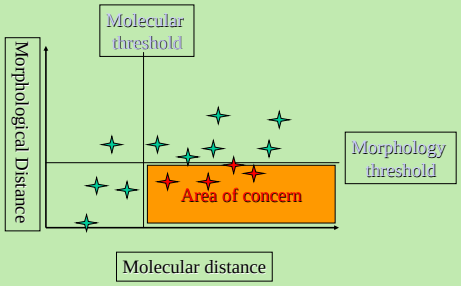
MODELS WITH A POSITIVE ASSESSMENT

- 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

Model: Calibrated molecular distances in the management of variety collections
Example: ***?***



Model: Use of molecular marker characteristics

View of the BMT Review Group, Technical Committee, Administrative and Legal Committee:

- no consensus on the acceptability of the Option 3 proposals within the terms of the UPOV Convention and no consensus on whether they would undermine the effectiveness of protection offered under the UPOV system.
- concerns were raised that, in these proposals, using this approach, it might be possible to use a limitless number of markers to find differences between varieties. The concern was also raised that differences would be found at the genetic level which were not reflected in morphological characteristics

Harmonized approach

Harmonization

⇒ facilitates cooperation in DUS testing

e.g. purchase of DUS reports

⇒ internationally recognized variety descriptions (effective protection)

"Exchangeable Software"

- Members of the Union are invited to offer software for inclusion in this document (UPOV/INF/16) on the basis that the software will be made available to other members of the Union, subject to any specified conditions (e.g. software to be supplied, but no provision of installation or on-going maintenance etc.).

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

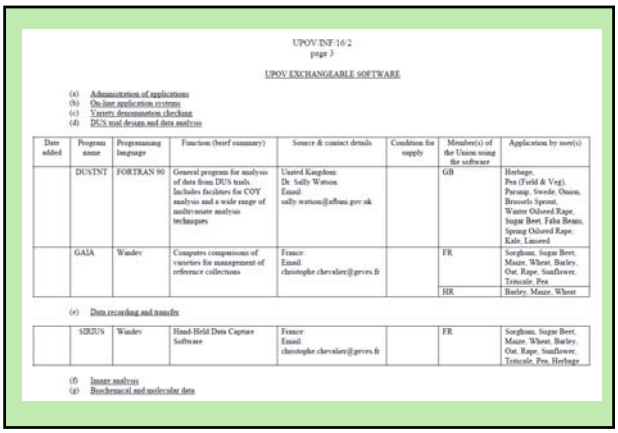
Categories of exchangeable software

(a) Administration of applications
(b) On-line application systems
(c) Variety denomination checking
(d) DUS trial design and data analysis
(e) Data recording and transfer
(f) Image analysis
(g) Biochemical and molecular data.

5. EXCHANGEABLE SOFTWARE

Updating of information on the use of the software presented in UPOV/INT/16

- UPOV/INF/16/2 was adopted by the Council on October 20, 2011



UPOV/INF/16/2
page 3

UPOV EXCHANGEABLE SOFTWARE

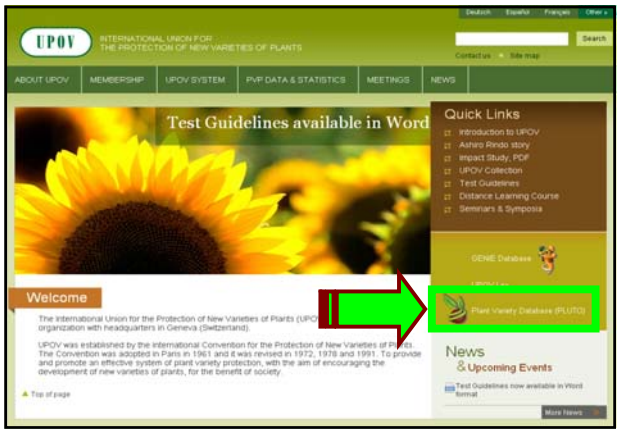
(a) Administration of applications
(b) On-line application systems
(c) Variety denomination checking
(d) DUS trial design and data analysis

Date added	Program name	Programming language	Function (brief summary)	Source & contact details	Condition for supply	Member(s) of the Union using the software	Application by user(s)
	DUSTNT	FORTRAN 90	General program for analysis of data from DUS trials. Includes facilities for COY analysis and a wide range of multivariate analysis techniques	United Kingdom: Dr. Sally Watson Email: sally.watson@stfbau.gov.uk		GB	Herbage, Pea (Field & Veg), Parsnip, Swede, Onion, Brussels Sprout, Winter Oilseed Rape, Sugar Beet, Faba Beans, Spring Oilseed Rape, Kale, Linseed
	GAIA	Windev	Computes compositions of varieties for management of reference collections	France: Email: christophe.chevalier@geves.fr		FR	Sorghum, Sugar Beet, Maize, Wheat, Barley, Oat, Rape, Sunflower, Triticale, Pea
						HR	Barley, Maize, Wheat

(e) Data recording and transfer

	SIRIUS	Windev	Hand-Held Data Capture Software	France: Email: christophe.chevalier@geves.fr		FR	Sorghum, Sugar Beet, Maize, Wheat, Barley, Oat, Rape, Sunflower, Triticale, Pea, Herbage

(f) Image analysis
(g) Biochemical and molecular data

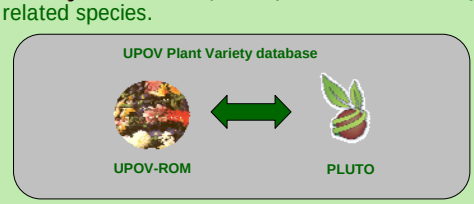


6. UPOV DATABASES

Article 20 of the 1991 Act
(Variety denominations)

(2) [*Characteristics of the **denomination***]

In particular, it **must be different from every denomination** which designates, in the territory of any Contracting Party, **an existing variety** of the same plant species or of a closely related species.



GENIE Database
(Genus / species)

GENIE Database

Variety denomination related information

Protection offered by UPOV members

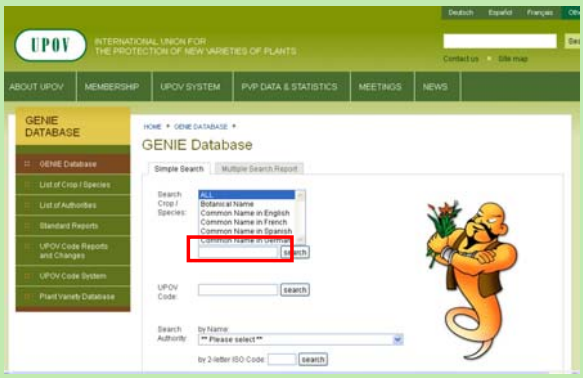
DUS information

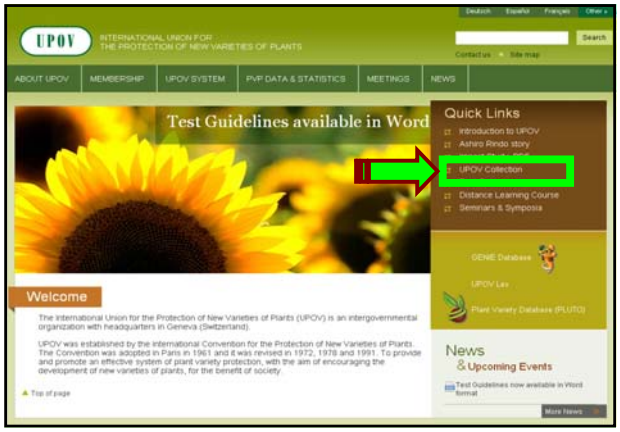
- UPOV Test Guidelines
- practical experience of UPOV (document TC/44/4)
- cooperation in DUS examination (document C/41/5)

UPOV Website

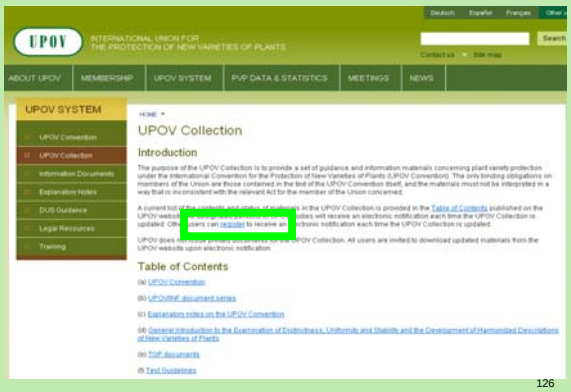
http://www.upov.int

(e-mail: upov.mail@upov.int)





7. THE UPOV WEBSITE



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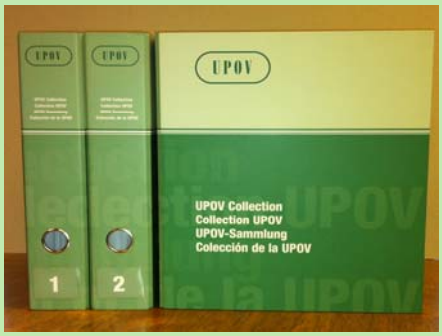
UPOV Collection: physical collection



UPOV Structure

Technical Working Party on Automation and Computer Programs	Technical Working Party for Agricultural Crops	Technical Working Party for Fruit Crops	Technical Working Party for Ornamental Plants and Forest Trees	Technical Working Party for Vegetables	Working Group on Biochemical and Molecular Techniques

Test Guidelines

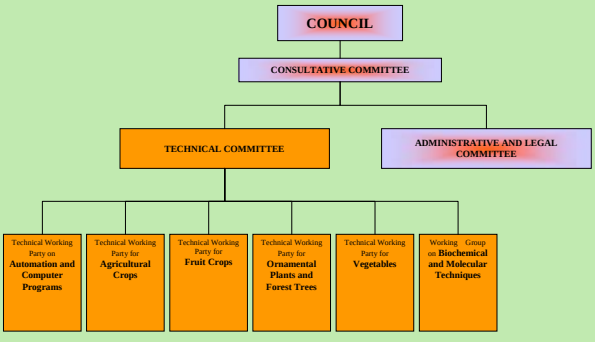
8. ROLE OF THE TECHNICAL WORKING PARTIES AND THE BMT

UPOV Structure

Technical Working Party on Automation and Computer Programs	Technical Working Party for Agricultural Crops	Technical Working Party for Fruit Crops	Technical Working Party for Ornamental Plants and Forest Trees	Technical Working Party for Vegetables	Working Group on Biochemical and Molecular Techniques

TGP documents

UPOV Structure



UPOV Structure

Technical Working Party on Automation and Computer Programs	Technical Working Party for Agricultural Crops	Technical Working Party for Fruit Crops	Technical Working Party for Ornamental Plants and Forest Trees	Technical Working Party for Vegetables	Working Group on Biochemical and Molecular Techniques

Role of the BMT

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 […];
- **(v)** Consider initiatives from TWPs, for the establishment of crop specific subgroups […];
- **(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.

10. FEEDBACK

9. AGENDA for the TWC Session

THANK YOU

(TWC program
to be attached when fixed)