GENERAL INTRODUCTION FOR DUS TEST

ON THE BASIS OF UPOV SYSTEM (TG/1/3)

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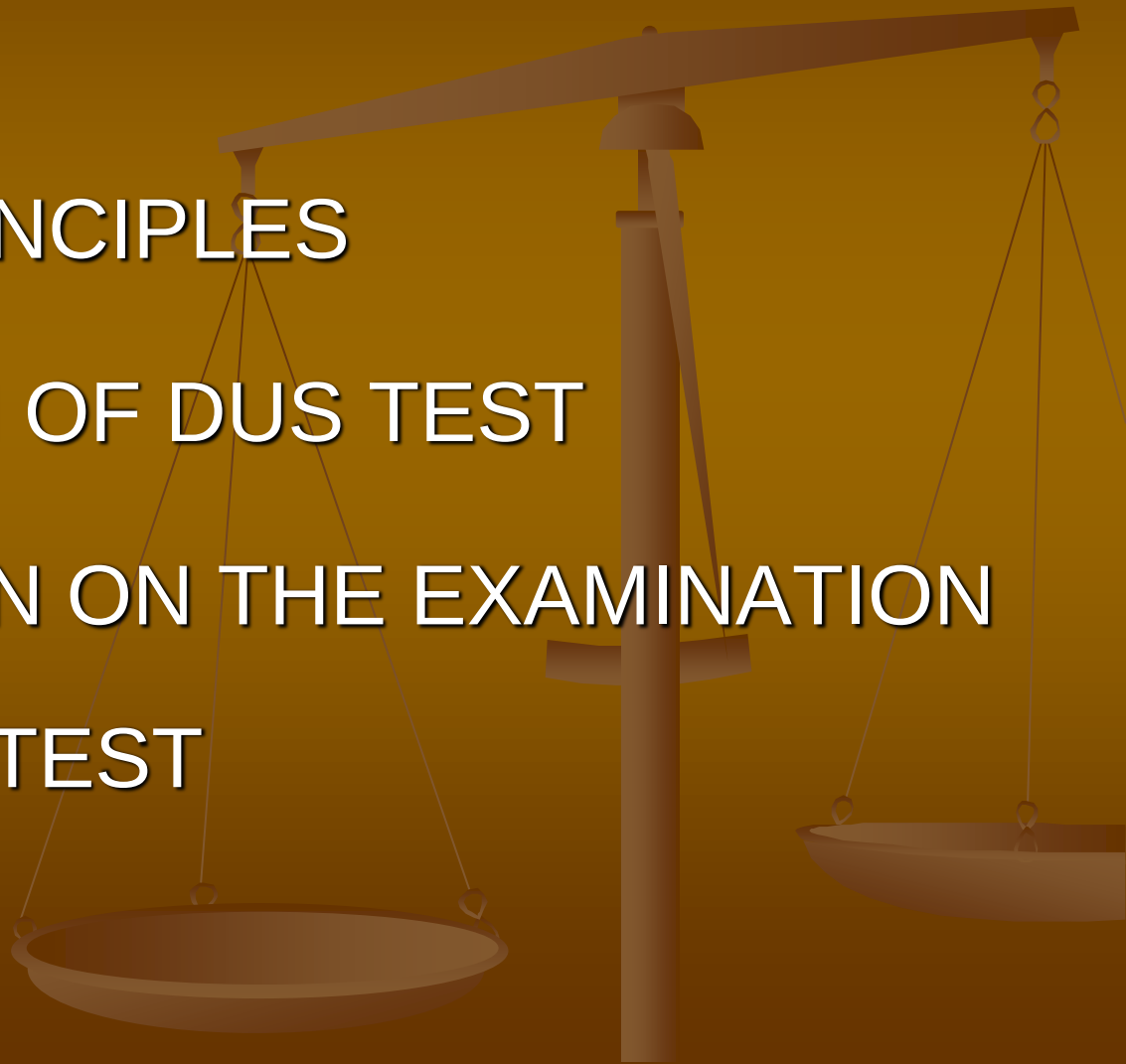
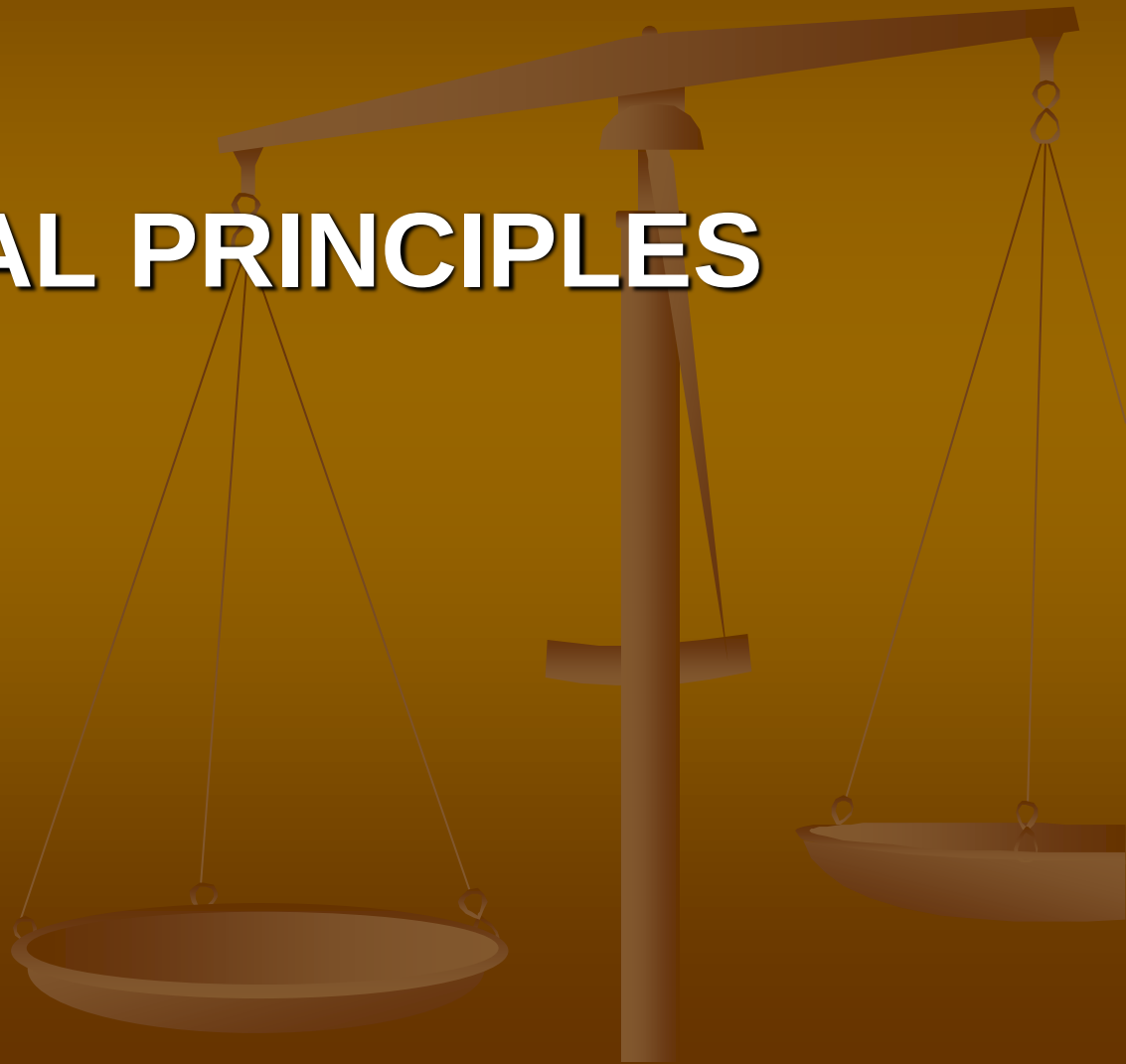
BARIA AUGUST 2016

OUTLINE OF THE PRESENTATION

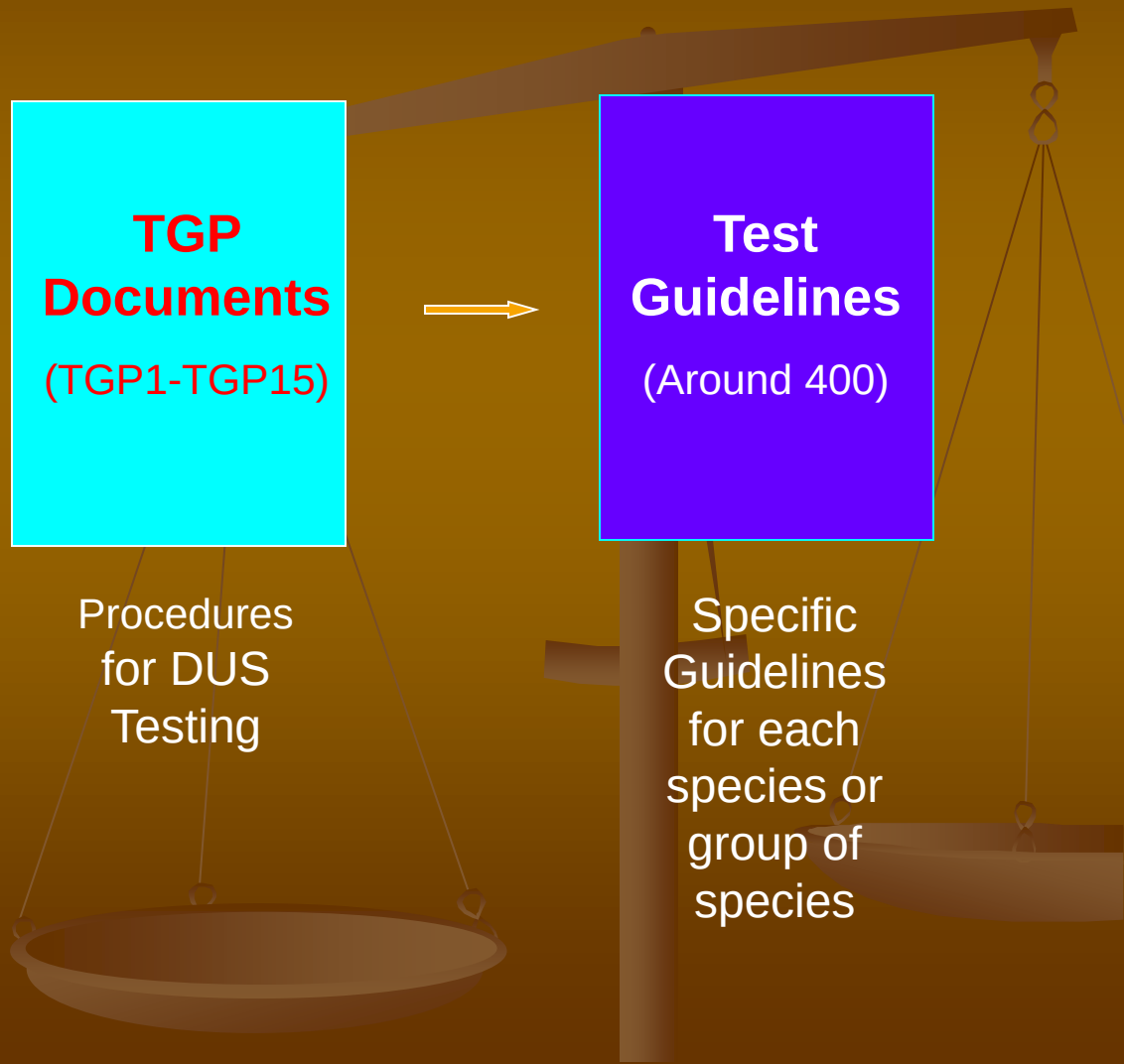


1. GENERAL PRINCIPLES
2. EXAMINATION OF DUS TEST
3. COOPERATION ON THE EXAMINATION OF THE DUS TEST

GENERAL PRINCIPLES



UPOV guidance for DUS test



General Introduction

(TG1/3)

Principle for DUS Testing

TGP Documents

(TGP1-TGP15)

Procedures for DUS Testing

Test Guidelines

(Around 400)

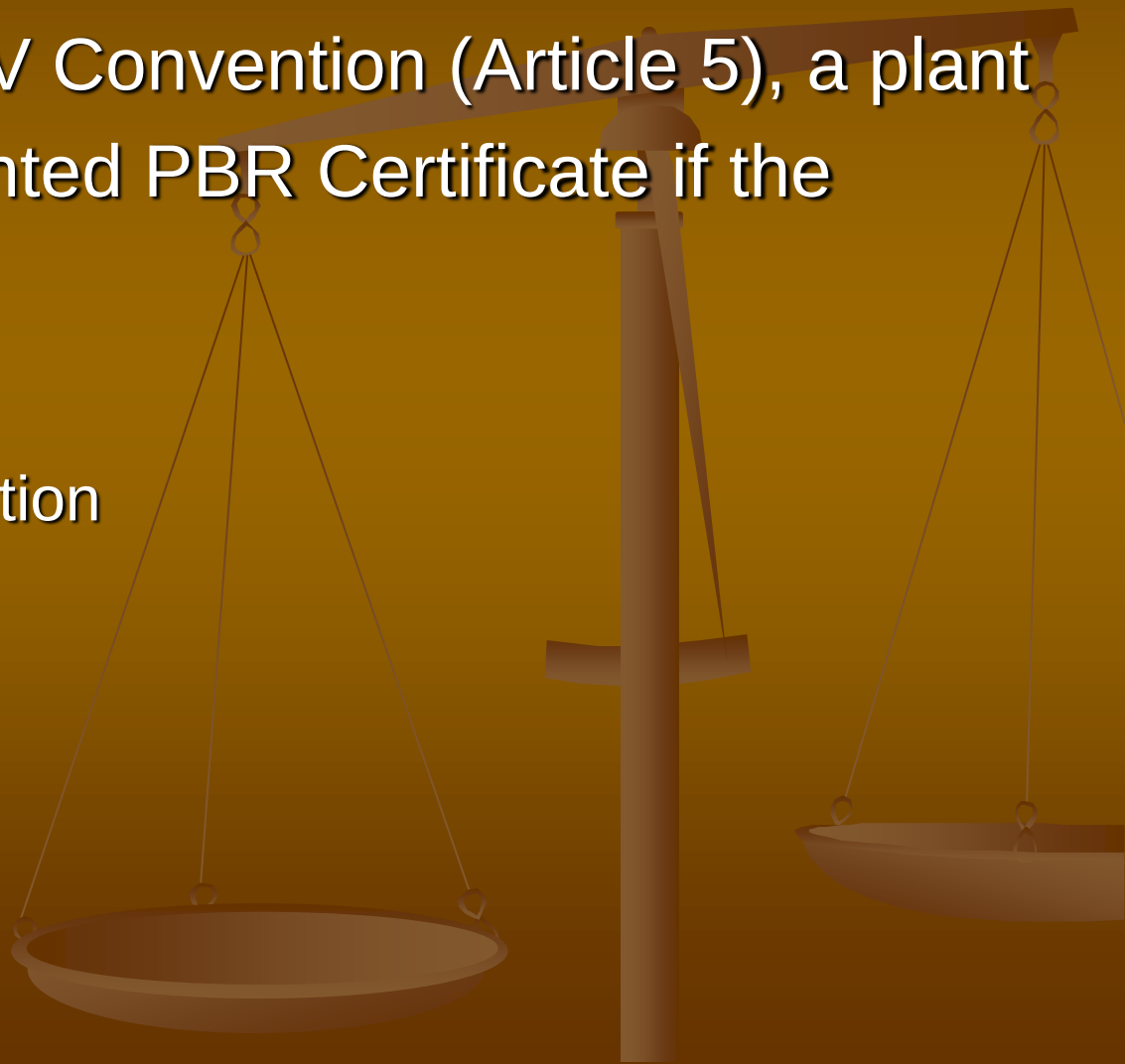
Specific Guidelines for each species or group of species

A Plant Variety

- Convention (1991 Act), Article 1(vi) states:
  - "(vi) "variety" means a plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder's right are fully met, can be
    - ✓ defined by the expression of the characteristics resulting from a given genotype or combination of genotypes,
    - ✓ distinguished from any other plant grouping by the expression of at least one of the said characteristics and
    - ✓ considered as a unit with regard to its suitability for being propagated unchanged".

Conditions to grant PBR for a Plant Variety

- According to UPOV Convention (Article 5), a plant variety can be granted PBR Certificate if the variety is
  - ✓ New
  - ✓ Suitable denomination
  - ✓ Distinct (D)
  - ✓ Uniform (U)
  - ✓ Stable (S)



DISTINCTNESS (Art. 7 of UPOV Convention)

"The variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application. In particular, the filing of an application for the granting of a breeder's right or for the entering of another variety in an official register of varieties, in any country, shall be deemed to render that other variety a matter of common knowledge from the date of the application, provided that the application leads to the granting of a breeder's right or to the entering of the said other variety in the official register of varieties, as the case may be."

Common knowledge varieties

- According to Article 7 of UPOV Convention, a variety shall be deemed to be common knowledge when it is:
  - ✓ Filed an application for Plant Breeder's Right or for the entering in an official register of varieties in any country
  - ✓ The application leads to the granting of a Plant Breeder's Right or to the entering in the official register of varieties, as in the case may be.

Common knowledge varieties (Cont.)

- Aspects which should be considered:
  - ✓ Commercialization of propagating or harvested material
  - ✓ Publishing a detailed description
  - ✓ Existence of living plant material in publicly accessible plant collections
- Is not restricted to national or geographical border

UNIFORMITY
(Article 8, UPOV Convention)

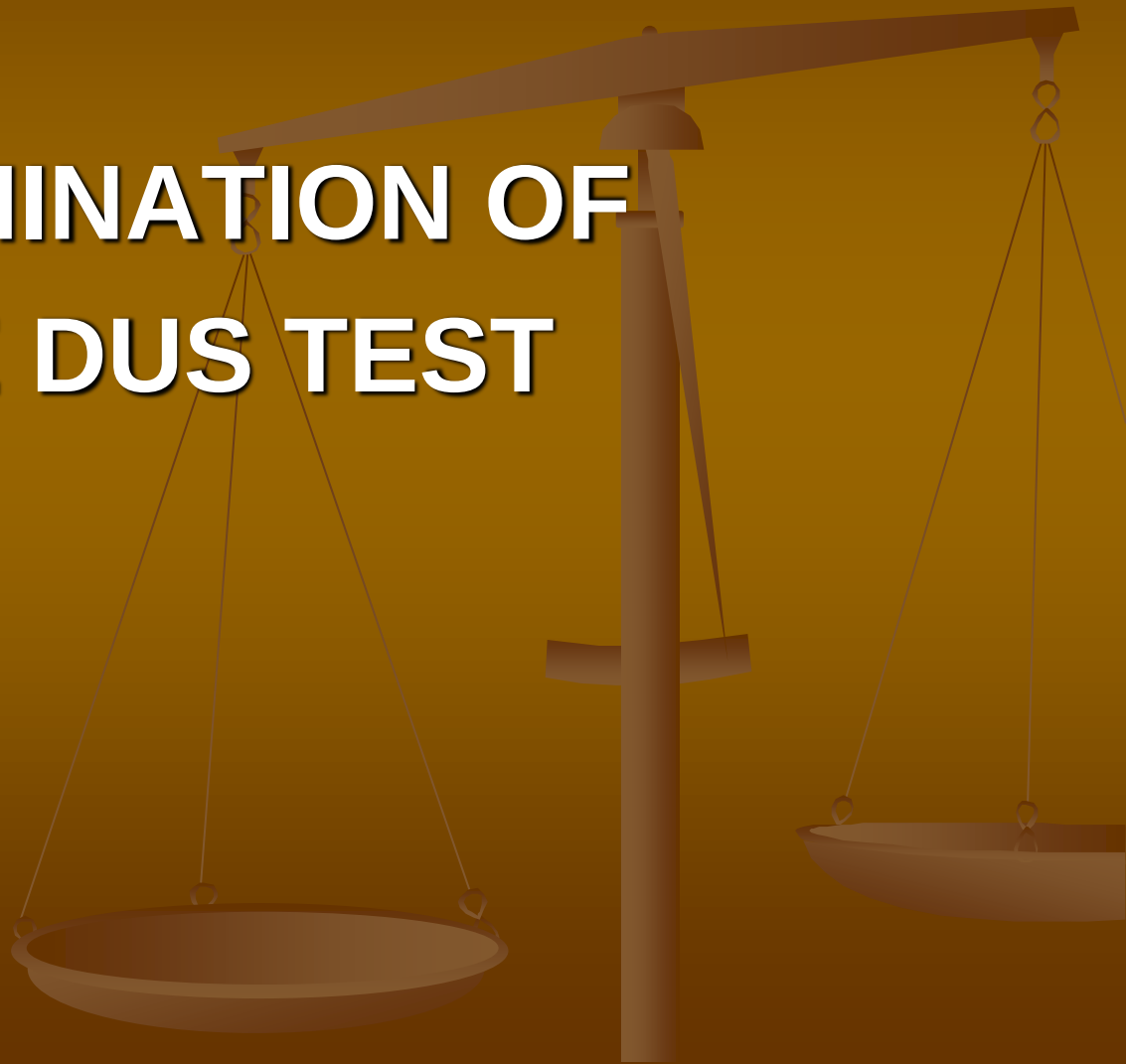
"The variety shall be deemed to be uniform if, subject to the variation that may be expected from the particular features of its propagation, it is sufficiently uniform in its relevant characteristics".

STABILITY
(Article 9, UPOV Convention)

- Convention (1991 Act), Article 9 reads as follows:

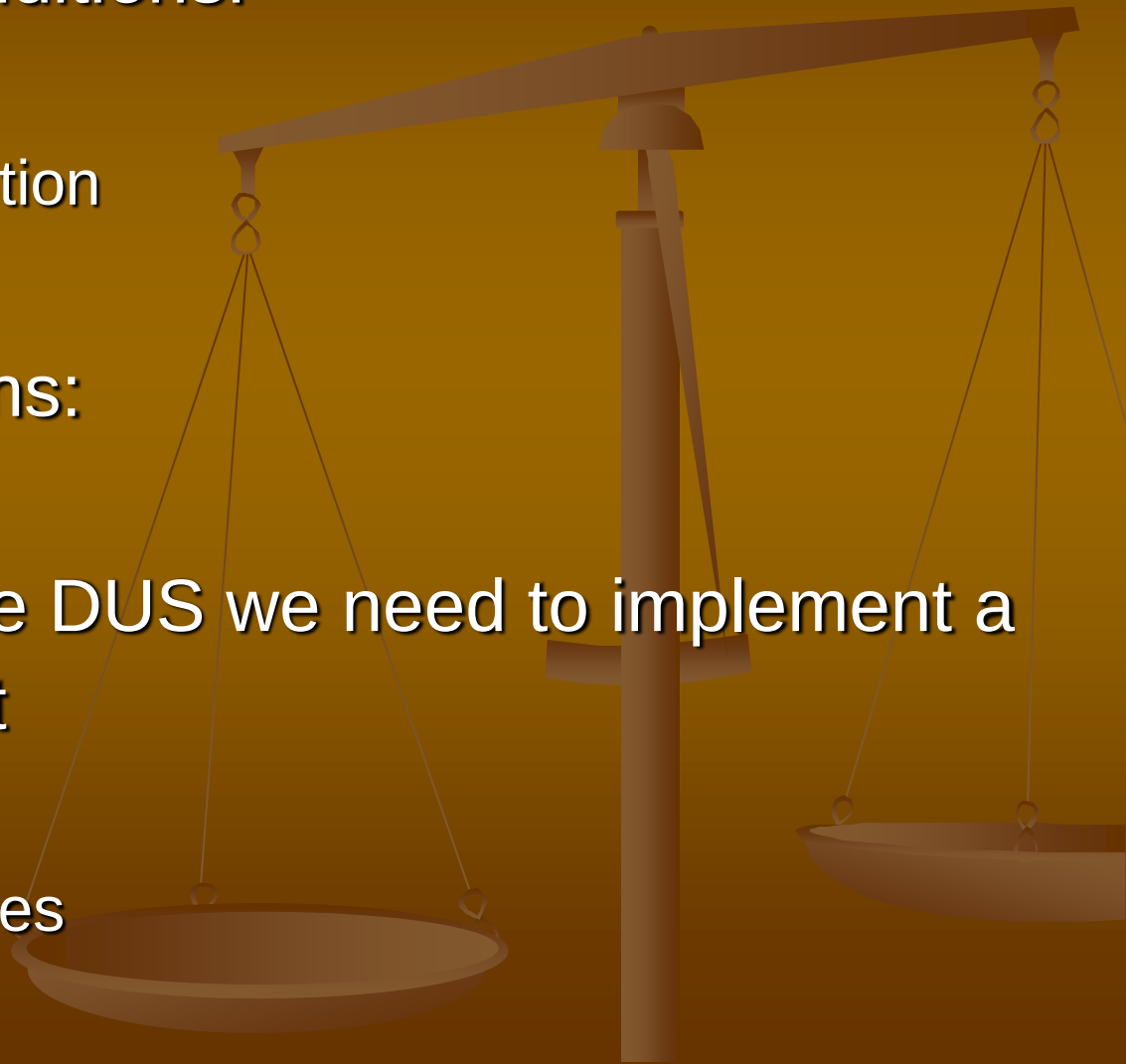
  "The variety shall be deemed to be stable if its relevant characteristics remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end of each such cycle."

EXAMINATION OF THE DUS TEST



Examination a variety for PBR

- Administrative Conditions:
  - New
  - Suitable denomination
  - Other conditions
- Technical conditions:
  - DUS
- In order to examine DUS we need to implement a DUS Growing Test
  - TG/1/3
  - DUS Test Guidelines



DUS Growing Test

- An experiment include the candidate variety and common knowledge varieties for testing D, U and S of the candidate variety (DUS Testing). Test Guidelines as a basis for DUS Testing
- DUS Growing Test may conducted by (Art. 12):
  - ✓ Breeder
  - ✓ Authority Offices (Centralized Center, Public Institutes…)
  - ✓ Purchase from other country

A DUS Test for Chrysanthemum (Tuliem Station)

DUS Test for Rice (Vanlam Station)

DUS Test for Chili (Baria Station)

UPOV Test Guidelines

- Instructions to conduct a DUS growing test to define if a candidate variety enough conditions for D,U,S
  - ✓ The way how to establish a DUS growing test
  - ✓ Observation/Measurement methods
- Types of expression of Characteristics
  - ✓ Quality; Quantity and Pseudo-Qualitative Characteristics
- Technical Questionnaire
  - ✓ Grouping characteristics and other necessary information

UPOV Test Guidelines

- Is not a rigid system
- May left out of the characteristics with out asterisked char. (*)
- Some characteristics may be added at national level
- New technique may considered
- TG is drafted and agreed by Experts in different experienced countries

Qualitative characteristics (QL)

- Expressed in discontinuous states
- These states are self-explanatory and independently meaningful
- All states are necessary to describe the full range of the characteristic; every form of expression can be describe by a single state
- Are not influenced by environment

Example for Corn: Ear – No of Color of grain (32)

Expression states	Note
✓ One	1
✓ More than one	2

1

2

Qualitative characteristics (Cont'd)

- Ear: Type of grain (36) - (QL)

Expression states	Note
Flint	1
Flint-like	2
Intermediate	3
Dent-like	4
Dent	5
Sweet	6
Pop	7
Waxy	8
Flour	9

1 2 3 4 5 6

Quantitative characteristics (QN)

- The expression covers the full range of variation from one extreme to the other.
- 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

Corn – Ear: Length of peduncle (QN)

Expression states	Note
Very short	1
Short	3
Medium	5
Long	7
Very long	9

Corn - Stem: Anthocyanin coloration of internodes (QN)

Expression states	Note
Absent or very weak	1
Weak	3
Medium	5
Strong	7
Very strong	9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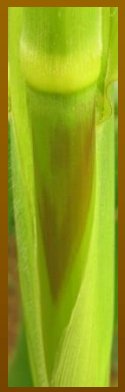
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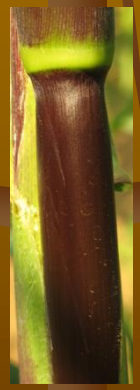
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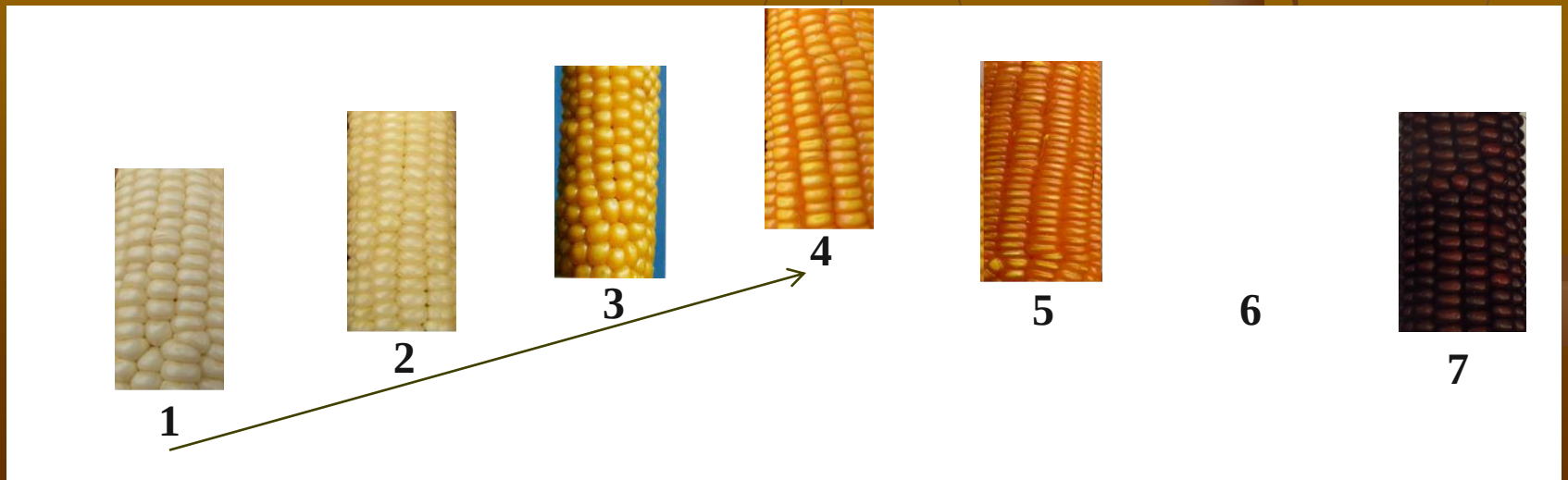
Pseudo - Qualitative characteristics (PQ)

- The range of expression is at least partly continuous but varies in more than one dimension
- Can not be adequately describe by just defining two ends of a linear range
- Each individual state of expression need to be identified to adequately describe the range of the characteristic.

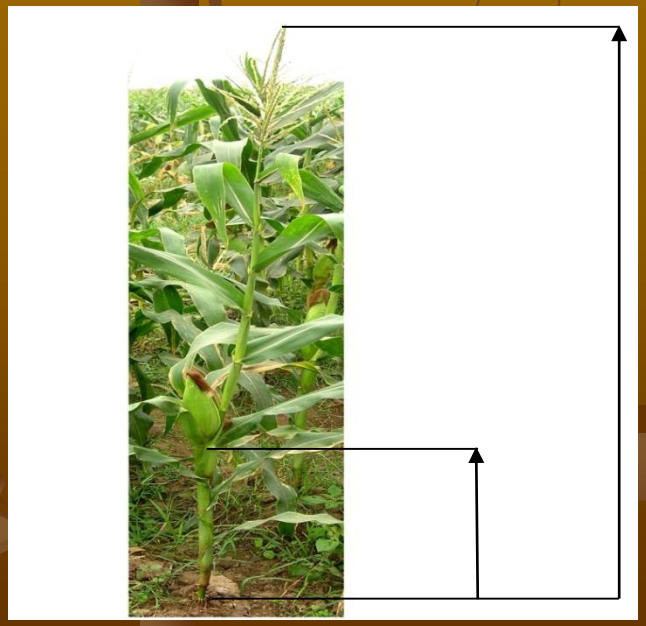
Corn – Ear: Main color of top of grain (PQ)

Expression states	Note
White	1
Yellowish white	2
Yellow	3
Yellow orange	4
Orange	5
Red	6
Purple	7



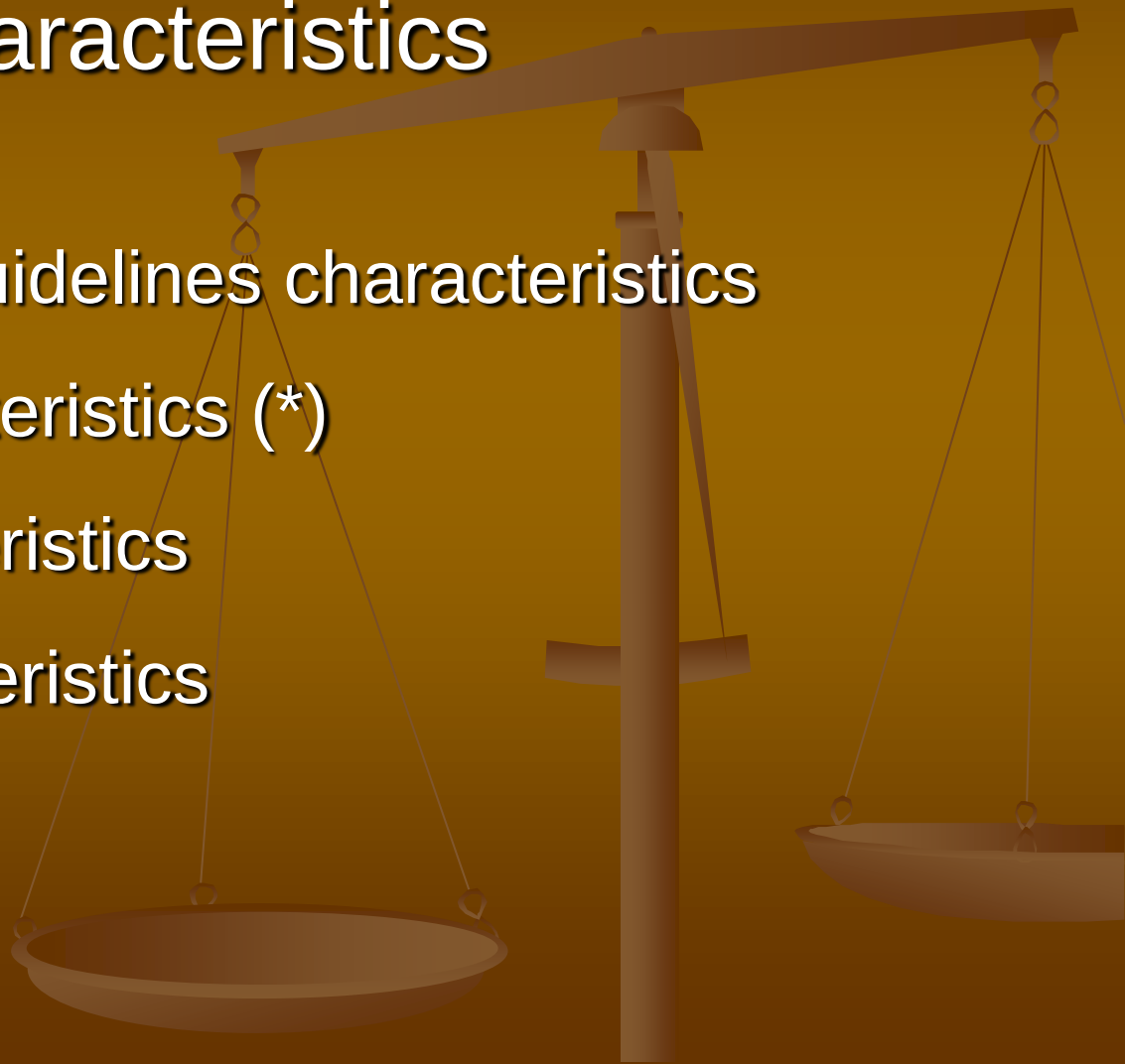
Special characteristics

- Expressed in response to external factors
  - ✓ Ex. Disease resistance; chemical resistance… it must be well defined and an appropriate method for examination.
- Combined characteristics
  - ✓ Ex. The ratio height of insertion of peduncle of upper ear to plant length (Char. 25)



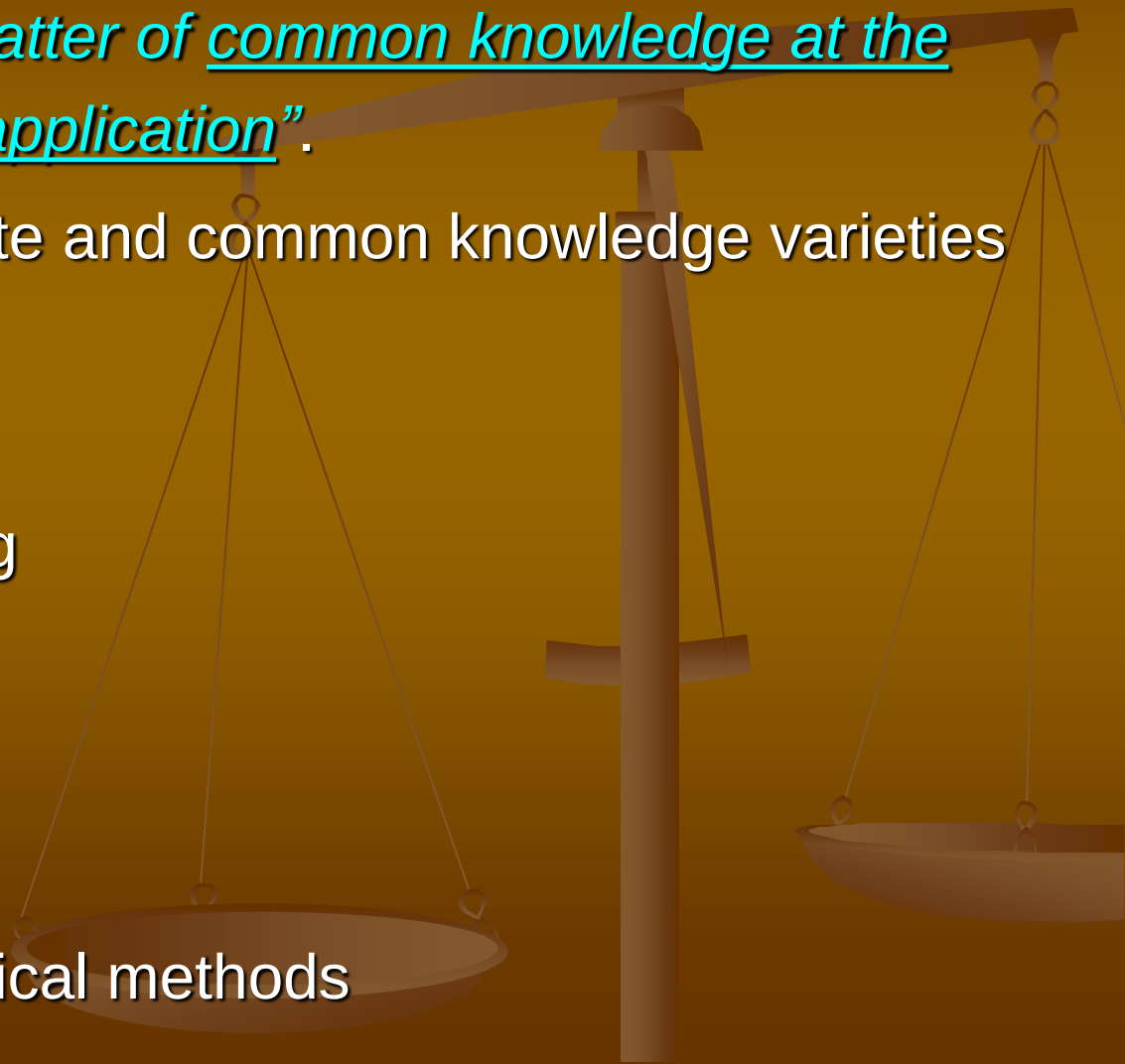
Functional Categorization of characteristics

- Standards Test Guidelines characteristics
- Asterisked characteristics (*)
- Grouping characteristics
- Additional characteristics



Examining Distinctness (D)

- According to UPOV: *"The variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application"*.
- Comparing the candidate and common knowledge varieties based on:
  - ✓ Consistent different
  - ✓ Clearly distinguishing
- Methods for examining:
  - ✓ Observation
  - ✓ Measured
  - ✓ Application of Statistical methods



Examining Distinctness (D)

- For measured Characteristics: we need to establish a **minimum allowable distance between** varieties so that a pair of varieties showing a difference greater than the minimum might be regarded as “distinct” in respect of that characteristic.
- For observation char. – it depend on the types of characteristics (QN, QL or PQ)
- Establishing the minimum distances based on the data of existing varieties from trials

Corn – Stem: Anthocyanin coloration of brace roots (QN)

Expression states	Note
Absent or very weak	1
Weak	3
Medium	5
Strong	7
Very strong	9

Clearly difference

Not clear differe nce

1

2

3

4

5

6

7

8

9

UNIFORMITY
(Article 8, UPOV Convention)

"The variety shall be deemed to be uniform if, subject to the variation that may be expected from the particular features of its propagation, it is sufficiently uniform in its relevant characteristics".

Examining Uniformity

- The variation in the expression of relevant char. Is the basis for assessment of Uniformity
- Particular features of propagation of the variety must be considered when examining U:
  - ✓ Truly self-pollinated or Mainly self-pollinated
  - ✓ Inbred lines
  - ✓ Vegetative
  - ✓ Cross pollinated or Mainly cross pollinated
  - ✓ Synthetic varieties
  - ✓ Hybrid varieties

Methods for Examining Uniformity

- For vegetative and self-pollinated varieties
  - ✓ Observation of off-types plants per number of sample (off-type plant is clearly distinguished from others by the expression of any characteristic of the whole plant or a part of the plant – depend on species)
  - ✓ Off-type approach by consideration of the level of variation ("standard deviation approach")
  - ✓ Measuring characteristics - an acceptable level of variation

Methods for Examining Uniformity (cont.)

- For cross-pollinated varieties
  - Including mainly cross-pollinated and synthetic varieties – exhibit wider variation within the variety than the others then it is difficult to determine off-types
  - are set by comparison with comparable varieties for the range of variation
- For hybrid varieties
  - Types of cross: single, tri, multiple or top cross are considered
  - Parents of F1: inbred, vegetative propagated lines or cross pollinated parents

Maximum acceptable No of off-types tolerated

- For vegetative propagated and truly self-pollinated, number of off-type plants based on the experience indicating the maximum acceptable number of off-types tolerated in samples of various sizes:

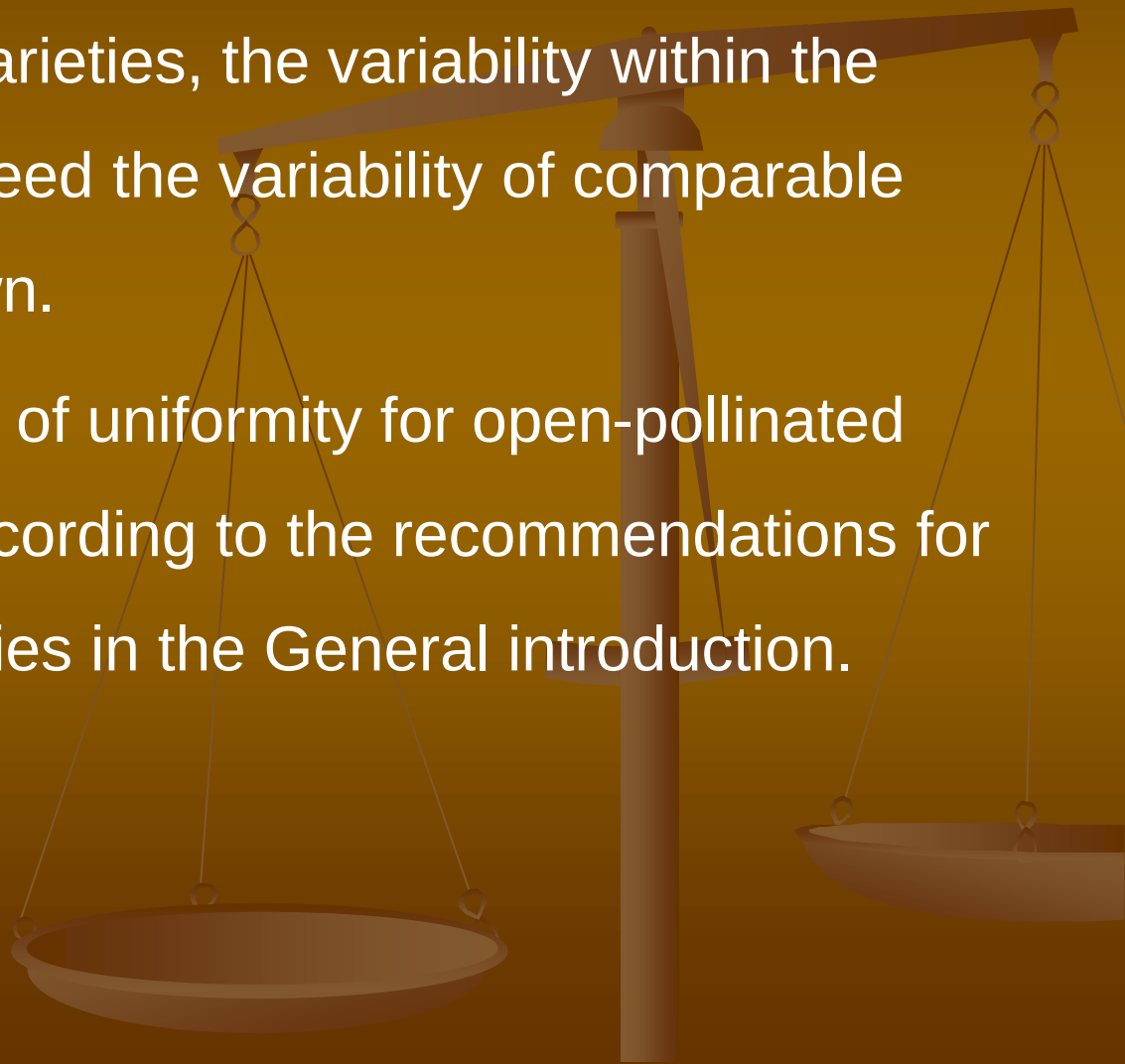
Sample sizes	Maximum No. of off-types
< 5	0
6 – 35	1
36 – 82	2
83 – 137	3

In case of Corn

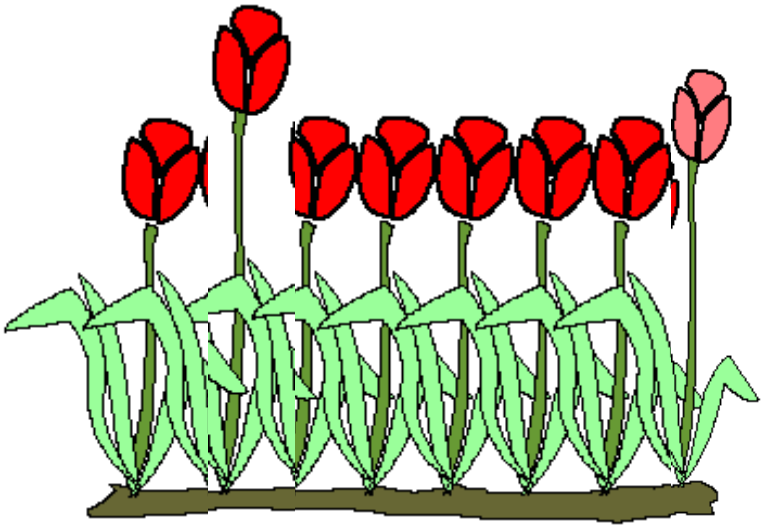
- Point 4.2.2 of Corn TG said:
  - ✓ “Inbred lines and single hybrids: a population standards of 3% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 40 plants, 3 off-type is allowed. In addition, the same population standard and acceptance probability should apply to clear cases of out-crossed plants in inbred lines as well as plants obviously resulting from the selfing of a parent line in single-cross hybrids (clear difference in plant height, size of ear or earliness as well as proof through isozyme polymorphism)”.

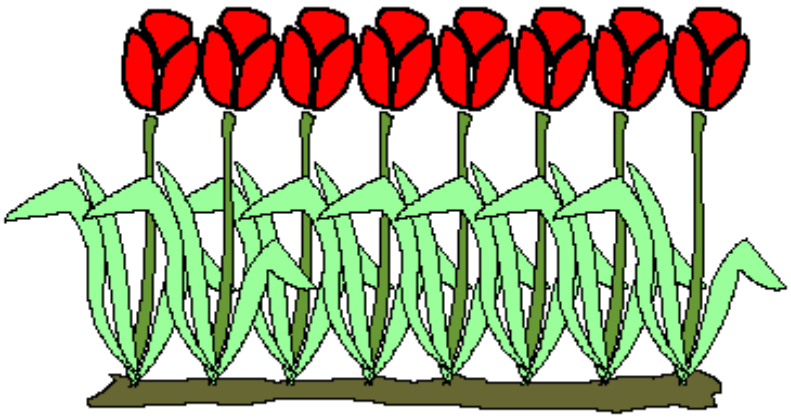
In case of Corn (cont.)

- 4.2.3 For three-way cross hybrids, double cross hybrids and open-pollinated varieties, the variability within the variety should not exceed the variability of comparable varieties already known.
- 4.2.4 The assessment of uniformity for open-pollinated varieties should be according to the recommendations for cross-pollinated varieties in the General introduction.



OFF-TYPES





A uniform variety

Unrelated and very Atypical Plants

- It is not necessary to consider as off-type plants
- The DUS Growing Test can implement as usual
- Unrelated and very atypical plants “may be disregarded” depend on the judgment of the crop expert
- For a Test with a small number of plants, one plant can interfere the Test so should not be disregarded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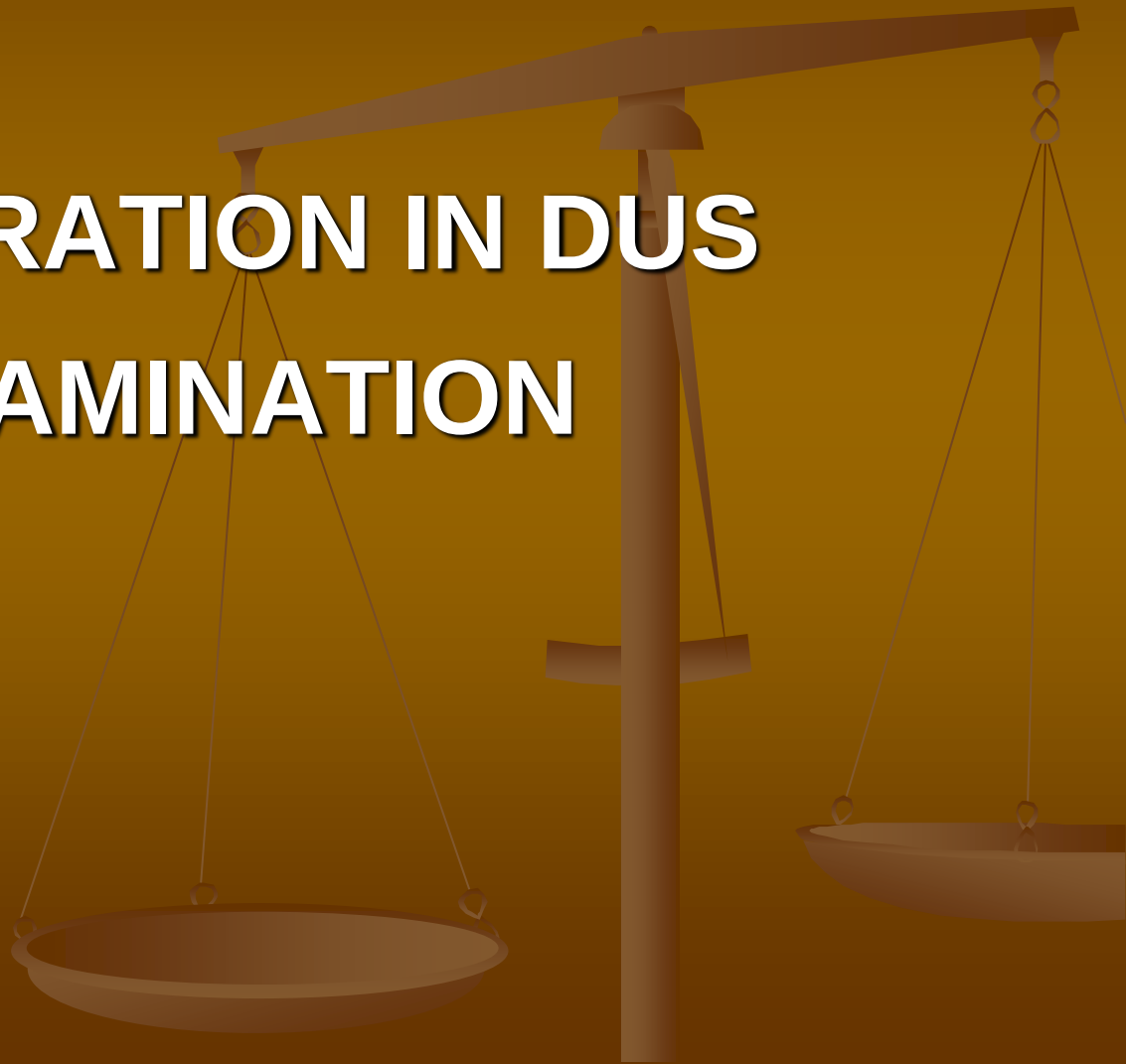
Examining of Stability

- Difficult for the final conclusion of the stability in DUS Growing Test as certain as Distinct and Uniformity
- Stability is assessed indirect through Uniformity: if a variety is uniform – It is considered as stable generally
- If doubt, special test: compare new and old material stocked by applicant
- If a variety is not stable – its material will be in-conform – refuse of the right
- Hybrids can examine by other test or indirect through it's parents

Conduct DUS Test when absence of TG

- To consult UPOV document (TGP/5)
- To find the experienced countries with suitable
- Ask UPOV for preparation
- Establish professional board for drafting National TG based on the consultation from:
  - ✓ Principles of General Introduction document (TG/3)
  - ✓ UPOV's TG of other close crops

COOPERATION IN DUS EXAMINATION



Cooperation in DUS Testing

- Types of cooperations
  - ✓ Between authority offices: Mutual acceptable of DUS report or International Assignment (Centralised Test)
  - ✓ Breeders: authorized, controlled and decided by PVPO
- Benefits from cooperation
  - ✓ Save time and money
  - ✓ Protection more species than capacities we have
  - ✓ Enough human resource for testing (Crop Experts)

Organization of the DUS Examination

Country A

Official Testing

PVP Office

Application → **DUS Trial** → **Decision to grant PVP Title**

Organization of the DUS Examination

Country A

Cooperation with Breeders

Breeder's DUS Trial

PVP Office

Application → **NO DUS Trial** → **Decision to grant PVP Title**

Country B

Cooperation between Authorities

PVP Office

Application → **DUS Trial** → **Decision to grant PVP Title**

Cooperation in DUS Trial

Country A

Application → **No DUS Trial** → **Decision to grant PVP Title**

Exchange of DUS reports

Country B

Application → **DUS Trial** → **Decision to grant PVP Title**

Purchase of DUS reports

Country C

Application → **No DUS Trial** → **Decision to grant PVP Title**

Cooperation in Examination (centralized examination)

Country A

Application

Country B

Application

Country C

Application

DUS Trial

Decision to grant PVP Title

Decision to grant PVP Title

Decision to grant PVP Title

Cooperation in Examination (centralized examination)

Country A

Application → **DUS Trial** → **Decision to grant PVP Title**

Country B

Application → **Decision to grant PVP Title**

Country C

Application → **Decision to grant PVP Title**

Cooperation in Examination (centralized examination)

Country A

Application

Decision to grant PVP Title

Country B

Application

Decision to grant PVP Title

Country C

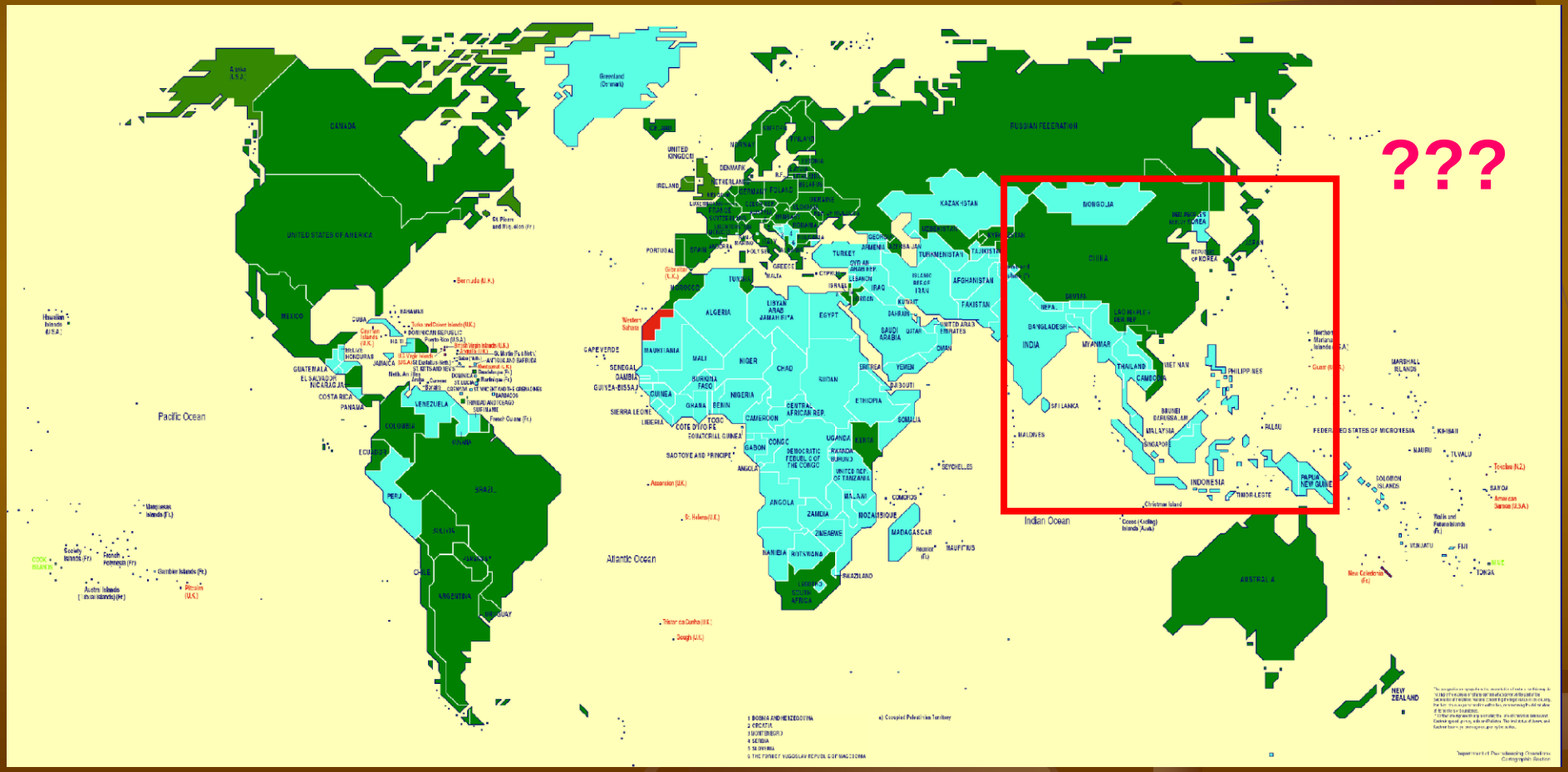
Application

DUS Trial

Decision to grant PVP Title

Breeder's Test

Regional DUS in future ?



Thank you for your attention

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