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Field Standards

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Field inspection

The main principles for checking at field inspection are:

- The previous cropping history of the field should be such that the risk of undesirable volunteer plants of the same or related species contaminating the seed crop is reduced to minimum
- The seed crop should be sufficiently isolated from other crops to reduce the risk of contamination with undesirable pollen

Field inspection

- The crop should be physically isolated to prevent mechanical admixtures at harvest
- The crop should be isolated from source of seed-borne diseases
- The seed crop should be reasonably free from weeds and other crop species especially those whose seeds may be difficult to separate from the seed crop during seed processing

Field inspection

- The seed crop should be free from seed-borne diseases
- The seed crop should have the correct identity
- There should not be more off-type plants present than the varietal purity standards allow

HYBRID MAIZE SEED INSPECTION **PROCEDURES**

- A field will be accepted or rejected for the following reasons:
  1. Varietal identification
  2. Off-type plants
  3. Isolation
  4. Pollen shedding
  5. Pest and diseases
  6. Weeds

HYBRID MAIZE SEED INSPECTION **PROCEDURES**

- To complete inspection for these criteria, at least five inspections of the field must be made:

  a) An isolation inspection (preliminary inspection)
- b) Three pollen control inspections
- c) A final inspection (pre-harvest inspection)

Isolation inspection (distance)

1. Walk around the field examining boundaries to confirm that the isolation requirement is satisfied. Isolation distance is measured across a ravine but not down the bank and backup.
2. Isolation correction may be made in the contaminating field provided the maize is removed before silks appear in the material being certified. After silking begins in the parents being certified, an isolation correction can only be made by completely destroying the improperly isolated seed crop.

Isolation inspection (distance)

2. Check the ratio of seed parent row to pollen parent row. This ratio should be such that no seed parent is more that 15 feet from pollen parent row.
3. Walk into the seed crop while examining plants to check whether they conform to the characteristics of the variety.
4. Check and confirm that border rows of pollen parent were planted. There should be eight border rows of pollen parent around the field

Isolation inspection (distance)

5. Check and confirm that the entire field was planted within 5 days. Fields planted at an interval of more than 5 days or a crop that is of uneven growth due to environmental factors should be separated so that fields of even crop growth are registered as a crop and kept apart from the other crops by a clear path of about 2 metres.

Isolation by time

- Normally achieved with a minimum of 2 weeks between planting days
- The best is to however have 3 to 4 weeks difference
- May not be possible during the normal growing season due to the pollen cloud in the air (irrigated areas).

Isolation by time

Pollen control inspection

- At least three inspections must be made during the period of 1 – 95% receptive silks in the seed (female)parent.
- Ideally, first inspection will be at 1-15% receptive silks, the second inspection at 15-60% receptive silks and the third inspection at 60-95% receptive silks.

Pollen control inspection

- It is not economically feasible to observe every plant in the field; therefore inspectors examine samples of plants. The sample size is 20 plants which is one count. The number of counts taken depends on the size of the field as follows:

Counts

Hectares	Minimum counts
=<6	100
7 – 16	200
17 – 32	300
33 – 40	400
Over 40	500

Sampling technique

- Establish a travel pattern before entering the field to avoid sample bias. The travel pattern should ensure that every row is crossed.
- Select a random location along the established travel pattern path to take sample count. Count 20 plants of the seed parent starting with a row next to the pollen parent after that omit one row and proceed to count 20 plants in the third. Repeat this procedure until the required total count is achieved.

Factors to check and record

- For each seed parent sample count, observe and record the following:
  1. The number of seed parent plants with receptive silks
  2. The number of seed parent plants shedding pollen
  3. The number of off-type plants in the seed parent
  4. The number of off-type plants in the seed parent shedding pollen
  5. The number of diseased plants (Head smut & common smut separately)

Factors to check and record

- And for each pollen parent sample count observe and record the following:
  1. The number of pollen parent plants shedding pollen
  2. The number of off-type plants in the pollen parent
  3. The number of off-type plants in the pollen parents shedding pollen
  4. The number of diseased plants (Head smut & common smut separately)

Decision Making

- Total your counts for each aspect and calculate the percentage.
- If you get after counting a field a percentage of tassels between 0.8 and 1.3% you have to recount. The average of both counts is the percentage for the field.

Decision Making

- Reject the crop if:
  - ❖ 0.1% off-types or 2% doubtful plants in male rows are shedding pollen
  - ❖ 0.1% off-types or 2% doubtful plants in female rows are found at final inspection
  - ❖ Two plants per hectare of either or both of head smut or common smut are found in the seed crop

Cont....

- If the figure for offtypes and doubtful plants fall between 0.8 and 1.3% and 1.8 and 2.3% respectively a second count should be taken. The average of the two counts is the percentage offtypes/doubtful plants

Pre-harvest inspection

- Inspect the field to ascertain that all male rows/ears have been fully removed or completely separated by a distinct and clear path before harvesting of the seed parent.

Cob inspection

1. The first step in ear inspection is to compare the description of the cob with the characteristics of the lot being inspected.
2. Pick up an ear of corn and roll the ear so you can see all the rows. Look for kernels or ears not matching the description and or distinctly different from the rest of the lot
3. While looking at the ears note the kernel at the end of the ears and cob colour. Incorrect cob colour is a good indication of an off-type.

Cob inspection

4. Continue picking and inspecting ears until 100 ears are examined.
5. Move to another location and observe 100 ears. Continue the process until the required sample size is achieved.
6. Record all the non conforming cobs and calculate the percentage.
7. Based on the above percentage make a decision on whether to request for resorting or not

Inspection procedures for bean seed crop

Bean seed crop

Inspection

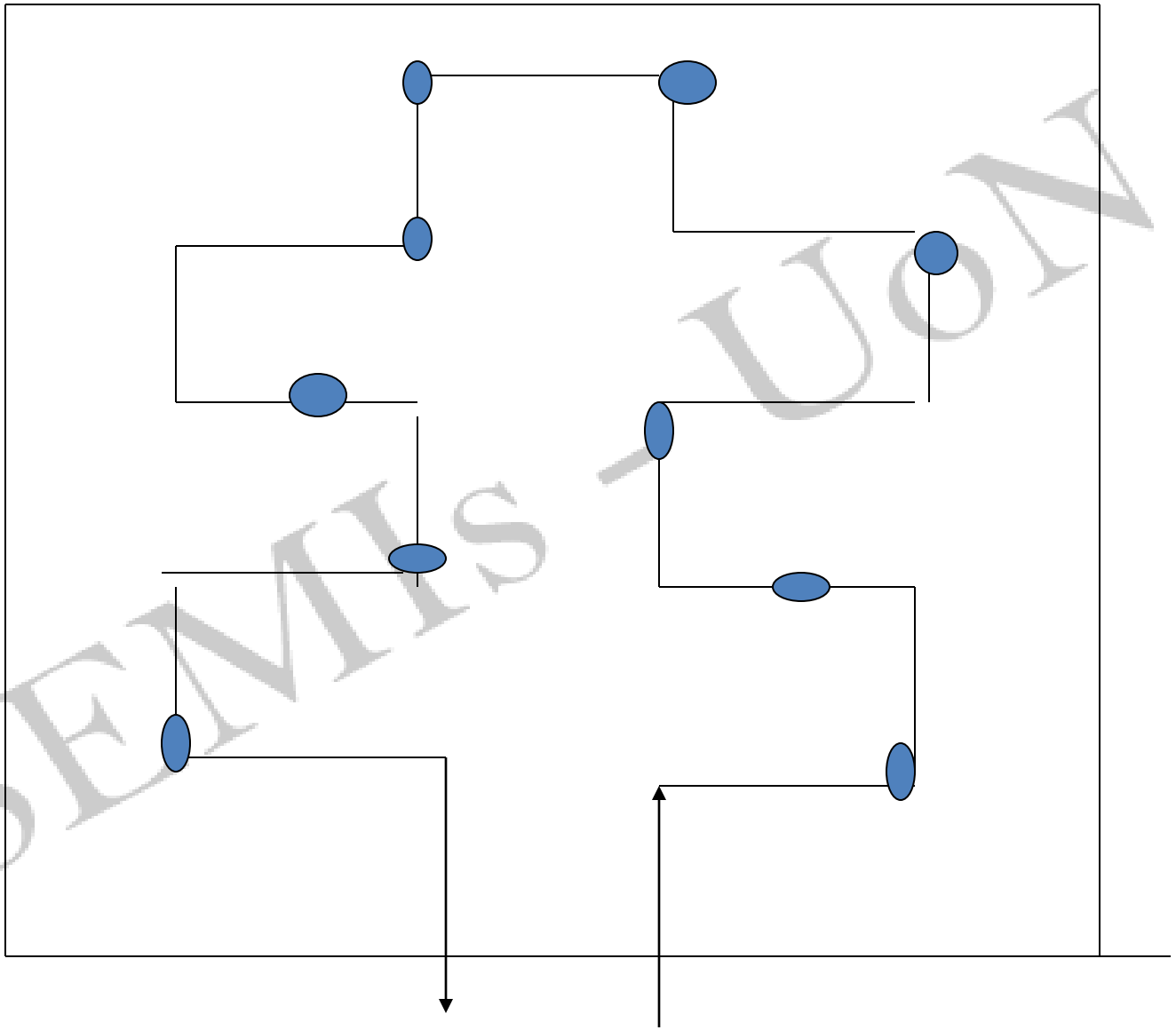
- Seed crop can be accepted or rejected for
- Inadequate isolation
- Varietal identity
- Off-type
- Diseases
- Lodging, weed infestation and stunting
- Inaccessibility

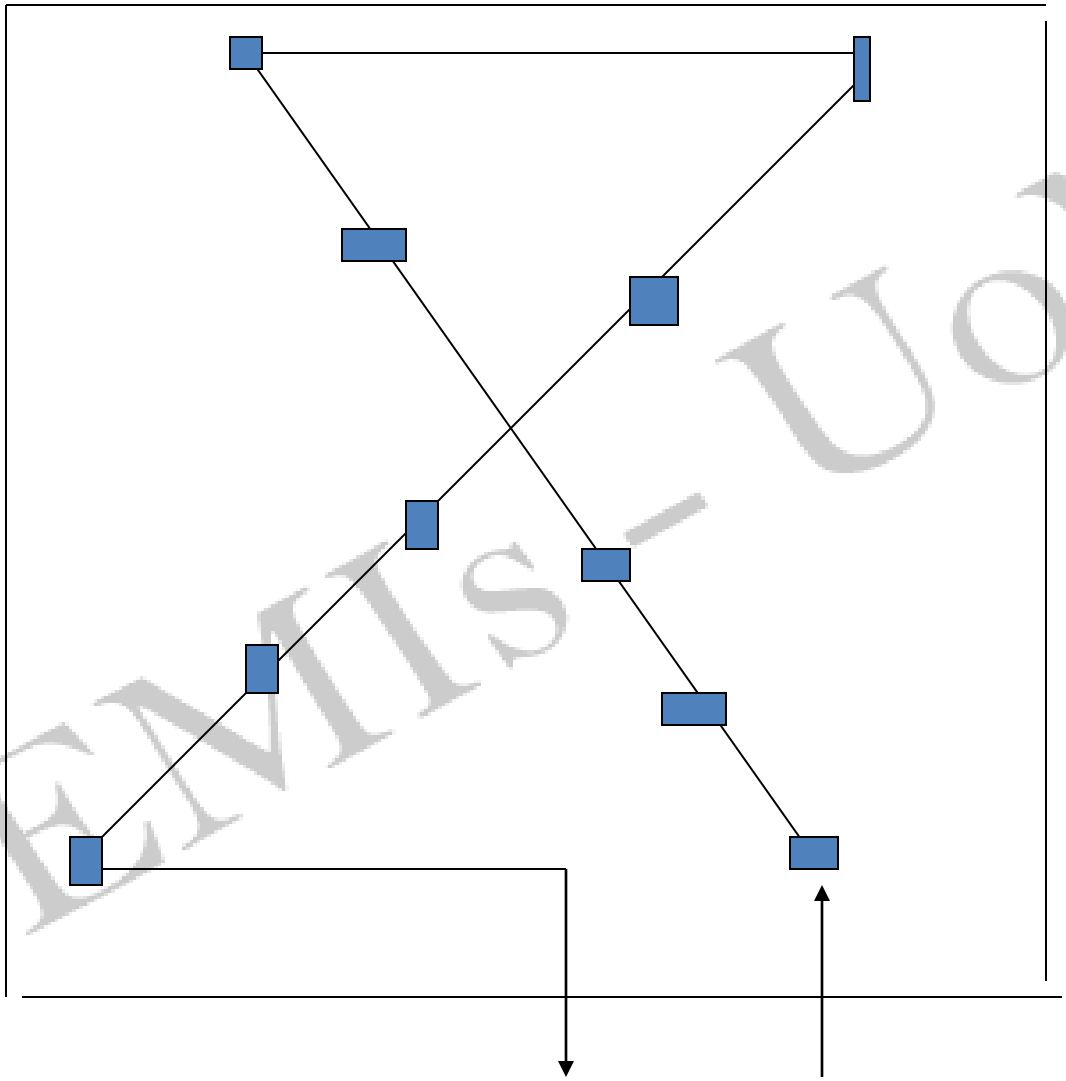
Counts

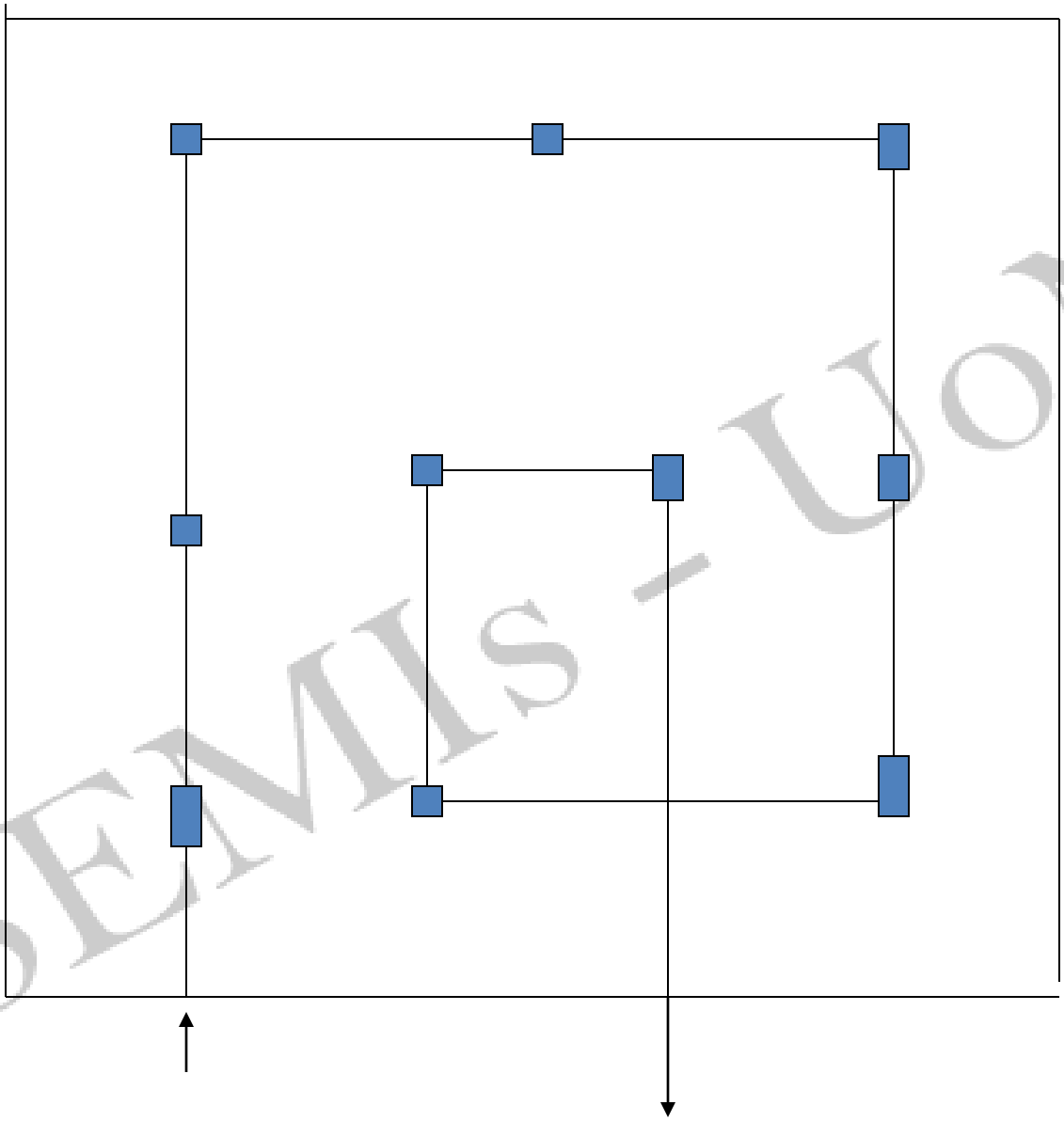
Hectares	Minimum counts
=<6	20
6.1-8	24
8.1-10	28
10.1-12	32
12.1-14	100

Technique

- Confirm general details of the crop as per application. Conformity to description and isolation requirement is satisfied.
- Determine travel pattern within the crop for sampling.
- Should allow greatest degree of coverage, increase accuracy, conserve time and ensure all rows are crossed.







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- Along the predetermined path count 100 plants(one count).
- Number of counts depend on the size of crop and class and should be random.
- Decision to pass or fail the crop is based on standards

Isolation distances

	Class	
	BR – B	***C1 – C2& Std***
• Beans	50	25
• Broad beans	200	100
• Soya beans	10	4
• Cowpeas	50	25
• Peas	50	25
• Green grams	50	25
• Dolicos lablab	50	25
• Chick pea	50	25
• Pigeon pea	400	200

Disease Tolerances

Species	Disease	Tolerance levels
Beans	Halo blight	None during final inspection
	Anthracnose	None during final inspection
	Bean common mosaic	None during final inspection
	Common blight	None during final inspection
Peas & cowpeas	Leaf spot	None during final inspection
	Pod spots	None during final inspection
	Bacterial blight	None during final inspection
Soya beans	Bacterial blight	None during final inspection
	Bacterial pustule	None during final inspection

Off types of other cultivars

Species	Maximum number per 100 plants		
	BR-basic	C1	C2-Std
Beans	0	1	2
Broadbeans	0	1	2
Soyabeans	0	1	2
Peas	0	1	2
Cowpeas	0	0	0
Greengrams	0	1	2
Dolichos lablab	0	1	2

Thank You

Laboratory Certification Standards

Presented by C.Kavu

Seed Testing

Seed testing procedures include:

- Purity testing
- Germination testing
- Other tests

Cont….

- Seed testing is part of seed certification process
- It ensures that seed that reaches the farmer is of high physical and genetic purity, high viability, and free from deleterious seed borne diseases and noxious weeds.
- In Kenya, all certified seed must meet minimum seed testing standards.

Historical Backgroung

Beginning of seed testing.

- 1869- Prof. Nobbe started the first seed testing laboratory in Tharandt- Germany.

Reasons

- Fraud in seed trade
- No confidence in seed quality.
- Increasing need for food due to growing population, urbanization and industrialization.

As a result seed testing stations started in many European countries.

Cont…

- The International Seed Testing Association (ISTA) was established in 1924 to work towards a vision of ***uniformity in seed testing*** worldwide.
- ISTA's mission is to develop, adapt and publish standard procedures for sampling and testing seeds, and to promote uniform application of these procedures.
- In Kenya, the first Seed Testing Laboratory was established in 1944 at NAL, Kabete.

Cont…

- The Laboratory was then serving mostly the European large-scale farmers who wanted to determine the quality of cereals and grass seeds before exporting.
- The first ISTA meeting on seed testing was held in 1964 in Nairobi.
- In 1979, the Seed Testing Laboratory was moved to Lanet in Nakuru and was renamed National Seed Quality Control Service.
- The Laboratory was then modernized and joined with the expanded field Seed Certification Program.

Purity Analysis

- Cleaned seed should not contain a high percentage of other particles-Cleaning machines leave impurities.
- objectives of purity analysis is to determine:
  - ❖composition of sample by weight
  - ❖identity of other species and inert matter.
  - ❖the quality of the seed lot
- Components of the sample are separated into the following fractions;
  - Pure seed
  - Other seeds
  - Inert matter

Cont….

- **Pure seed:**
  - ❖Species stated by the sender
  - ❖Or species found to predominates in the test
  - ❖Includes all botanical varieties/ cultivars
  - ❖Intact seeds
  - ❖Broken seeds, more than one half their original si

Cont….

- **Inert matter**
  - ❖Soil/earth particles, sand
  - ❖Straw or chaff, stems, leaves, etc
  - ❖Nematode galls
  - ❖All non seed matter
    - ❖Seed and seed like structures like:
      - – Pieces of broken or damaged seeds half and less than half of the original size
      - – Seed units in which it is readily apparent that there is no true seed present

Cont…

Other seeds:

- ❖Shall include seeds of any plant species other than that of pure seed:
  - weed seeds
  - crop seeds

Apparatus

- Magnifiers, reflected light, sieves, blowers

-The purity analysis is made on a working sample taken from the submitted sample.

Germination Test

- Germination is the emergence and development of essential structures of a seedling to a stage that indicates whether or not it is able to develop further into a satisfactory plant under favourable conditions in soil.
- It can be used to compare the quality of different lots and estimate the field planting value.

Germination procedure

- 400 seeds planted in four replicates.

Growing media specifications:

- Water retention-hold sufficient water for seeds and seedlings
- pH- range of 6.0–7.5
- Conductivity-salinity must be as low as possible.
- Cleanliness and freedom from toxicity-free from fungi, bacteria or toxic substances.

Incubation at controlled conditions for germination viz. Moisture, aeration, temperature and light

- Evaluate, record and calculate results

Germination media

- Paper substrates
  - Top of paper (TP)
  - Between paper (BP)
  - Pleated paper (PP).
- Sand or organic growing media
  - Top of sand (TS), Top of organic growing media (TO)
  - Sand (S) or organic growing medium (O)
- Top of paper covered with sand (TPS)
- Soil (S)

Dormancy breaking methods

- **Pre-treatments**
  - pre-heating- at 30 to 35 °C for up to 7days
  - pre-chilling
  - pre-washing
  - soaking
  - mechanical or chemical scarification
  - KNO3-0.2 % KNO3 solution,
  - Gibberellic acid(GA3)- 0.05 % solution of GA3

Essential seedling structures

The following seedling structures are essential for further development of a seedling into a satisfactory plant:

- root system (primary root; in certain cases seminal roots);
- shoot axis (hypocotyl; epicotyl; in certain *Poaceae*
- mesocotyl; terminal bud);
- cotyledons (one to several);
- coleoptile (in all *Poaceae).*

Cont….

- Normal seedlings:
  - Well developed shoot and root systems,
  - shoot and root systems with slight defects or infected with secondary infection.
- Abnormal seedlings:
  - Damaged seedlings
  - Deformed seedlings
  - Decayed seedlings
  - Primary infection

Cont….

- Un-germinated seed-Seeds that failed to germinate by the end of the test period.
  - Fresh seed
  - Dead seed
  - Hard seed

Other seed tests

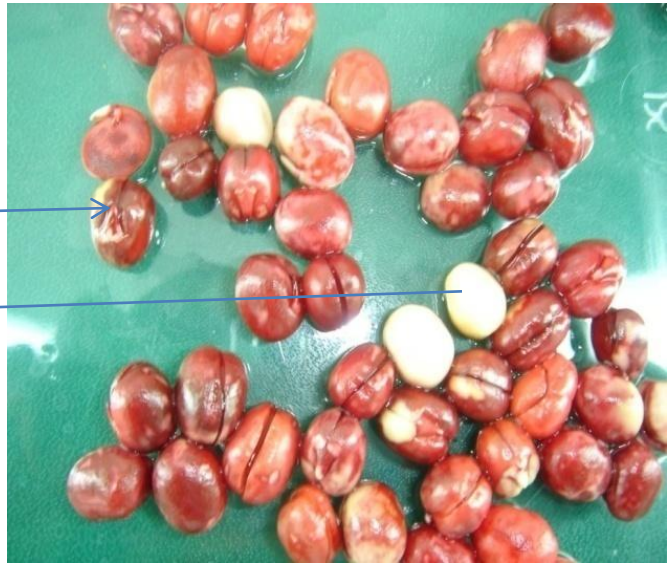
- Tetrazolium test
- Seed vigour testing
- Moisture content

Tetrazolium testing

- It is a quick biochemical test that assesses the seed viability using the staining pattern of living tissue.
- This makes it possible to distinguish the red-coloured living parts of seeds from the colourless dead ones.

- Living

Dead



Cont…

- Make a quick estimate of the viability of seed samples in general and those showing dormancy in particular
- Determine viability of individual dormant seeds when there are high percentage of dormant seeds after the end of a germination test

Cont…

- The color phase of the test is obtained by use of a colorless testing solution that consists of water, and 2, 3, 5-triphenyl tetrazolium chloride (TTC).
- When 2, 3, 5 triphenyl tetrazolium chloride is hydrogenated, a red, stable and non-diffusible substance called **triphenyl formazan is produced** in living cells.

Cont….

- Formazan formation indicated by staining shows mitochondrial respiratory activity, hence cell and tissue viability.

Seed vigour testing

- The sum of those properties that determine the

activity and performance of seed lots of acceptable germination in a wide range of environments.

- Germination test conducted in an optimum conditions-performance of a seed lot in the field cannot be known.
- seed lots having similar laboratory germinations may give widely differing field emergence values.

Cont….

- two seed lots having the same germination percentage in the laboratory may age differently when stored.

Seed aspects associated with Vigour

- Emergence ability of seeds under unfavorable environmental conditions
- Rate and uniformity of seed germination and seedling growth
- Performance after storage, particularly the ability to germinate
- A vigorous seed lot is one that is able to perform well even under environmental conditions not optimal for the species.

Why vigour tests

- To provide information about the planting value in a wide range of environments and/or storage potential of seed lots
- To provide additional information to the standard germination test to assist in differentiation of seed lots of acceptable germination.

Moisture Testing

- The moisture content is an important factor in seed longevity and quality. In seed trade, high seed moisture content may exaggerate the weight of the seed lot and encourage disease infection during storage. The recommended seed moisture content levels are stated in the Seeds and Plant Varieties Act (Cap. 326).

Pathology tests

- Seed pathology tests are done to detect and identify seed-borne pathogens.
- Different methods are used depending on the pathogen being investigated (fungi, bacteria or virus).
- Seed pathology is also crucial in the routine seed field inspections and surveillance.

THANKYOU

Certification Procedures and Standards

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Purpose

- To maintain and make available to the public high quality seeds and propgating material of notified varieties to ensure genetic identity and genetic purity.
- Designed to achieve prescribed standards.
- Certification done by certification Agency as per the laws of individual countries.

International institutions

- OECD-Organisation for economic co-operation and development.
- AOSCA-Association of official seed certifying Agencies
- ISTA-International Seed Testing Association
- AOSA-Association of official seed Analysts
- UPOV-Union for the protection of new varieties of plants

Variety eligibility

- The variety to be certified must have undergone National Performance Trial (NPT) and Distinctive Uniformity and Stability tests and officially released or an advanced breeder's lines, which have potential for release.

Variety eligibility

- The variety should have a detailed description of the morphological, physiological and other characteristics of the plant and seed that distinguish it from other varieties

Phases of seed certification

- Receipt and scrutiny of application
- Verification of seed source, class and other requirements of seed used for raising the seed crop
- Field inspections to verify conformity to the prescribed field standards.
- Processing and packaging
- Seed sampling and analysis
- Grant of certificate,certification tags and sealing.

Seed certification class

- Refers to a generation system of seed multiplication for production of a particular class from specific class up to certified stage .
- It is the number of generations distant this seed is from the original variety as developed by the plant breeder

Cont…

- The number of generations allowed depends on:-
  - The rate of genetic deterioration
  - Seed multiplication ratio
  - The total seed demand

Cont….

- Different seed multiplication generation models are derived:
  - Three-Generation model: Breeder seed (BRS), Foundation seed (FS) and certified seed (CS)

Cont…

- Four-Generation model: BRS, FS, Registered seed (RS), and CS or BRS, Pre basic seed (PB), Basic seed (BS), and CS
- Five-Generation model: BRS, FS (i), FS (ii), CS(i) and CS (ii)

NB: In cross pollinated crops three and four generation model system are used

Cont…

- Seed classes vary from country to country
- Seed classes used in various countries
  - **Breeder seed**
  - **Pre-basic seed**
  - **Basic seed**
  - **Certified seed**

Breeder seed

- It is the progeny of the nucleus seed
- Produced directly under plant breeder supervision
- Produced in one or more stages
- Used for production of pre-basic or basic seed.

Cont…

- 99.9% genetically and 100% physically pure.
- Labeled upon meeting quality standards
- Pre-controlled to determine its genetic purity
- Not available for general cultivation

Pre-basic seed

- It is the progeny of breeder seed
- Produced under the supervision of the breeder and seed certifying agency.
- The seed is not available for general cultivation.
- Pre-controlled to determine its genetic purity
- Labeled upon meeting the quality standard

Basic seed

- It is a progeny of pre-basic seed
- Produced under the supervision of the plant breeder and the seed certifying agency
- Not available for general cultivation
- Pre-controlled to determine its genetic purity.
- Labeled upon meeting quality standards

Certified seed

- Progeny of basic seed
- Available to farmers for general cultivation.
- Produced under control of seed certifying agency
- Further generations of certified classes may be produced using this class.
- Labeled upon meeting quality standards
- This class of seed requires post controlling

Cont..

- Seed in each class must satisfy the conditions laid down for that class
- Conditions are different for each class with breeder seed having the highest standard.

OECD Seed Classes

Class	Label colour
Pre-Basic	White with diagonal violet stripe
Basic	White
C1G	Blue
C2G	Red
Not Finally certified seed	Grey

Seed classes in Kenya

Class	Label colour
Breeder	White
Pre-basic	White
Basic	White
C1G	Blue
C2G	Red
C3G	Red
C4G	Red
Standard	Grey

COMESA & SADC seed classes

- COMESA and SADC countries have adopted the following classes of seeds:-
  - Breeder
  - Pre-basic
  - Basic
  - Certified 1st
  - Certified 2nd

AOSCA seed classes

- Breeder-White
- Foundation seed-White
- Registered seed-Purple
- Certified seed-Blue

Field standards of kenyan seed classes

Species	Isolation Distance (m)	Offtypes- Max no. per 100 plants
Cowpea, greengrams		
Breder-Basic	50	0
C1	25	1
C2-C4	25	2

Cont…

Species	Isolation Distance (m)	Offtypes- Max no. per 100 plants
Sorghum & Maize		
Breeder-Basic	400	0
C1	200	2
C2-C4	200	1

Seed Processing

- Means cleaning, drying, treating, grading and other operations which will improve the quality of seeds.
- Specified screen sizes are used for cleaning and grading of seeds so that typical contaminants such as weed seeds,smallseeds,damaged seeds, broken and shrivelled seeds,straw,chaff,leaves,twigs,stones,soil particles etc.are removed

Seed sampling

- Reliability of interface made about quality of seed lots depends on :-

-The accuracy with which the sample represents the lot.

-Accuracy and precision of the laboratory test.

-Only qualified personnel allowed to take samples(samplers).

Cont….

- Objective:-To obtain a representative sample of a size suitable for test.
- A sample is obtained from the seed lot by taking small portions at random from different position of the lot and combining them

SeedLot:-It is specified quantity of seed,physically identifiable,in respect of which a seed test certifiacte can be issued.

-Maximum lot sizes per species available in the ISTA rules

Cont….

Primary sample:-Small portion taken from one point in the lot.

Composite sample:-Is formed by combining and mixing all primary samples taken from the lot.

- Submitted sample:-Sample submitted to seed testing laboratory .The size of the submitted sample is specified
- in the Seed Testing Rules.

Cont…

Working sample:-Is a sub sample taken from Submitted Sample in the laboratory,on which one of the quality test is made.

-Three representative samples are taken in the prescribed manner, marked and sealed.(seed testing lab, seed producer(company) and reference sample retained for any legal proceedings.

Minimum sampling intensities for seed lots in containers

Containers	No. of primary samples
1-4	3 From each container
5-8	2 From each container
9-15	1 from each container
16-30	15 in Total
31-59	20 in total
60 or more	30 in Total

NB. seed lots in containers smaller than 15kg capacity, containers shall be combined to sampling units not exceeding 100kg and subjected to the scheme above

Thank You