*Technical working party for Fruit Crops*

# PREPARATORY WORKSHOP for the Forty-eighth session

*Office of the Union - UPOV*

*Kelowna, British Columbia, Canada,*
*September 17, 2017*

UPOV
International Union for the Protection of New Varieties of Plants

## PROGRAM

1. Introduction to UPOV and the role of UPOV Technical Working Parties (TWPs)
2. Overview of the General Introduction (document TG/1/3 and TGP documents)
   - Characteristics as the Basis for DUS Examination and Selection of Characteristics
   - Molecular techniques
3. Guidance on drafting Test Guidelines (document TGP/7)
   a) Subject of the Test Guidelines, Material Required and Method of Examination;
   b) Method of Observation (MS, MG, VS, VG);
   c) Types of Expression (QL, PQ, QN), notes and distinctness;
   d) Shape and Color Characteristics;
   e) Example Varieties;
   f) The process for developing UPOV Test Guidelines, including: TG Template; Additional Standard Wording; and Guidance Notes;
4. Agenda for the TWP Session

## 1. INTRODUCTION TO UPOV AND THE ROLE OF UPOV TECHNICAL WORKING PARTIES (TWPS)

## UPOV: INDEPENDENT INTERGOVERNMENTAL ORGANIZATION

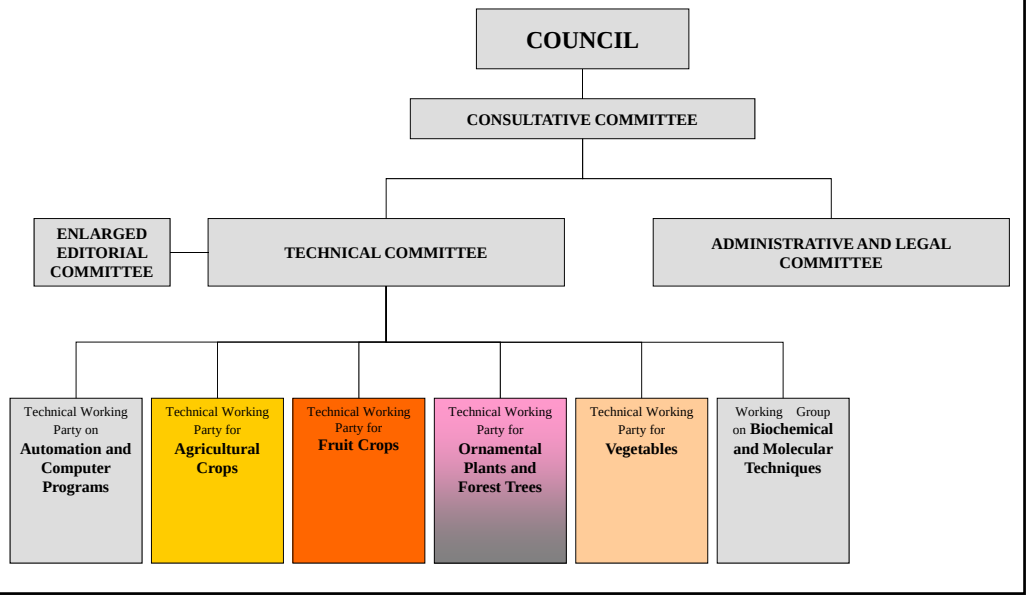
**The International Convention for the Protection of New Varieties of Plants**

**established in 1961**

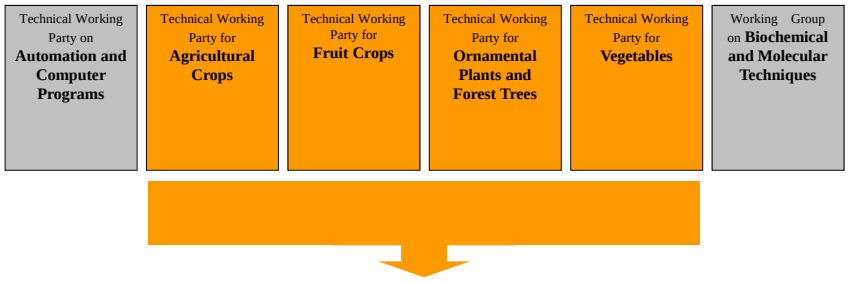
**The International Union for the Protection of New Varieties of Plants**

**Union internationale pour la protection des obtentions végétales**

# UPOV Structure

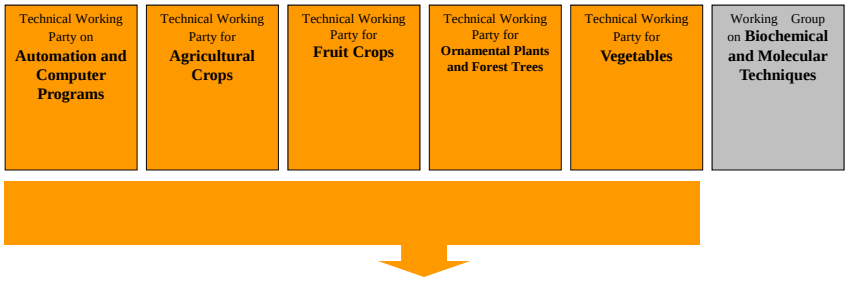


# UPOV Structure



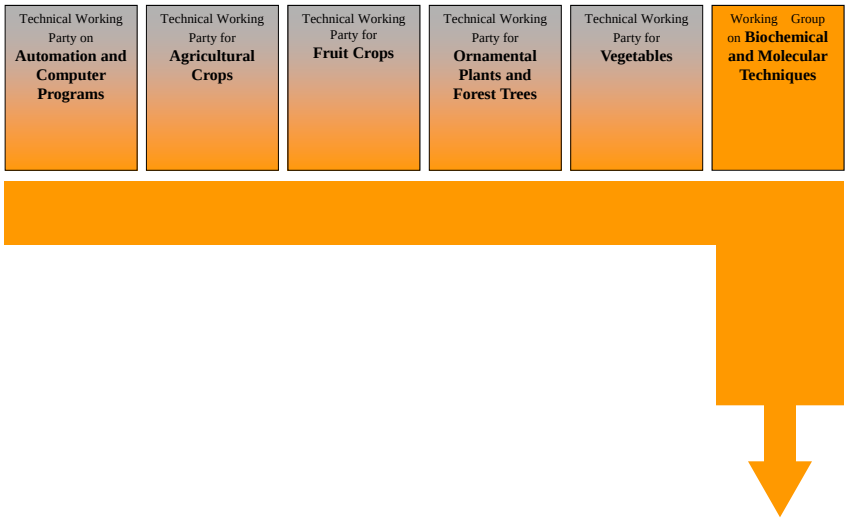

**Test Guidelines**

# UPOV Structure




**TGP documents**

# UPOV Structure




# 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.**

## Questions

## 2. OVERVIEW OF THE GENERAL INTRODUCTION (document TG/1/3 and TGP documents)

a) Characteristics as the Basis for DUS Examination

b) Selection of Characteristics

## 2. OVERVIEW OF THE GENERAL INTRODUCTION (document TG/1/3 and TGP documents)

**a) Characteristics as the Basis for DUS Examination**

b) Selection of Characteristics

## THE CONDITIONS FOR GRANTING A BREEDER'S RIGHT

*Criteria to be satisfied*

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

} **"DUS"**

## THE CONDITIONS FOR GRANTING A BREEDER'S RIGHT

*Other conditions*

- VARIETY DENOMINATION
- FORMALITIES
- PAYMENT OF FEES

**NO OTHER CONDITIONS!**

## 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)

## 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

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

## 2. OVERVIEW OF THE GENERAL INTRODUCTION (document TG/1/3 and TGP documents)

a) Characteristics as the Basis for DUS Examination

**b) Selection of Characteristics**

## "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

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

**Etc.**

## 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 | |

## Selection of Characteristics

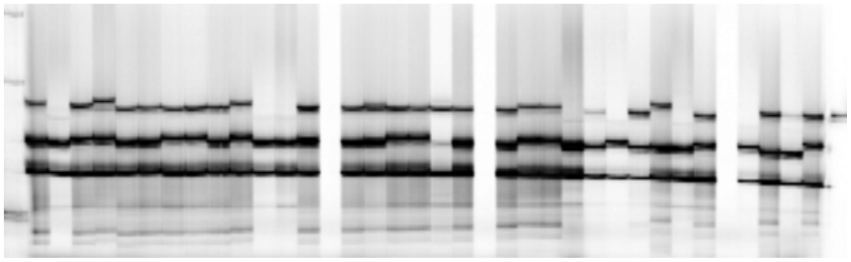
| Criteria | Fruit: color | Leaf: shape | Yield |
|---|---|---|---|
| (a) results from a given genotype or combination of genotypes | Yes | Yes | Yes |
| (b) sufficiently consistent and repeatable in a particular environment | Yes | Yes | (No) |
| (c) exhibits sufficient variation between varieties to 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 |

## 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<br>*Standardize inoculum<br>*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* |

## Questions

## Molecular Techniques?



## 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/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 […]

**UPOV/INF/18/1** (INFormation document)

"Possible Use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability"

The purpose of this document is to provide guidance on the possible use of biochemical and molecular markers in the examination of Distinctness, Uniformity and Stability (DUS). […]

# UPOV/INF/18
# POSSIBLE APPLICATION MODELS

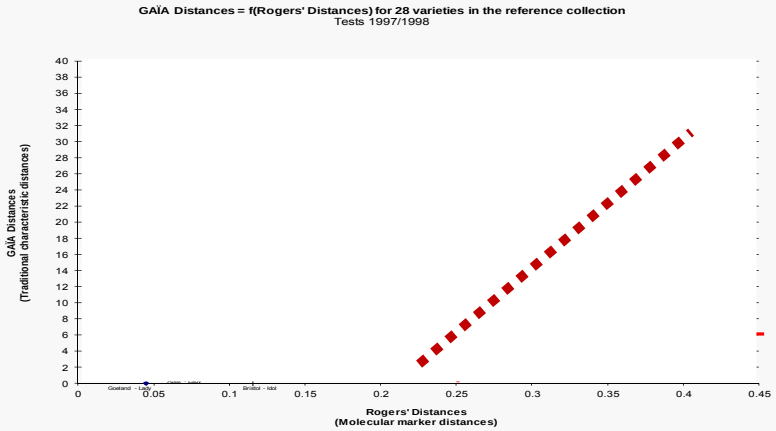
## MODELS WITH A POSITIVE ASSESSMENT

- 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




32

**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**.

→ *Adopted by the Council of UPOV in October, 2013.*

## Model 1: Characteristic-specific molecular markers

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

On the basis that:

[…]

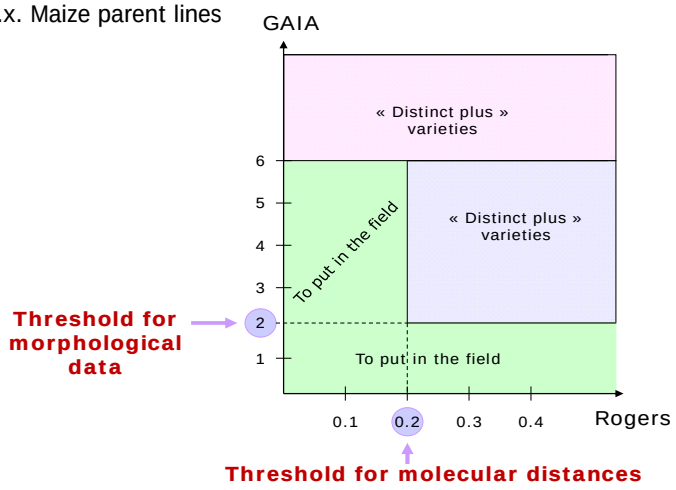
- there is verification of the reliability of the link between the marker and the characteristic;

- 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




## Combining phenotypic and molecular distances in the management of variety collections

**"A combination of phenotypic differences and molecular distances can be used to identify within the variety collection, those varieties which need to be compared with candidate varieties in order to improve the selection of "Distinct plus" varieties, on the following basis:**

**(a)** **there is reliable information that the molecular distances are sufficiently related to phenotypic differences, such that**

**(b)** **the method selects varieties in the variety collection which are similar to the candidate varieties; and**

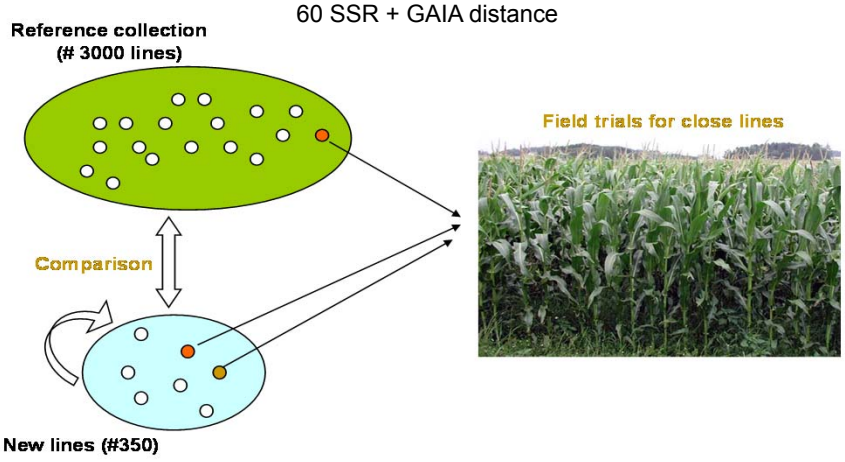
**(c)** **the method does not create an increased risk of not selecting a variety in the variety collection which needs to be compared to the candidate varieties in the field.**

36

## MANAGEMENT OF THE REFERENCE COLLECTION

### DISTINCNESS PROCEDURE

60 SSR + GAIA distance



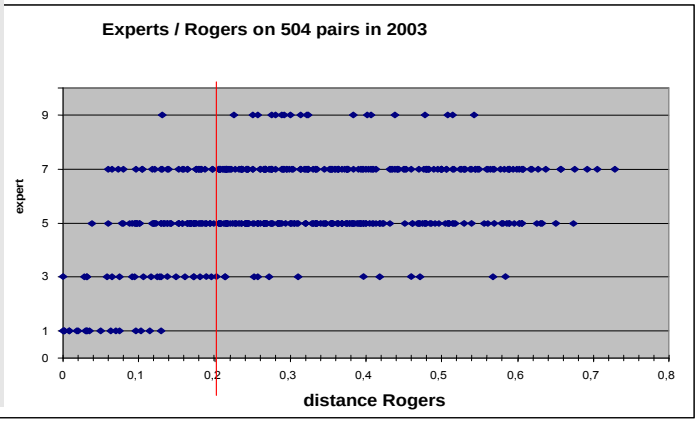

9

## EVALUATION OF THE LEVEL OF CORRELATION BETWEEN MOLECULAR AND MORPHOLOGICAL DATA

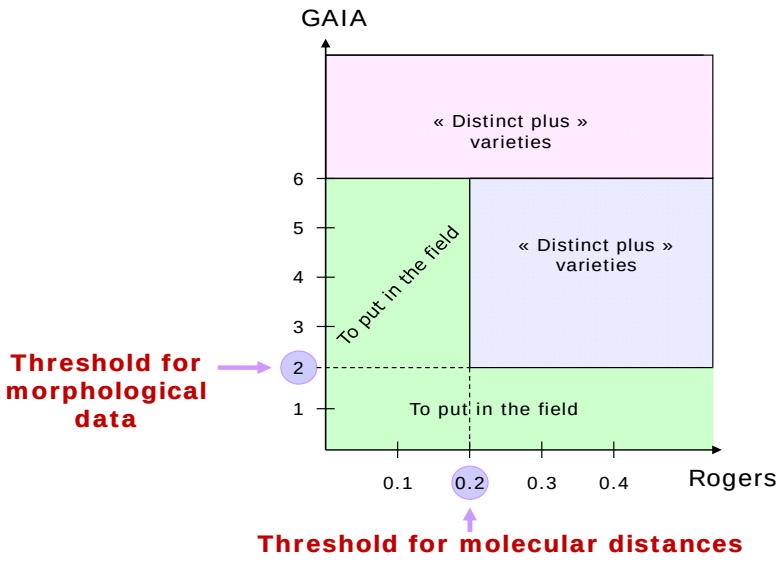
EXPERTS

Scale of similarity:

1. the two varieties are similar or very close;
3. the two varieties are distinct but close;
5. the comparison was useful, but the varieties are clearly distinct;
7. the comparison should have been avoided because the varieties are very different;
9. the comparison should have been avoided because the varieties are totally different;




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




39

# OVERVIEW

## Molecular techniques

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

40

OECD/UPOV/ISTA JOINT WORKSHOP ON MOLECULAR TECHNIQUES

## WORKSHOP 1

(UPOV BMT/14 - Seoul, Republic of Korea, November 12, 2014)

Agreed:

1. would be useful to develop a joint document explaining the principal features (e.g. DUS, variety identification, variety purity, etc. ) of the systems of OECD, UPOV and ISTA.

## WORKSHOP 2

(OECD Seed Schemes- Paris, June 8, 2016)

OECD Annual Meeting approved:

1. develop a joint document explaining the principal features (e.g. DUS, variety identification, variety purity, etc. ) of the systems of OECD, UPOV, AOSA and ISTA

## 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.

## WORKSHOP 2

OECD Annual Meeting approved:

3. To develop a list of terms and their definitions as used by OECD, UPOV, AOSA and ISTA and to make an attempt to harmonise these.

## WORKSHOP 1

Agreed:

4. would be useful for mutual understanding, to repeat the joint workshop at relevant meetings of the OECD and ISTA

## WORKSHOP 2

OECD Annual Meeting approved:

4. to consider organising another similar workshop [in OECD] in three years time

## UPOV BMT/15

- OECD, ISTA and UPOV had different objectives and cooperation between the organizations in the use of molecular techniques would need to reflect that. However, the BMT agreed that it would be important to explore circumstances in which the same techniques and information could be used. In the first instance, it agreed that it would be more effective to explore such possibilities on the basis of real situations rather than at a theoretical and institutional level.
- welcomed the proposal by the Netherlands to organize a practical workshop in 2017, with support from UPOV, OECD and ISTA, to explore how molecular techniques might be applied in an efficient way for UPOV, OECD and ISTA purposes.

## WORKSHOP 2

OECD Annual Meeting approved:

- endorsed the proposal of the Netherlands to organise a practical workshop in 2017, with support of the OECD, UPOV and ISTA, to explore how molecular techniques might be applied in an efficient way for UPOV, OECD and ISTA purposes.

## OVERVIEW

**Molecular techniques**

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

48

## 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**.

49

## 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**.

50

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.

51

## 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'**

## OVERVIEW

**Molecular techniques**

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

53

## 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")?

54

## 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:

55

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

(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.

56

## Questions

## TGP/7 :“Development of Test Guidelines”

***Additional Information and guidance on Asterisked, grouping and TQ characteristics***

# Standard
# Test Guidelines Characteristic

| Function | Criteria |
|---|---|
| 1.Characteristics that are **accepted by UPOV for examination of DUS** and from which members of the Union can select those suitable for their particular circumstances. | 1.Must satisfy the criteria for use of any characteristic for DUS as set out in **Chapter 4, section 4.2**.<br><br>2.Must have been **used** to develop a variety description **by at least one member of the Union**.<br><br>3.Where there is a long list of such characteristics and, where considered appropriate, there may be an indication of the extent of use of each characteristic. |

# Asterisked Characteristic

| 14 | (*) | PQ | VG | (+) | (c) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Leaf blade: distribution of secondary color** | | | | | | | |
| | | none | | | | | | Edward Goucher | 1 |
| | | on margin only | | | | | | Wevo2 | 2 |
| | | marginal zone | | | | | | Keylib | 3 |
| | | central zone | | | | | | | 4 |
| | | irregular | | | | | | Francis Mason | 5 |

# Asterisked Characteristic

| Function | Criteria |
|---|---|
| 1.Characteristics that are important **for the international harmonization of variety descriptions**. | 1.Must be a characteristic included in the Test Guidelines.<br><br>2.**Should always be examined** for DUS and included in the variety description **by all members of the Union**<br><br>**EXCEPT** when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.<br><br>3.Must be useful for function 1.<br><br>4.Particular care should be taken before selection of disease resistance characteristics. |

# Grouping Characteristic

5. Grouping of Varieties and Organization of the Growing Trial

5.1 The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics:

(a) Plant: growth habit (characteristic 1)
(b) Plant: height in relation to width (characteristic 2)
(c) Young shoot: anthocyanin coloration (characteristic 5)
(d) Leaf blade: main color on upper side (characteristic 12)
green
yellow
green
grey green
purple green
(e) Leaf blade: secondary color (characteristic 13)
white
pinkish white
yellow
yellow red
(f) Sepal: color (characteristic 20)
pinkish white
light pink
orange pink

## Apple: Fruit color

## Apple: Fruit color

10. Technical Questionnaire

| TECHNICAL QUESTIONNAIRE | Page {x} of {y} | Reference Number: |
|---|---|---|
| | | Application date:<br>(not to be filled in by the applicant) |

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Genus: *Plectranthus* L'Hér

1.2 Species (please complete): [ ]

1.3 Hybrid: [ ]

Species (please complete):

2. Applicant

Name:

| TECHNICAL QUESTIONNAIRE | Page {x} of {y} | Reference Number: |
|---|---|---|

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds).

| | Characteristics | Example Varieties | Note |
|---|---|---|---|
| **5.5 (37)** | **Fruit: hue of over color – with bloom removed** | | |
| | orange red | Cox's Orange Pippin, Egremont Russet | 1[ ] |
| | pink red | Cripps Pink, Delorgue | 2[ ] |
| | red | Akane, Galaxy, Red Elstar, Regal Prince | 3[ ] |
| | purple red | Red Jonaprince, Spartan | 4[ ] |
| | brown red | Fiesta, Joburn, Lord Burghley | 5[ ] |
| **5.6 (39)** | **Fruit: pattern of over color** | | |
| | only solid flush | Red Jonaprince, Richared Delicious | 1[ ] |
| | solid flush with weakly defined stripes | Galaxy | 2[ ] |
| | solid flush with strongly defined stripes | Jonagored | 3[ ] |
| | weakly defined flush with strongly defined stripes | Gravensteiner | 4[ ] |
| | only stripes (no flush) | Helios | 5[ ] |
| | flushed and mottled | Elstar | 6[ ] |
| | flushed, striped and mottled | Jonagold | 7[ ] |

# Grouping Characteristic

| Function | Criteria |
|---|---|
| characteristics in which the **documented states of expression**, even where recorded **at different locations**, can be used either individually or in combination with other such characteristics:<br>**1. to select varieties of common knowledge that can be excluded from the growing trial** used for examination of distinctness, and/or<br>**2. to organize the growing trial so that similar varieties are grouped together** | 1.(a) Qualitative characteristics or<br>(b) Quantitative or pseudo-qualitative characteristics which provide useful discrimination between the varieties of common knowledge from documented states of expression recorded at different locations.<br><br>2.Must be useful for functions 1 and 2.<br><br>3.Should be an **asterisked characteristic** and/or included in the **Technical Questionnaire** or application form. |

# Relationship between functions

(a) **GROUPING CHARACTERISTICS** selected from the Table of Characteristics should, in general, **receive an asterisk** in the Table of Characteristics and be **included in the Technical Questionnaire**.

(b) **TQ CHARACTERISTICS** selected from the Table of Characteristics should, in general, **receive an asterisk** in the Table of Characteristics and be **used as grouping characteristics**. TQ characteristics are **not restricted to** those characteristics used as **grouping characteristics**;

(c) **ASTERISKED CHARACTERISTICS** are **not restricted to** those characteristics selected as **grouping or TQ characteristics**.

## Questions

## 3. GUIDANCE ON DRAFTING TEST GUIDELINES (Document TGP/7)

**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. GUIDANCE ON DRAFTING TEST GUIDELINES

***a) Subject of the Test Guidelines, Material Required and Method of Examination***

# Example

1. Subject of these Test Guidelines

- These Test Guidelines apply to all varieties of *Theobroma cacao* L.

2. Material Required

2.2 The material is to be supplied in the form of seed or plants.

2.3 The minimum quantity of plant material, to be supplied by the applicant, should be:

- seed-propagated varieties: 20 fresh seeds
- vegetatively propagated varieties: 5 plants

73

# Example

Method of Examination

3.1 Number of Growing Cycles

- 3.1.1 The minimum duration of tests should normally be two independent growing cycles.
- In particular, it is essential that the trees produce a satisfactory crop of fruit in each of the two growing cycles.
- 3.1.2 The growing cycle is considered to be the duration of a single growing season, beginning with vegetative growth, followed by flowering and fruit harvest.

3.4 Test Design

- 3.4.1 Each test should be designed to result in a total of at least 10 plants in the case of seed-propagated plants or, in the case of vegetatively propagated varieties, in a total of at least 5 plants.

74

# Example

Method of Examination

Assessment of Distinctness

4.1.4 Number of Plants / Parts of Plants to be Examined

Seed-propagated varieties: [...] all observations on single plants should be made on 10 plants or parts taken from each of 10 plants and any other observations made on all plants in the test, disregarding any off-type plants.

Vegetatively propagated varieties: [...] all observations should be made on 5 plants or parts taken from each of 5 plants, disregarding any off-type plants.

75

# Example

Method of Examination

4.2 Uniformity

- 4.2.2 Vegetatively propagated varieties
- For the assessment of uniformity of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of 95% should be applied. In the case of a sample size of 5 plants, no off-types are allowed.

- 4.2.3 Seed propagated varieties
- The assessment of uniformity for seed-propagated varieties should be according to the recommendations for cross-pollinated varieties in the General Introduction.

76

## 10 Chapters of UPOV Test Guidelines

1. Subject of the Test Guidelines
2. Material Required
3. Methods of Examination
4. Assessment of Distinctness, Uniformity and Stability
5. Grouping of Varieties and Organization of the Growing Trial
6. Introduction to the Table of Characteristics
7. **Table of Characteristics**
8. Explanation on the Table of Characteristics
9. Literature
10. Technical Questionnaire

## TGP/7 :"Development of Test Guidelines"

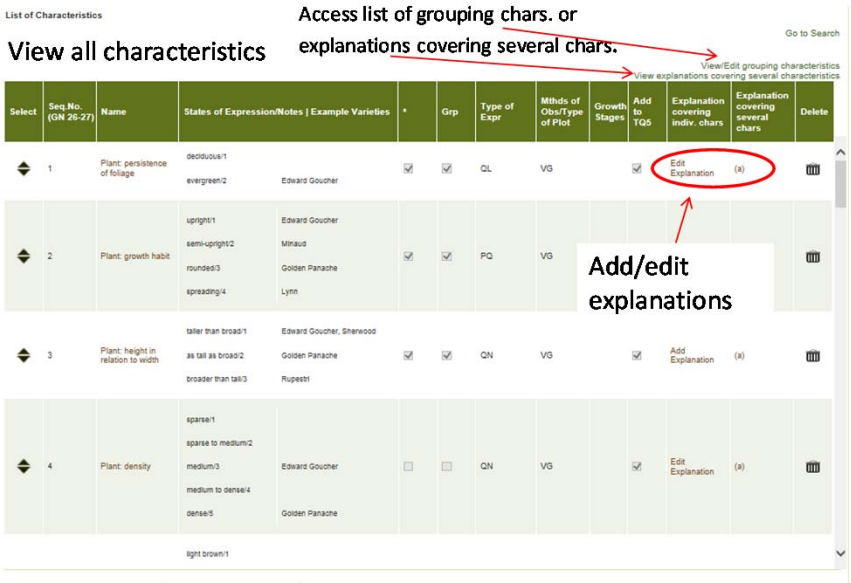
**Section 3. Guidance for Drafting Test Guidelines**

- The **TG Template**
- **Additional Standard Wording** for the TG Template
- **Guidance Notes** for the TG Template

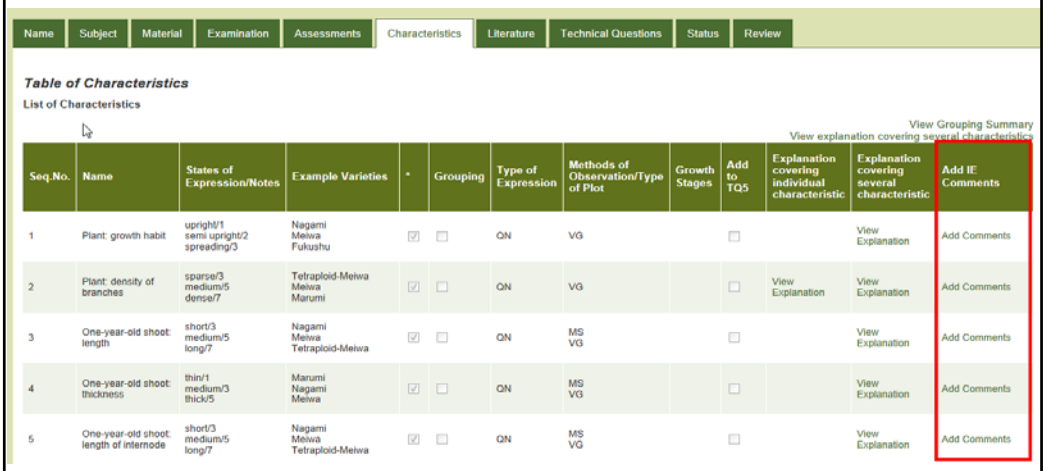
## Web-Based TG Template

# Web-Based TG Template

# Edit TG: List of characteristics



# Comment Function for Interested Experts



Name | Subject | Material | Examination | Assessments | Characteristics | Literature | Technical Questions | Status | Review

***Table of Characteristics***

List of Characteristics

View Grouping Summary
View explanation covering several characteristics

| Seq.No. | Name | States of Expression/Notes | Example Varieties | * | Grouping | Type of Expression | Methods of Observation/Type of Plot | Growth Stages | Add to TQ5 | Explanation covering individual characteristic | Explanation covering several characteristic | Add IE Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Plant: growth habit | upright/1<br>semi upright/2<br>spreading/3 | Nagami<br>Meiwa<br>Fukushu | ☑ | ☐ | QN | VG | | ☐ | | View Explanation | Add Comments |
| 2 | Plant: density of branches | sparse/3<br>medium/5<br>dense/7 | Tetraploid-Meiwa<br>Meiwa<br>Marumi | ☑ | ☐ | QN | VG | | ☐ | View Explanation | View Explanation | Add Comments |
| 3 | One-year-old shoot: length | short/3<br>medium/5<br>long/7 | Nagami<br>Meiwa<br>Tetraploid-Meiwa | ☑ | ☐ | QN | MS<br>VG | | ☐ | | View Explanation | Add Comments |
| 4 | One-year-old shoot: thickness | thin/1<br>medium/3<br>thick/5 | Marumi<br>Nagami<br>Meiwa | ☑ | ☐ | QN | MS<br>VG | | ☐ | | View Explanation | Add Comments |
| 5 | One-year-old shoot: length of internode | short/3<br>medium/5<br>long/7 | Nagami<br>Meiwa<br>Tetraploid-Meiwa | ☑ | ☐ | QN | MS<br>VG | | ☐ | | View Explanation | Add Comments |

81

# Demonstration

# 3. GUIDANCE ON DRAFTING TEST GUIDELINES

*b) Method of observation (MS, MG, VS, VG)*

| 35. | QN | MG/VG | (+) | | | | |
|---|---|---|---|---|---|---|---|
| | **Time of beginning of flowering** | | | | | | |
| | early | | | | | | 3 |
| | medium | | | | | Minaud | 5 |
| | late | | | | | Golden Panache | 7 |

## 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 "Examining Distinctness"

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

# TGP/9 "Examining Distinctness"

**V= Visual observation**

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

# TGP/9 "Examining Distinctness"

**V= Visual observation or**
**M= Measurement**

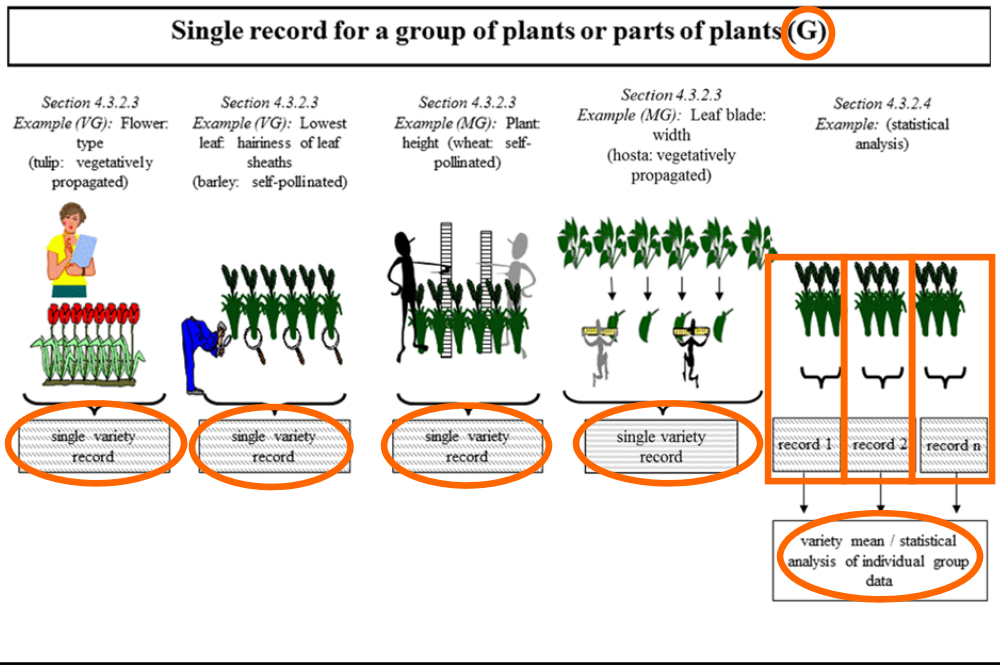
| Method of propagation of the variety | Type of expression of characteristic | | |
|---|---|---|---|
| | QL (QUAL itative) | PQ (PSEUDO qualitative) | QN (QUANT itative) |
| Vegetatively propagated, self-pollinated | *Notes (VG)* | *Notes (VG)*<br>*Side-by-side (VG)* | *Notes (VG/MG/MS)*<br>*Side-by-side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

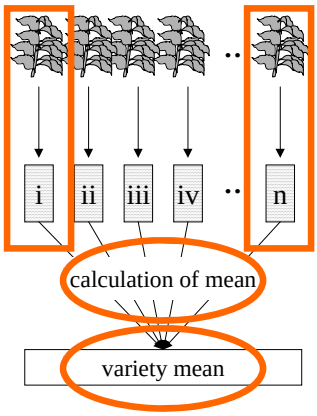
In most cases, "G" provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.

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

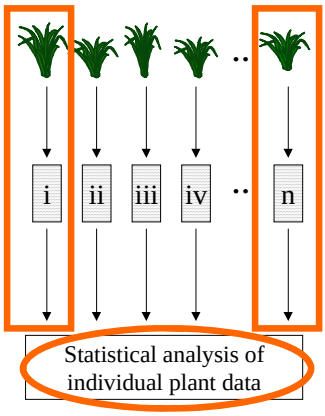


**Records for a number of single, individual plants or parts of plants (S)**

*Section 4.3.3.1*
*Example (MS):* Leaflet: length
(pea: self-pollinated)




*Section 4.3.3.2*
*Example (MS):* Plant: natural height
*Example (VS):* Plant: growth habit
(ryegrass: cross-pollinated)




# Questions

## EXERCISE

## 3. GUIDANCE ON DRAFTING TEST GUIDELINES

*c) Types of Expression (QL, PQ, QN), notes and distinctness;*

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

## Types of Expression

**QL: QUALITATIVE**

**QN: QUANTITATIVE**

**PQ: PSEUDO-QUALITATIVE**

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

| | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|
| **1. (*) PQ VG** | | **(+)** | | | | |
| | **Plant: growth habit** | **Plante : port** | **Pflanze: Wuchsform** | **Planta: hábito de crecimiento** | | |
| | upright | dressé | aufrecht | erguido | Edward Goucher | 1 |
| | semi-upright | semi□dressé | halbaufrecht | semierguido | Minaud | 2 |
| | rounded | | | | Golden Panache | 3 |
| | spreading | étalé | breitwüchsig | extendido | Lynn | 4 |
| **2. (*) QN VG** | | | | | | |
| | **Plant: height in relation to width** | **Plante : hauteur par rapport à la largeur** | **Pflanze: Höhe im Verhältnis zur Breite** | **Planta: altura en relación con la anchura** | | |
| | taller than broad | plus haute que large | höher als breit | más alta que ancha | Edward Goucher, Sherwood | 1 |
| | as tall as broad | aussi haute que large | gleich hoch wie breit | tan alta como ancha | Golden Panache | 2 |
| | broader than tall | plus large que haute | breiter als hoch | más ancha que alta | Rupestri | 3 |
| **3. QN VG** | | **(+)** | | | | |

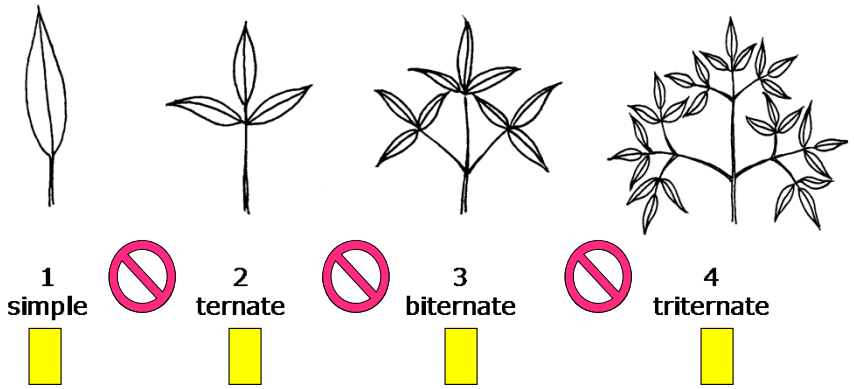
# QUALITATIVE Characteristics

"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**.

## Qualitative characteristic

Clematis: Leaf: type



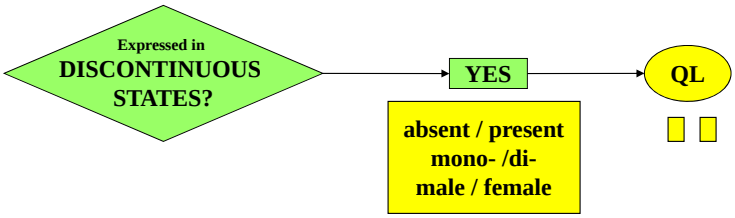

## Qualitative (QL) characteristic?

Anthocyanin coloration: QL (=absent / present)?

**NO!**

| | Variety A | Variety B | Variety C |
|---|---|---|---|
| Environment A | absent | present | absent |
| Environment B | absent | present | present |

# QL, QN or PQ?

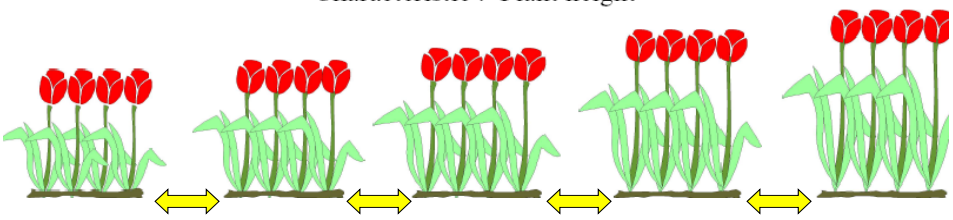



# QUANTITATIVE Characteristics

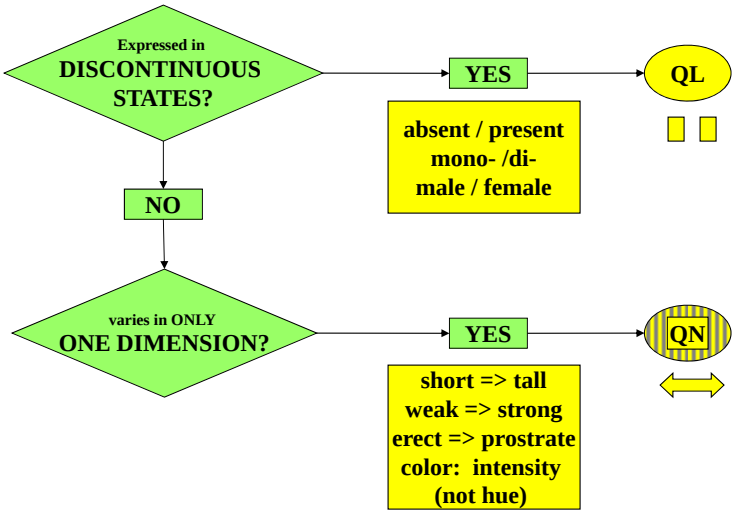
"Quantitative characteristics" are those where the expression covers the full range of variation from one extreme to the other. The **expression can be recorded on a one-dimensional, continuous or discrete, linear scale**. The range of expression is divided into a number of states for the purpose of 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.

## Quantitative Characteristic

Characteristic : Plant height



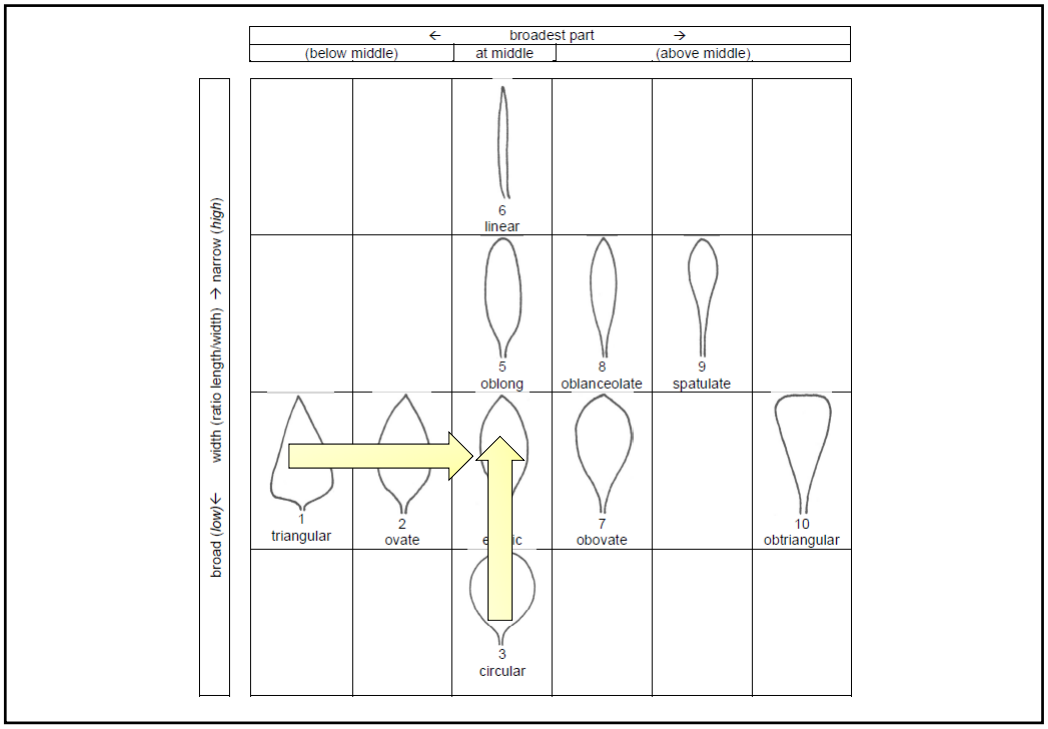
## QL, QN or PQ?

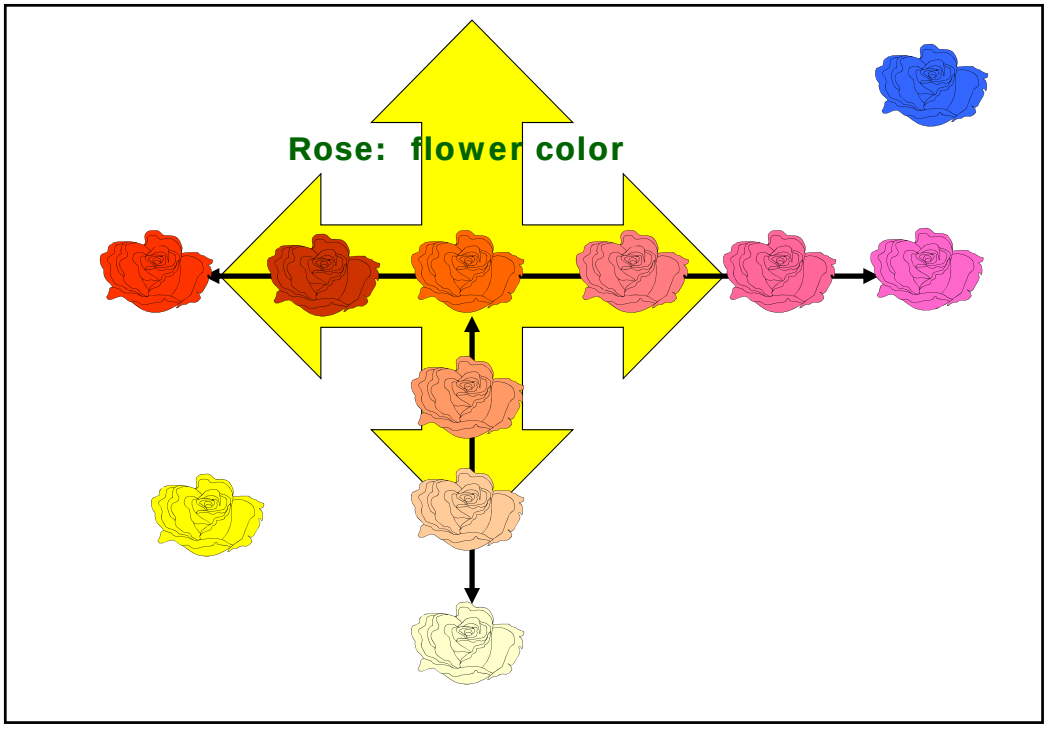


## **PSEUDO-QUALITATIVE** Characteristics

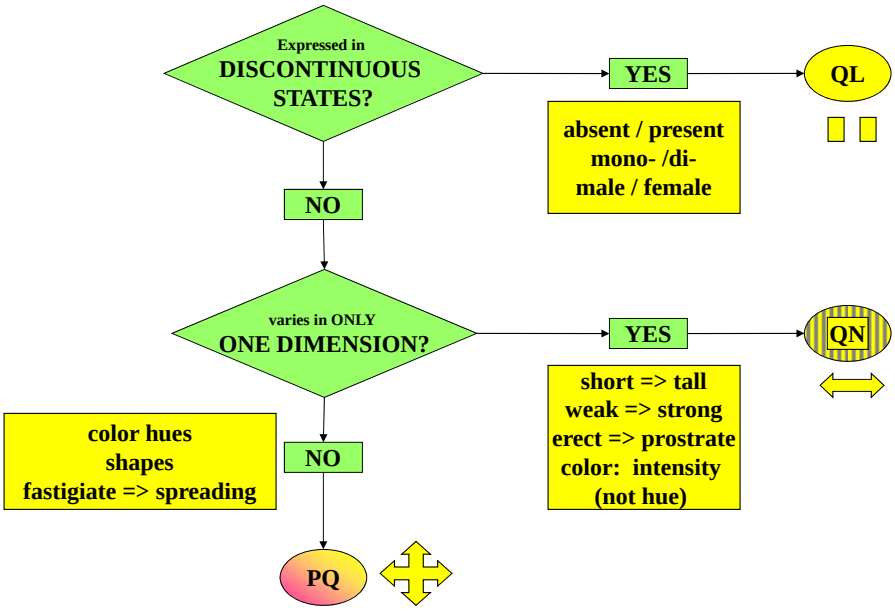
In the case of "pseudo-qualitative characteristics," the **range of expression is at least partly continuous, but varies in more than one dimension** (e.g. shape: ovate (1), elliptic (2), circular (3), obovate (4)) and cannot be adequately described by just defining two ends of a linear range. In a similar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


← broadest part →
(below middle)
at middle
(above middle)
broad (low)← width (ratio length/width) → narrow (high)
6
linear
5
oblong
8
oblanceolate
9
spatulate
1
triangular
2
ovate
7
obovate
10
obtriangular
3
circular


Rose: flower color

# QL, QN or PQ?




# EXERCISE

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

## Types of Expression

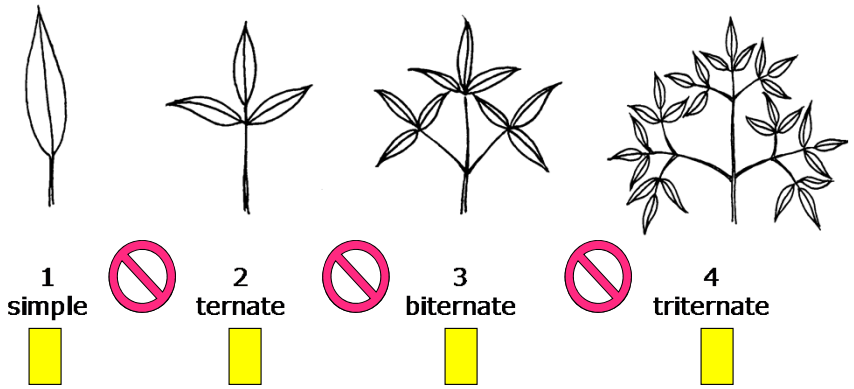
**QL: QUALITATIVE**

QN: QUANTITATIVE

PQ: PSEUDO-QUALITATIVE

# Qualitative characteristic

Clematis: Leaf: type




# 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 |

**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)).

## Types of Expression

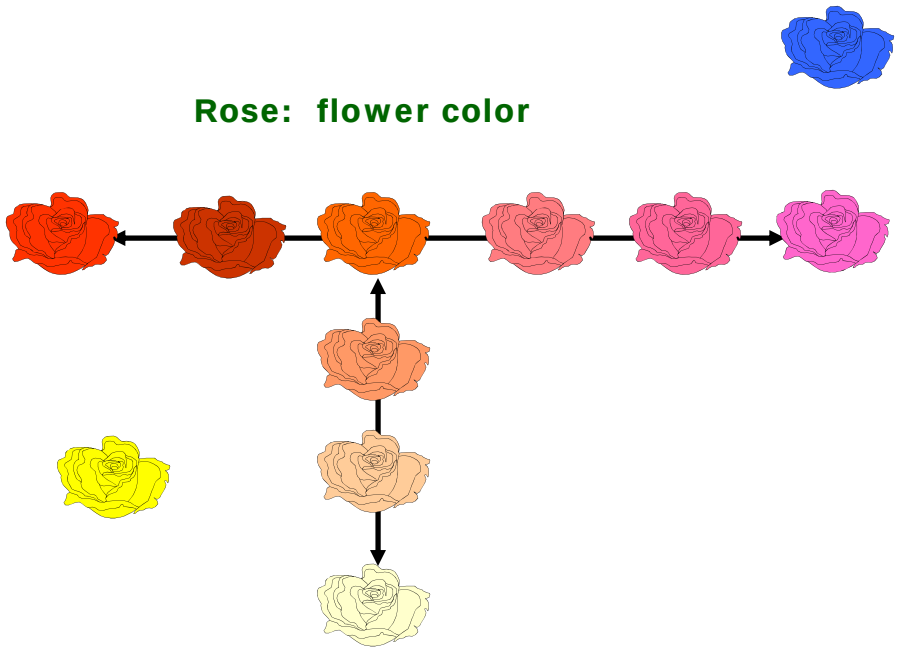
QL: QUALITATIVE

QN: QUANTITATIVE

**PQ: PSEUDO-QUALITATIVE**

## **PSEUDO-QUALITATIVE** Characteristics

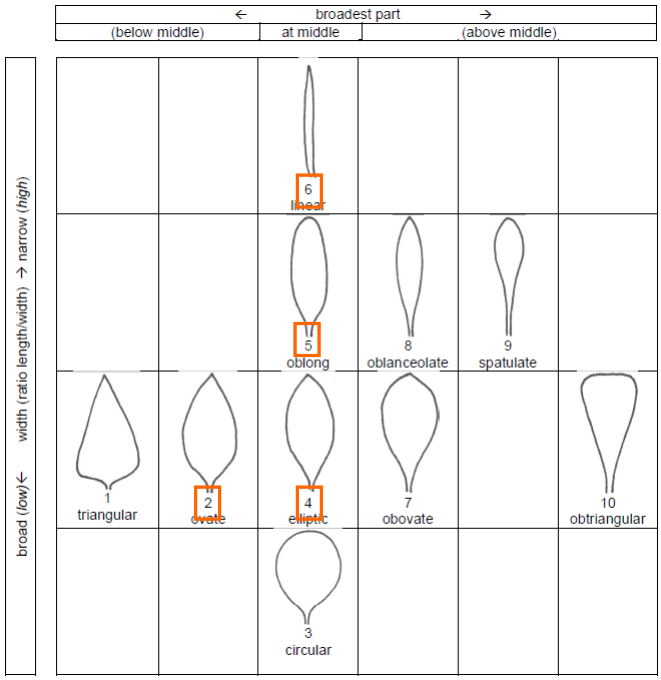
In the case of "pseudo-qualitative characteristics," the **range of expression is at least partly continuous, but varies in more than one dimension** (e.g. shape: ovate (1), elliptic (2), circular (3), obovate (4)) and cannot be adequately described by just defining two ends of a linear range. In a similar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



# 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 | purpurn | púrpura | 6 |



## Types of Expression

QL: QUALITATIVE

**QN: QUANTITATIVE**

PQ: PSEUDO-QUALITATIVE

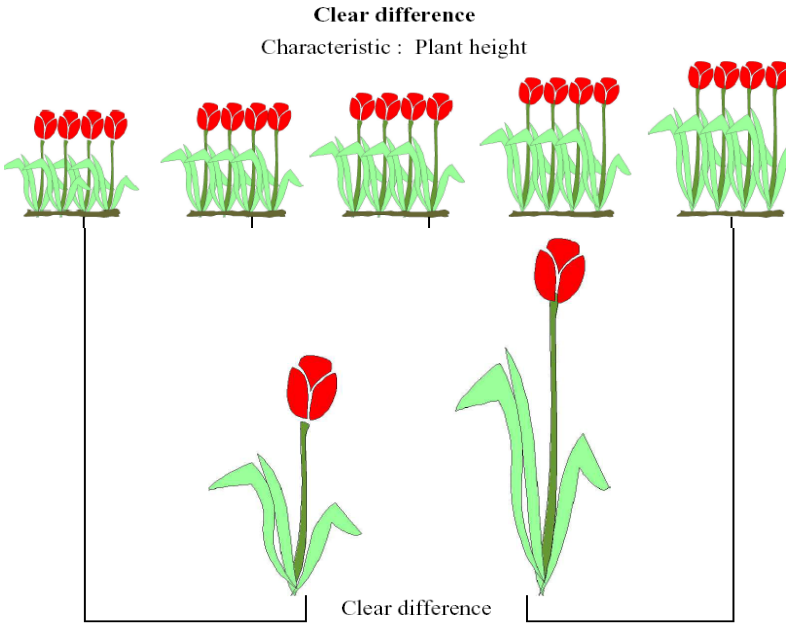
## QUANTITATIVE Characteristics

"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.

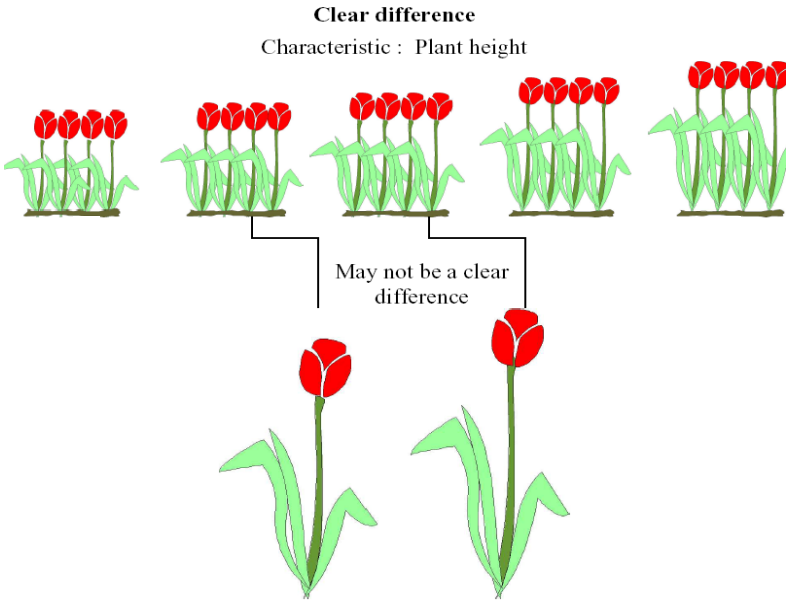
## **Quantitative** Characteristics: **distinctness**

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

## Quantitative Characteristic



## Quantitative Characteristic




## 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 | - |

## Quantitative Characteristics (1-9)

| State | Example 1<br>**Size relative to:** | Example 2<br>**Angle:** | Example 3<br>**Position:** | Example 4<br>**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** |

## Quantitative Characteristics (at least 3 notes)

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

| State | Example 1<br>**Stem: attitude** |
|---|---|
| 1 | erect |
| 3 | semi-erect |
| 5 | prostrate |

## NOTES
*versus*
## SIDE-BY-SIDE COMPARISON

## (Quantitative characteristics)

# TGP/9 “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: **distinctness**

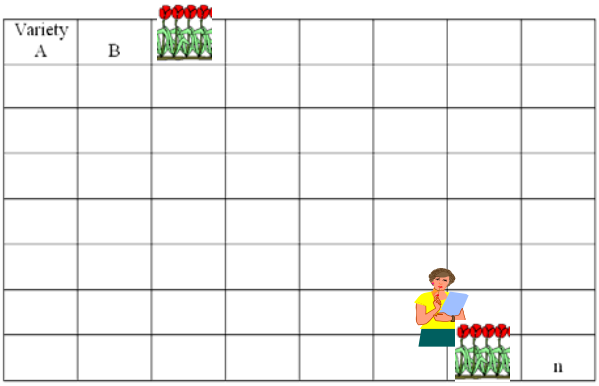
The General Introduction explains that, in the case of visually observed quantitative characteristics:

“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 “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

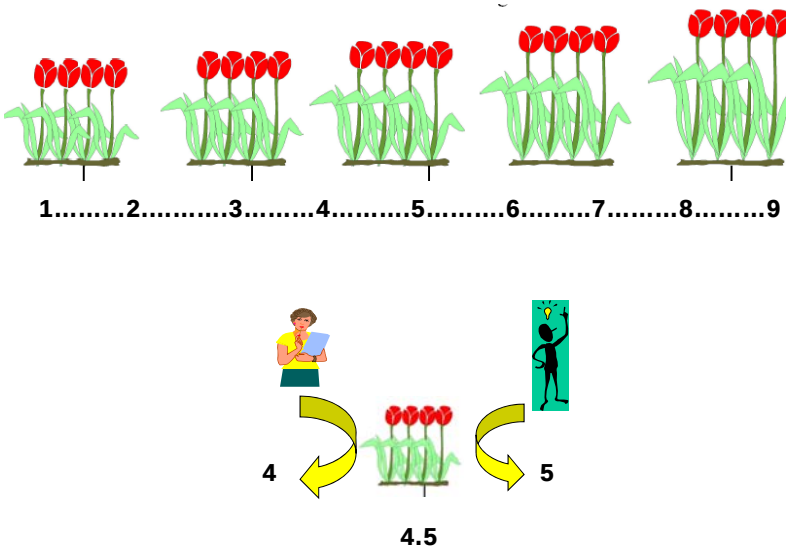
## **Quantitative** Characteristics: **distinctness**

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

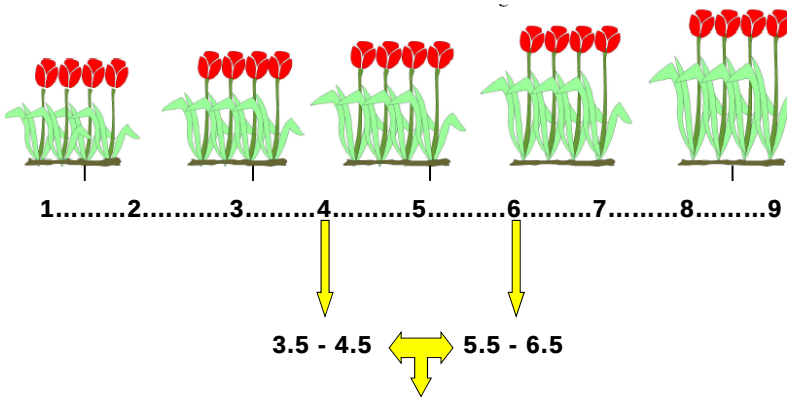
Test Guidelines (TGP/7)

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

**WHY?**



## “Two Notes” clear difference...




...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)

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

| 35. | QN | MG/VG | (+) | | | | |
|---|---|---|---|---|---|---|---|
| | **Time of beginning of flowering** | | | | | | |
| | early | | | | | | 3 |
| | medium | | | | | Minaud | 5 |
| | late | | | | | Golden Panache | 7 |

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

## Quantitative Characteristics: distinctness



| | English | français | Deutsch | español | Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|
| 5. | **Stem: anthocyanin coloration below inflorescence** | **Tige: pigmentation anthocyanique sous inflorescence** | **Trieb: Anthocyanfärbung unter dem Blütenstand** | **Tallo: pigmentación antociánica por debajo de la inflorescencia** | | |
| QN | absent or weak | absente ou faible | fehlend oder gering | ausente o débil | Heccharm | 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

# 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

| | |
|---|---|
| CAJ | Administrative and Legal Committee |
| CAJ-AG | Administrative and Legal Committee Advisory Group |
| TC | Technical Committee |
| TC-EDC | Enlarged Editorial Committee |
| TWA | Technical Working Party for Agricultural Crops |
| TWC | Technical Working Party on Automation and Computer Programs |
| TWF | Technical Working Party for Fruit Crops |
| TWO | Technical Working Party for Ornamental Plants and Forest Trees |
| TWV | Technical Working Party for Vegetables |
| BMT | Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular |
| BMT-RG | *Ad hoc* Subgroup of Technical and Legal Experts of Biochemical and Molecular Techniques |
| BMT Crop Subgroups | Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular – Crop Subgroups |
| WG-IPBR | *Ad hoc* Working Group to Study the Impact of Plant Breeders' Rights |
| WG-PVD | *Ad hoc* Working Group on the Publication of Variety Descriptions |
| WG-VD | *Ad hoc* Working Group on Variety Denominations |
| Seminar on DUS Testing | UPOV, Geneva, March 18 to 20, 2010 |

# Questions

## 3. GUIDANCE ON DRAFTING TEST GUIDELINES

*d) Shape and Color Characteristics*

## TGP/14: Shape

Characteristics related to shape, could use the following components:

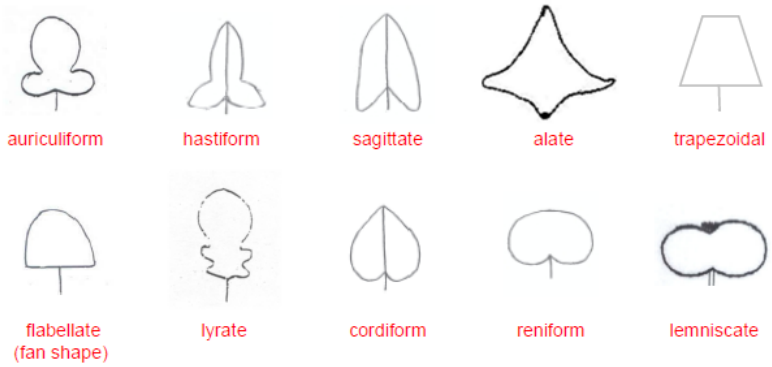
- Shape: e.g. ovate (1), elliptic (2), circular (3), obovate (4)...
- Ratio length/ width (from low to high)
- Position of broadest part
- Shape of base
- Shape of apex
- Lateral outline

# TGP/14: Shape

1.6 The following chart (Chart for Other Plane Shapes) illustrates some other common plane shapes:

*Chart for Other Plane Shapes*

For each of the shapes below, ranges for ratio length/width and position of broadest part can be developed, in a similar way to that shown in the Chart for Simple Symmetric Plane Shapes (Section 1.5).



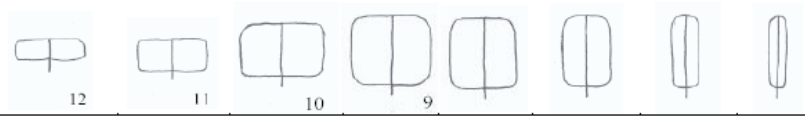

# TGP/14: Shape

*Chart for Simple Symmetric Plane Shapes*

| shape | very compressed | moderately compressed | slightly compressed | medium | slightly elongated | moderately elongated | very elongated |
|---|---|---|---|---|---|---|---|
| ratio length/width | very low | low | low to medium | medium | medium to high | high | very high |

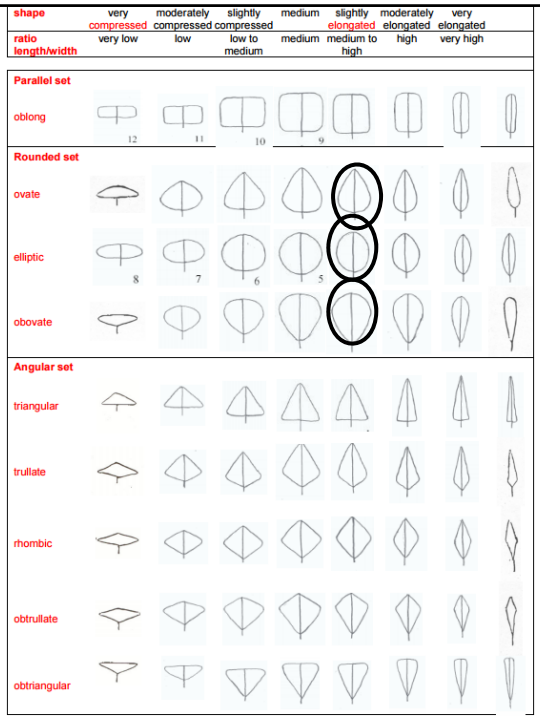
**Parallel set**

oblong




**Rounded set**

ovate




# TGP/14: Shape



Alternative 1: ratio length/width: low | ratio length/width: medium | ratio length/width: high

Alternative 2: 1 | 2 | 3

Shape: broad obovate | Shape: medium obovate | Shape: narrow obovate



broadest part towards base
1
ovate

broadest part at middle
2
elliptic

broadest part towards apex
3
obovate

# TGP/14: Shape

*Alternative 1*

(a) position of broadest part (QN):
*e.g. strongly towards base (1); moderately towards base (3); at middle (5); moderately towards apex (7); strongly towards apex (9)*

(b) ratio length/width (QN):
*e.g. very low (1); low (3); medium (5); high (7); very high (9);*

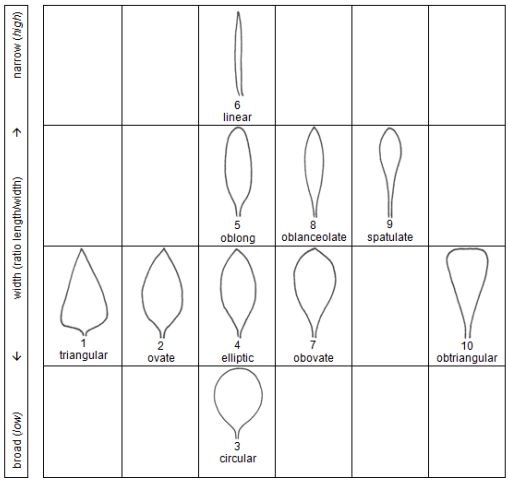
# TGP/14: Shape

*Alternative 2*

General shape (PQ): triangular (1); ovate (2); circular (3); elliptic (4); oblong (5); linear (6); obovate (7); oblanceolate (8); spatulate (9); obtriangular (10)

(Note: Where the overall shape is presented as a single pseudo-qualitative characteristic, the order of states should be: primary order, broadest part below middle to broadest part above middle; secondary order, broad to narrow (low to high ratio length/width)).

| ← broadest part → | | |
|---|---|---|
| (below middle) | at middle | (above middle) |



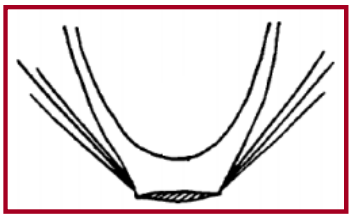
# EXERCISE

## Describing a candidate variety

Leaf: shape of central leaflet

1 2 3 4

# Describing a candidate variety



Primary grain: hairiness of base

1
absent or weak

3
medium

5
strong

# TGP/14: Color

| | | state of expression | example |
|---|---|---|---|
| level of precision | low | single color | yellow, orange, red |
| | ↓ | color range | (a) yellow, yellow orange, orange, orange red, red<br>(b) white, yellowish white, yellow, yellowish orange |
| | ↓ | intensity | light yellow, medium yellow, dark yellow |
| | high | RHS Colour Chart No. | RHS 41 B |

Species?

Level of variation?

# TGP/14: Color

## Single color

- A single color has the lowest precision to describe the state of expression.
- Example: Flower: color: white (1); yellow (2); orange (3); red (4)

# TGP/14: Color

## Color range

- (a) In color combinations the second color indicates the predominant color with blending of both colors, resulting in what can look like a single color. For example in “green red” the predominant color is red and in “red green” the predominant color is green.
- Example: Flower: color: white (1); yellow white (2); yellow (3); yellow orange (4); orange (5)
- (b) The use of "ish" in color combinations indicates that there is a predominant color (e.g. yellow) together with another minor color. For example,
- Example: Flower: color: whitish (1); yellowish (2); greenish (3)

# TGP/14: Color Intensity

- Depending on the organ described, the intensity can be presented either in relation to a single color or in combination with different colors (example 2).
- Example 1: Leaf: green color of upper side: light (3); medium (5); dark (9)
- Example 2: Flower: color: white (1); light yellow (2); medium yellow (3); dark yellow (4); orange (5)

# TGP/14: Color Color Chart

- The "RHS Colour Chart" because of its worldwide availability.
  - UPOV names for colors in document TGP/14: ANNEX.
- "Because daylight varies, color determinations made against a color chart should be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The spectral distribution of the illuminant for artificial daylight should conform with the CIE Standard of Preferred Daylight D 6500 and should fall within the tolerances set out in the British Standard 950, Part I. These determinations should be made with the plant part placed against a white background".
- Observations should not be made in direct sunlight. The observations should be made on a cloudy day with sufficient light intensity, or in a shaded area.

Allocation of UPOV Color Groups for each RHS Color in RHS Reference order

RHS COLORS (RHS COLOUR CHART, EDITIONS 1986, 1995, 2001 AND 2007)
BY UPOV COLOR GROUPS

| UPOV Group No. | No. RHS | English | français | deutsch | español |
|---|---|---|---|---|---|
| 11 | 001A | yellow | jaune | gelb | amarillo |
| 5 | 001B | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 5 | 001C | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 5 | 001D | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 11 | 002A | yellow | jaune | gelb | amarillo |
| 11 | 002B | yellow | jaune | gelb | amarillo |
| 5 | 002C | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 5 | 002D | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 11 | 003A | yellow | jaune | gelb | amarillo |
| 11 | 003B | yellow | jaune | gelb | amarillo |
| 11 | 003C | yellow | jaune | gelb | amarillo |
| 5 | 003D | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 11 | 004A | yellow | jaune | gelb | amarillo |
| 11 | 004B | yellow | jaune | gelb | amarillo |
| 5 | 004C | yellow green | vert-jaune | gelbgrün | verde amarillento |
| 10 | 004D | light yellow | jaune clair | hellgelb | amarillo claro |
| 11 | 005A | yellow | jaune | gelb | amarillo |
| 11 | 005B | yellow | jaune | gelb | amarillo |
| 11 | 005C | yellow | jaune | gelb | amarillo |
| 10 | 005D | light yellow | jaune clair | hellgelb | amarillo claro |
| 11 | 006A | yellow | jaune | gelb | amarillo |
| 11 | 006B | yellow | jaune | gelb | amarillo |
| 11 | 006C | yellow | jaune | gelb | amarillo |
| 10 | 006D | light yellow | jaune clair | hellgelb | amarillo claro |
| 11 | 007A | yellow | jaune | gelb | amarillo |
| 11 | 007B | yellow | jaune | gelb | amarillo |
| 11 | 007C | yellow | jaune | gelb | amarillo |
| 11 | 007D | yellow | jaune | gelb | amarillo |

# TGP/14: Color

## APPROACHES TO DESCRIBE COLORS AND COLOR PATTERNS

- depends on the number of colors...
- the types of color distribution...
- and the number of color patterns possible for the species concerned.

# TGP/14: Color

Approach according to the size of the surface area

- (a) only a few colors, a few types of color distribution and a few patterns to be described,
- the colors are described according to the size of the surface area they cover

**“The main color is the color with the largest surface area.
In cases where the areas of the main and secondary color are too similar to reliably decide which color has the largest area,
[the darkest color] / [the color...[location]Q]
is considered to be the main color.”**

# TGP/14: Color

## Approach according to tissue layers

- one layer is covering the other:
- (a) Ground color (not always the largest surface area):
  - (i) the first color to appear chronologically.
  - (ii) has a continuous dispersion across the surface.
- (b) Over color (not always occupying the smallest surface area):
  - a second color, such as a flush, spots or blotches developed over time.

## APPLE – TG/14/9

| 35. (*) | | Fruit: ground color | |
|---|---|---|---|
| PQ | (f) | not visible | 1 |
| | | whitish yellow | 2 |
| | | yellow | 3 |
| | | whitish green | 4 |
| | | yellow green | 5 |
| | | green | 6 |

| 37. (*) | | Fruit: hue of over color – with bloom removed | |
|---|---|---|---|
| PQ | (f) | orange red | 1 |
| | | pink red | 2 |
| | | red | 3 |
| | | purple red | 4 |
| | | brown red | 5 |

## Phalaenopsis (TG/213/2(proj.7))

***Petal: ground color – RHS Colour Chart 155A - white***
***Petal: over color – RHS Colour Chart 83A – dark violet***

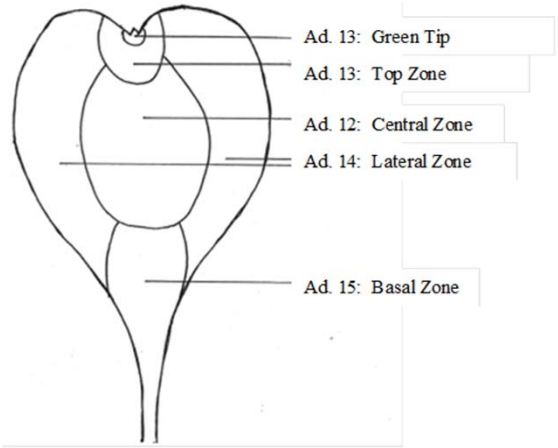
# TGP/14: Color

## Approach according to defined parts of an organ

- (a) If the different parts of a plant organ can have different colors, the color of these different parts can be described separately.
- Example:
  - Petal: color of margin
  - Petal: color of middle zone
  - Petal: color of base
- (b) When an organ has one color with different intensities, the parts of the organ which are lighter or darker could be described as follows:
- Example:
  - Ray floret: color distribution on upper side:
    - lighter towards base (1); even (2); lighter towards apex (3)

# TGP/14: Color

Ad. 12: Outer tepal: main color of **central** zone
Ad. 13: Outer tepal: main color of **top** zone (green tip excluded)
Ad. 14: Outer tepal: main color of **lateral** zone
Ad. 15: Outer tepal: main color of **basal** zone



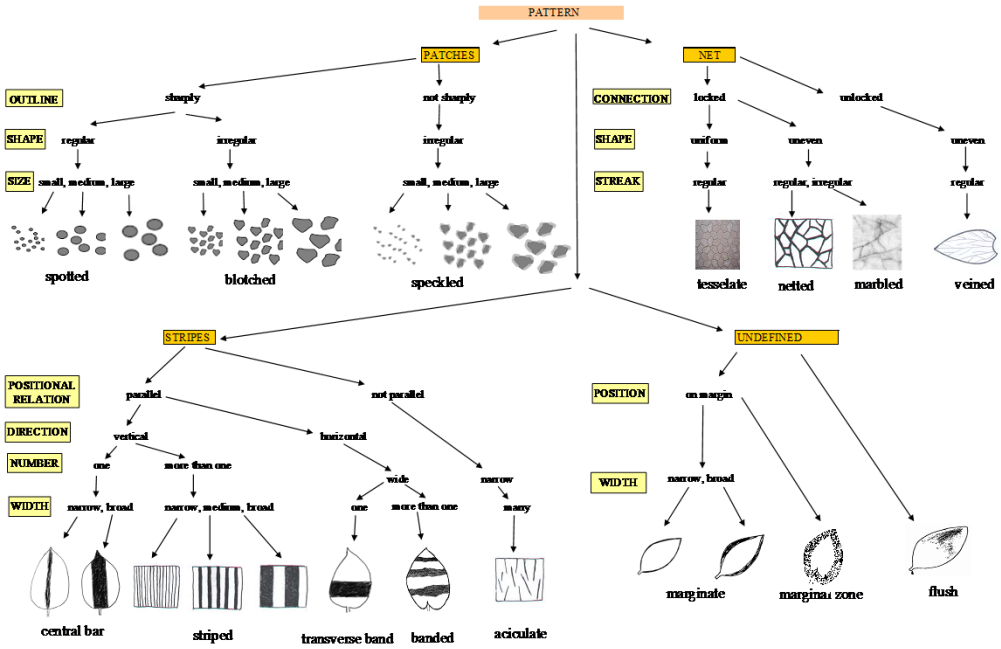

# Approach according to the RHS Colour Chart number ("Lisbon" approach)

- All colors of the plant part concerned are assessed using the RHS Colour Charts first.
- The color should first be described, followed by:
  - distribution,
  - pattern
  - area,
  - conspicuousness of the color (if necessary).
- The same sequence should be followed for color two, color three and so on. I

# Heuchera and Heucherella (TG/280/1)

- **36. Leaf blade: color one – RHS Colour Chart – Yellow-Green 144C**
- **37. Leaf blade: color one: distribution – marginal zone (7)**
- **38. Leaf blade: color one: pattern – solid or nearly solid (5)**
- **39. Leaf blade: color one: total area – very small to small (2)**
- 40. Leaf blade: color two – RHS Colour Chart – Greyed-Orange 176B
- 41: Leaf blade: color two: distribution – along veins (2)
- 42: Leaf blade: color two: pattern – solid or nearly solid (5)
- 43: Leaf blade: color two: total area – small (3)
- **44: Leaf blade: color three – RHS Colour Chart – Greyed-Orange 177D but more grey**
- **45: Leaf blade: color three: distribution – between veins in intermediate zone (6)**
- **46: Leaf blade: color three: pattern – solid or nearly solid (5)**
- **47: Leaf blade: color three: total area – large (7)**
- 48: Leaf blade: color four – RHS Colour Chart – not applicable
- 49: Leaf blade: color four: distribution – none (1)
- 50: Leaf blade: color four: pattern – not applicable
- 51: Leaf blade: color four: total area – not applicable

# TGP/14: Color



## TGP/14: Color

## Order of states of expression

- normally presented in the following order: white, green, yellow, orange, pink, red, purple, violet, blue, brown, black
- chronological appearance of the color (e.g. as the fruit ripens)

**Questions**

# 3. GUIDANCE ON DRAFTING TEST GUIDELINES

## *e) Example Varieties*



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

| | English | français | Deutsch | español | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota |
|---|---|---|---|---|---|---|
| **1.**<br>**(*)** | **Seed: color** | **Semence: couleur** | **Samen: Farbe** | **Semilla: color** | | |
| | white | blanche | weiß | blanco | Verpia | 1 |
| | yellow | jaune | gelb | amarillo | Durango | 2 |
| | black | noire | schwarz | negro | Kagraner Sommer | 3 |
| **2.**<br>**(*)**<br>**(+)** | **Seedling: anthocyanin coloration** | **Plantule: pigmentation anthocyanique** | **Keimpflanze: Anthocyanfärbung** | **Plántula: pigmentación antociánica** | | |
| | absent | absente | fehlend | ausente | Verpia | 1 |
| | present | présente | vorhanden | presente | Pirat | 9 |
| **3.** | **Seedling: size of cotyledon (fully developed)** | **Plantule: taille du cotylédon (à complet développement)** | **Keimpflanze: Größe des Keimblatts (voll entwickelt)** | **Plántula: tamaño del cotiledón (plenamente desarrollado)** | | |
| | small | petit | klein | pequeño | Romance | 3 |
| | medium | moyen | mittel | medio | Expresse | 5 |
| | large | grand | groß | grande | Verpia | 7 |

| | | English | français | deutsch | español | Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **14.** | **VG** | **Leaf blade: intensity of purplish color of lower side** | **Limbe: intensité de la couleur pourpre de la face inférieure** | **Blattspreite: Intensität der Purpurfarbe der Unterseite** | **Limbo: intensidad del color purpúreo del envés** | | |
| **QN** | **(a)** | very light | très claire | sehr hell | muy claro | | 1 |
| | | light | claire | hell | claro | Perlime | 3 |
| | | medium | moyenne | mittel | medio | | 5 |
| | | dark | foncée | dunkel | oscuro | Perro | 7 |
| | | very dark | très foncée | sehr dunkel | muy oscuro | Bora, Purple | 9 |
| **15.** | **VG** | **Leaf blade: profile** | **Limbe: profil** | **Blattspreite: Profil** | **Limbo: perfil** | | |
| **QN** | **(a)** | concave | concave | konkav | cóncavo | Perro | 3 |
| | | plane | plan | flach | plano | Pergro, Saeyeupsil | 5 |
| | | convex | convexe | konvex | convexo | | 7 |



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

| | | English | français | deutsch | español | Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **1. (*) (+)** | | **Plant: growth type** | **Plante: type de croissance** | **Pflanze: Wuchstyp** | **Planta: tipo de crecimiento** | | |
| **QL** | **(a)** | basal clusters | en amas à la base | basale Büschel | en racimos basales | | 1 |
| | | bushy | buissonnant | buschig | arbustivo | | 2 |
| **2. (+)** | | **Only varieties with bushy growth type: Plant: predominant attitude of stems** | **Variétés à type de croissance buissonnant uniquement: Plante: port le plus fréquent des tiges** | **Nur Sorten mit buschigem Wuchstyp: Pflanze: vorwiegende Haltung der Triebe** | **Sólo variedades con tipo de crecimiento arbustivo: Planta: porte predominante de los tallos** | | |
| **QN** | **(a)** | upright | dressées | aufrecht | erecto | | 1 |
| | | semi upright | demi-dressées | halbaufrecht | semierecto | | 3 |
| | | horizontal | horizontales | waagerecht | horizontal | | 5 |
| **3.** | | **Only varieties with bushy growth type: Plant: number of stems** | **Variétés à type de croissance buissonnant uniquement: Plante: nombre de tiges** | **Nur Sorten mit buschigem Wuchstyp: Pflanze: Anzahl Triebe** | **Sólo variedades con tipo de crecimiento arbustivo: Planta: número de tallos** | | |
| **QN** | **(a)** | few | peu nombreuses | klein | bajo | | 3 |
| | | medium | moyennement nombreuses | mittel | medio | | 5 |
| | | many | nombreuses | groß | alto | | 7 |
| **4. (*) (+)** | | **Plant: height including flowers** | **Plante: hauteur, fleurs comprises** | **Pflanze: Höhe einschließlich Blüten** | **Planta: altura, incluidas las flores** | | |
| **QN** | **(a)** | short | basse | niedrig | corta | Mardi Gras | 3 |
| | | medium | moyenne | mittel | media | Breakoday | 5 |
| | | tall | élevée | hoch | larga | Happy Face Pink | 7 |

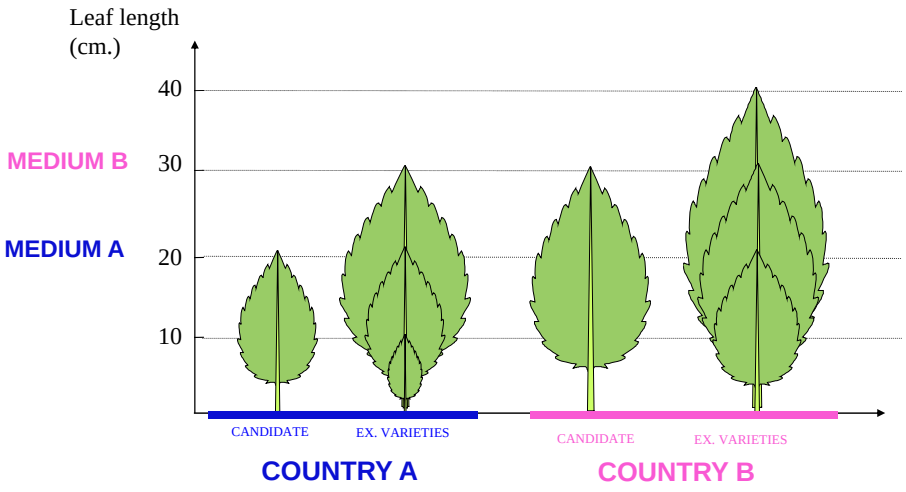
# Example Varieties: the Objective

Clarify states of expression

- Illustrate characteristics
- Determine the state of expression

→ Harmonized descriptions

# Example Varieties versus Measurements

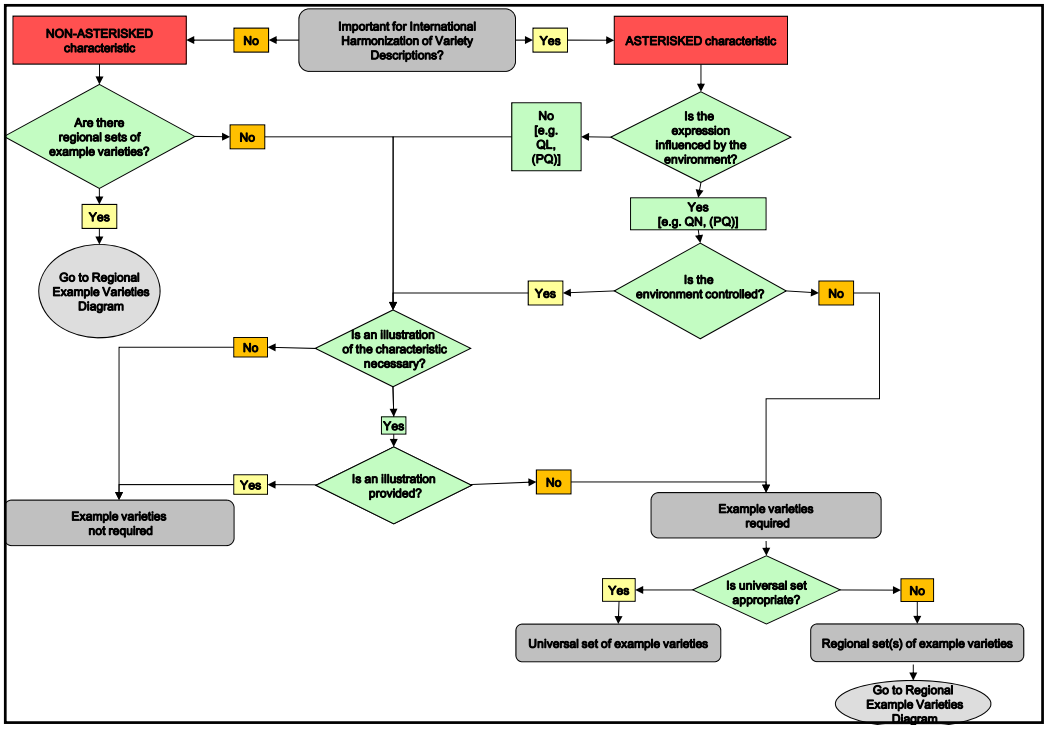


# Example Varieties – the need

in characteristics used to **harmonize descriptions**

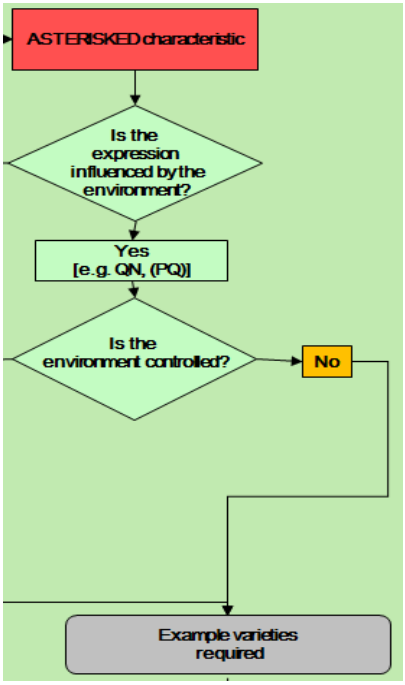
**NEED** and

which are **influenced by the environment**



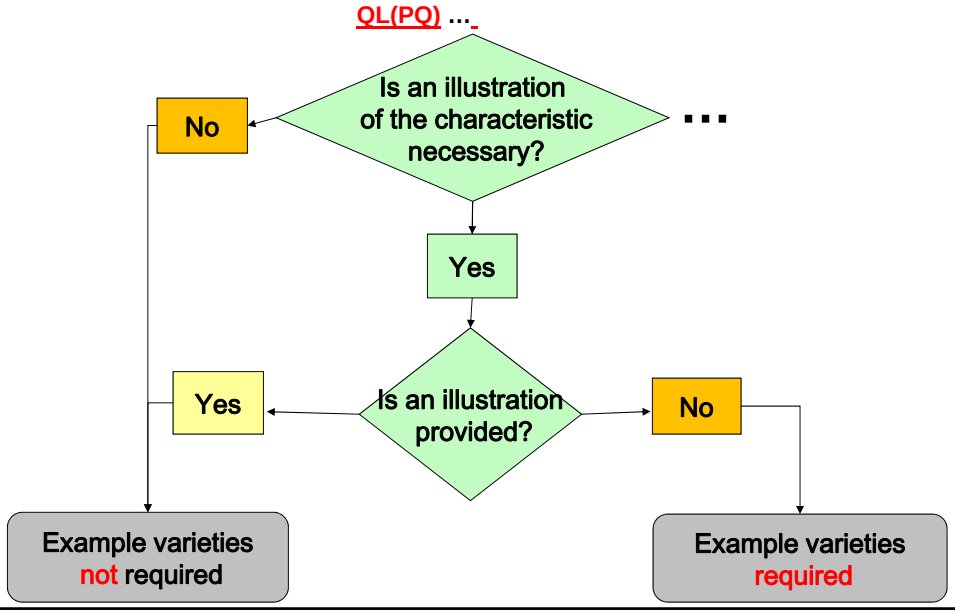
## Example Varieties – QN(PQ) Asterisked Characteristics

**Extract from document TGP/7: GN 28**




## Example Varieties – QL(PQ) Asterisked Characteristics

**Extract from document TGP/7: GN 28**



## Questions

## 3. GUIDANCE ON DRAFTING TEST GUIDELINES

*f) The process for developing UPOV Test Guidelines, including: TG Template; Additional Standard Wording; and Guidance Notes;*

## Genera and Species

- **>3,450 genera and species** with varieties examined for PBR
- **>3,305 genera and species** for which UPOV members have practical DUS experience
- **321Test Guidelines** adopted

Note: **321Test Guidelines estimated to cover 92% of PBR-related varieties in UPOV Plant Variety Database**

## PRIORITY for UPOV Test Guidelines

**PRIORITY for species or crops with high:**

- **number of authorities receiving PBR applications;**
- **number of PBR applications;**
- **number of foreign applications received by UPOV members;**
- **economic importance;**
- **level of breeding activity**

## EXAMPLE (New Test Guidelines)

Test Guidelines: ***Plantus magnifica*** **L.**
**(Common name: Alpha)**

Technical Working Party: **TWX**

| | |
|---|---|
| TWX (2014): | Alpha (proj.**1**) |
| TWX (2015): | Alpha (proj.**2**) |
| TWX (2016): | Alpha (proj.**3**) |
| Enlarged Editorial Committee (2017): | Alpha (proj.**4**) |
| Technical Committee (2017): | Alpha (proj.**5**) |
| Final adopted document (2017): | **TG/500/1** |

## TGP/7 :"Development of Test Guidelines"

### Procedure for the Introduction and Revision of UPOV Test Guidelines

- **Proposals (New TG, Revisions, Corrections)**
  - **Criteria to be observed**
- **Approval**
- **Preparation of draft TG for the TWP**
  - **Leading Expert**
  - **Subgroup**
- **Submission to the TC**
  - **Requirements for "final" draft**
  - **Consideration by the TC-EDC**
- **Adoption of the TG by the TC**

# 4. AGENDA for the TWP Session

**Example TWP Session**

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| [TECHNICAL WORKSHOP] (optional) | Reports on developments in PVP | TGP document development | TGP document development | Experiences with new types and species<br>Variety denominations | Databases, Electronic application systems<br>Exchangeable software |
| COFFEE | COFFEE | COFFEE | COFFEE | COFFEE | COFFEE |
| [TECHNICAL WORKSHOP] (optional) | Reports (Continuation)<br>Molecular techniques | TGP document development | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | Uniformity method development | Recommendations on Test Guidelines |
| | **LUNCH** | **LUNCH** | **LUNCH** | **LUNCH** | **LUNCH** |
| PREPARATORY WORKSHOP | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | **TECHNICAL VISIT** | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | Future program<br>Adoption of report |
| COFFEE | COFFEE | COFFEE | | COFFEE | **END OF SESSION** |
| PREPARATORY WORKSHOP | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | | Room 1: Test Guidelines subgroup<br>Room 2: Test Guidelines subgroup | |
| | Continuation | **RECEPTION** | | Continuation | |

EXCHANGING INFORMATION

AN OPPORTUNITY
for
TRAINING