DUS TESTING

Presented at:

The Seed Production Course, SEMIS, University of Nairobi, 26th – 31st May, 2014

Simeon Kibet,
General Manager, Quality Assurance,
Kenya Plant Health Inspectorate Service
(*www.kephis.org*)

DUS Testing

A DUS test seeks to establish if a new variety is:

- **D**istinct - from all commonly known varieties existing in one or more characteristics
- **U**niform - The variety must be sufficiently uniform in essential characteristics
- **S**table - The variety must remain true to its description after repeated propagation

DUS testing cont'd

Definition of Plant Variety

- a plant grouping within a single botanical taxon of the lowest known rank,
- 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;

Purpose of DUS testing

In Kenya, DUS is undertaken to achieve three purposes:

- Plant Variety Protection – to qualify for protection, a new variety needs to be **D**istinct, **U**niform and **St**able
- Variety Release – a system of listing of varieties exists and for a variety to be listed, it needs to be **D**istinct, **U**niform and **St**able in addition to being agronomically superior to existing varieties (VCU = NPT)
- Seed Certification – Kenya has a system of compulsory certification and generates descriptors for use in the process

Steps in DUS testing

- Planning the DUS trial
- Designing the DUS trial
- Assembly of the requirements
- Setting up of the DUS test
- Observations and data recording
- Analysis and interpretation of data
- Preparation of DUS report

Planning a DUS trial

- Review database on the crop
- Examine descriptor of candidate
- Identify reference & comparative varieties
- Estimate size of trial
- Determine crop-specific requirements
- Identify facilities required

Designing the DUS trial

- Depends on method of examination based on kind of crop, capacity and available information
- Three methods:
  - Growing test – establishment of a growing trial, mostly applies to annual crops e.g. maize, beans, wheat etc
  - On-site inspection – uses materials on breeders' fields, applies to perennial crops e.g. coffee, tea, sugarcane
  - Purchase of DUS reports from UPOV members that have registered the variety – for ornamentals

Assembly of requirements

Assembly is based on information from:

1. Technical guidelines (TG)
2. Crop database
3. Descriptors of most comparative varieties
4. Varieties of common knowledge
5. Additional characteristics

Setting up of the DUS test

- Complete list of varieties to be included:
  - Candidates
  - Comparative varieties – with close similarity with candidate
  - Reference varieties – varieties of common knowledge
- Seed of the right quality – germination, health
- Proper packaging & labelling of seed

Setting up of the DUS test cont'd

- Set-up/ design of trial determined by:
  - No. of entries
  - No. of plants to observe
  - Observation method
  - Growing cycles
- Varieties subjected to same treatment

Setting up of the DUS test cont'd

- Optimal agronomic management
  - supplementary irrigation
  - disease & pest control
  - other stresses managed
- Ensures differences observed are due to genetic variations only

Observations & Data Recording

- DUS data taken from same plants
- Off-types noted and used in determination of uniformity
- Observations made strictly at defined stages

Analysis & Interpretation

- Analysis with/without statistics depending on:
- Trial layout (randomized vs side-by-side)
- Type of expression of characteristic – Qualitative (QL), Pseudo-qualitative (PQ) or Quantitative (QN)
- Method of observation – Measurement (M) or visual (V)
- Features of propagation of variety

Preparation of DUS Report

- Includes all characteristics used to describe the variety
- Characteristics distinguishing the new variety from similar varieties are highlighted
- Report used:
  - To make a decision on whether or not to grant plant breeders' rights.
  - To make a decision whether the variety should be released for commercialization and included in the national variety list
  - As a variety descriptor during seed certification.

Development of National Test Guidelines

- UPOV test guidelines used in most cases
- National test guidelines developed for crops without UPOV TGs
- Important characteristics not included in UPOV TGs identified for inclusion in national test guidelines
- Is an ongoing process as application for new crop varieties keep coming

Example – Maize DUS

- UPOV Technical guideline applied
- Material required
  - 1,500 grains – inbred lines
  - 1 kg hybrids and OPVs
  - Meeting minimum requirements for germination, purity, health & moisture content.
  - Not to have undergone dressing that would affect expression of characteristics

Maize DUS

- Method of examination
  - Two independent growing cycles
  - Testing conducted at one place
  - Under conditions ensuring satisfactory growth for expression of relevant characteristics
- Trial population
  - 40 plants inbred lines and single hybrids
  - 60 plants other hybrids and open pollinated varieties
- At least 2 replicates per trial

Maize DUS

Stage of characteristic development

- Indicates the optimum stage of development when that character must be scored
  - Seedling growth
  - Inflorescence emergence
  - Anthesis
  - Milk development
  - Dough development
  - Ripening

Type of observation

- Expression of characteristics can be observed
  - Visually (V)
  - By measurement (M)
  - Method used depends on the nature of the characteristic and the type of variety, i.e. whether it is an inbred line, single cross, 3-way cross, double cross or open pollinated variety (OPV)

Example, TASSEL:- ATTITUDE OF LATERAL BRANCHES

Time: halfway anthesis
Place: in lower third of tassel

Slightly recurved

Moderately Recurved

Strongly recurved

SCALE

3	**slightly recurved**	**5**	**moderately recurved**	**7**	**strongly recurved**

DUS Testing Staff and Stations

- 15 DUS examiners distributed in 5 stations. Undertake other duties in addition to DUS examination
- There are 5 DUS testing stations, established based on crops and agro-ecological conditions
  - Kisumu – Sesame, sorghum, millets, sugarcane
  - Kitale – Pasture crops, maize (high altitude)
  - Nakuru – Wheat, barley, oats, vegetables
  - Nairobi – Legumes, maize (low altitude), root crops
  - Embu – Rice, maize (medium altitude)
  - Other crops allocated to suitable locations as applications come

END

- THANK YOU