



SEED PACKAGING

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SEED TREATING

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SEED PACKAGING

The two most important factors that affect seed packaging and storage are:

Seed moisture content

- The lower MC-limit for attacks by fungi is **13-14%** for starchy seeds and **8-9%** for oil-containing seeds
- For every 1% rise in MC. the seed viability is halved

Seed temperature

For every 5% rise in temperature seed viability is halved

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OTHER FACTORS AFFECTING STORED SEED

Atmosphere:

- Other gases, e.g. ethylene which promotes fruit and seed ripening
- Quarantine treatment with poisonous gases may kill seed
- Lack of oxygen may kill some seeds.

Biological agents:

Fungi, moulds, rodents and insects

Mechanical hazards:

Shock, compression, vibrations.

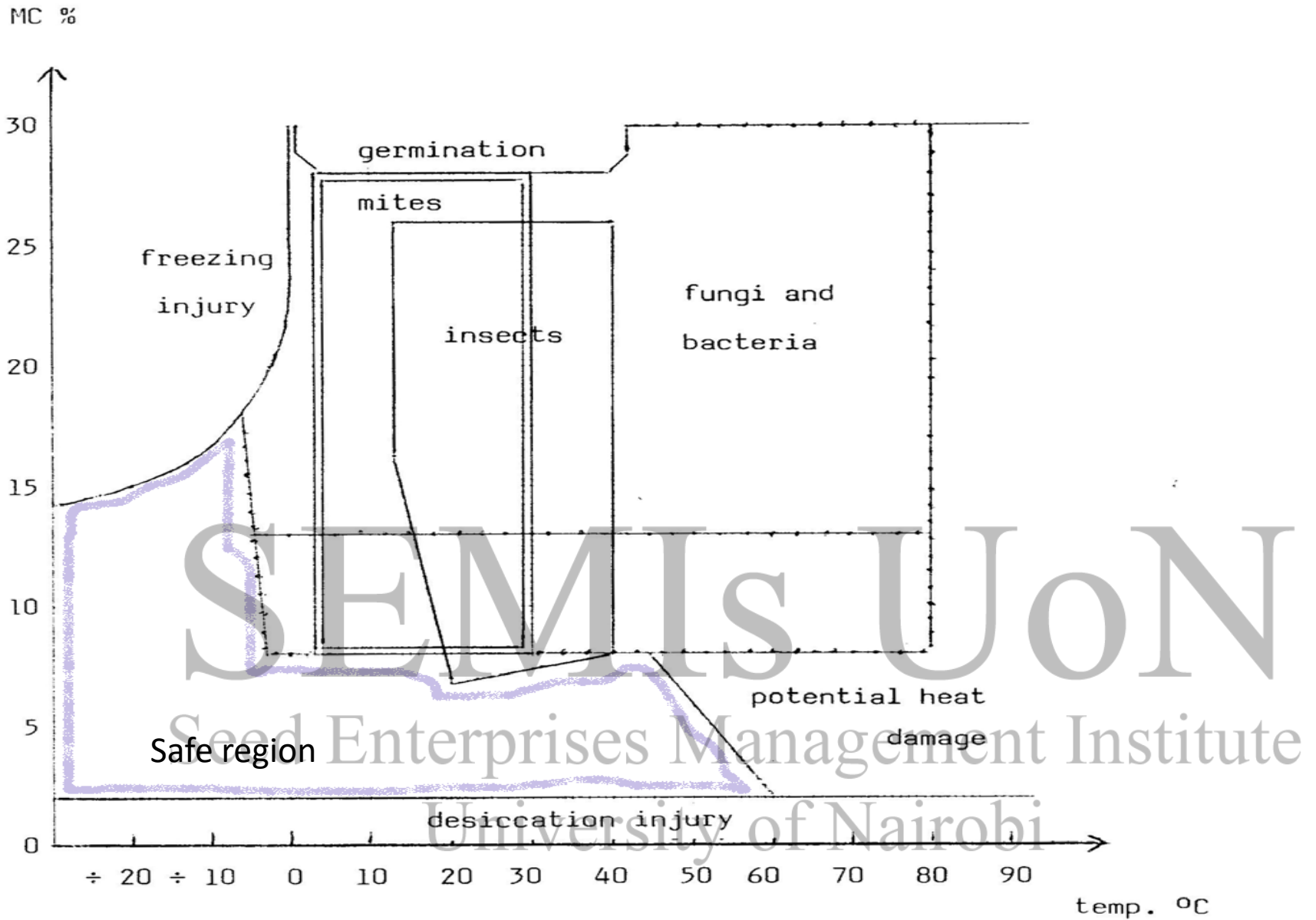
Impact during handling

Compression during transit and storage

Vibrations particularly during transport

Punctures from other packages.

Sharp protrusions on vehicles, pallets, conveyors, or by the contents of the package itself.



Approximate limits of moisture content (MC %) and temperature (°C) for potentially damaging factors.

FACTORS TO CONSIDER IN SELECTING PACKAGING MATERIALS

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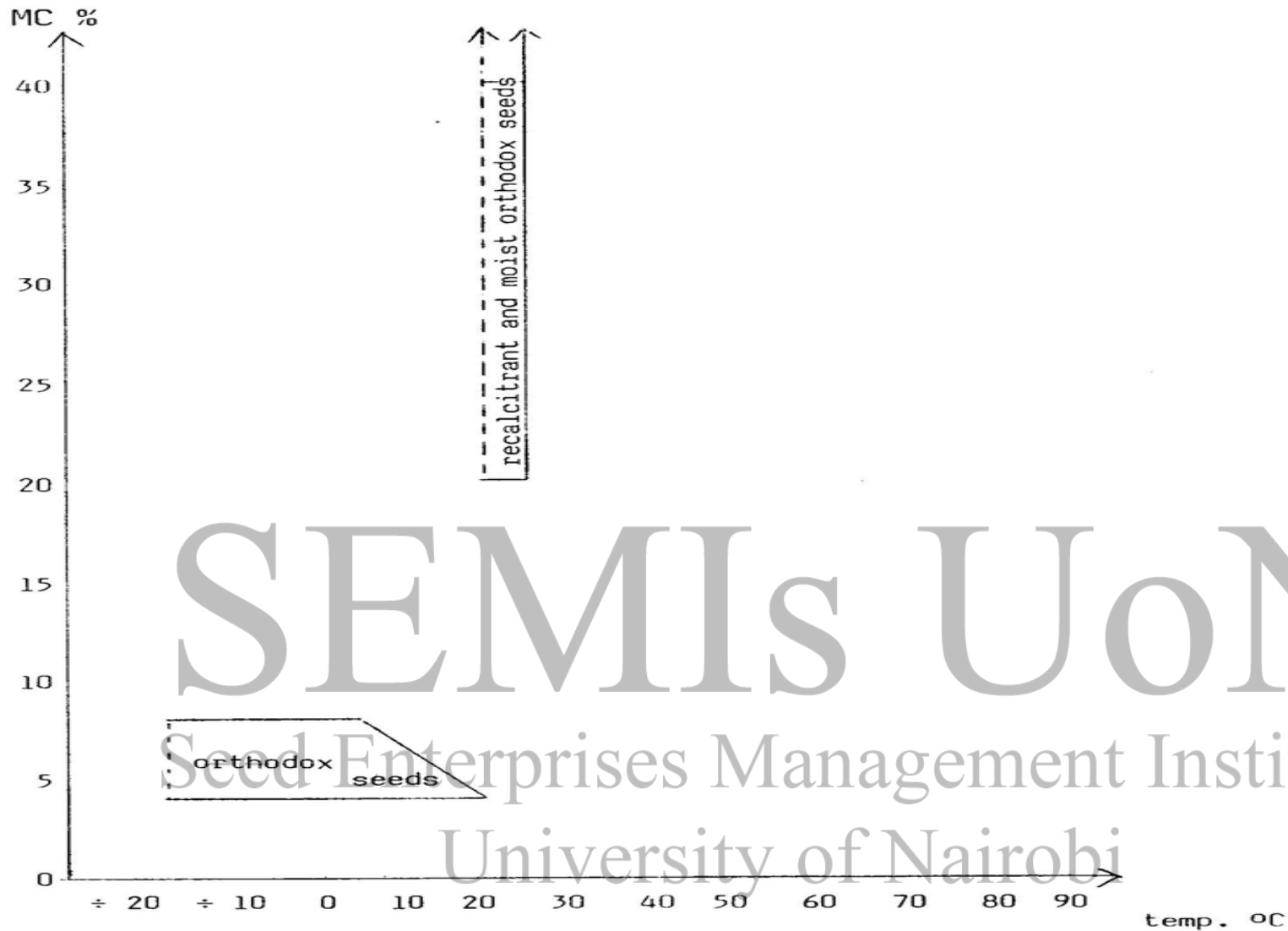
1. TYPES OF SEED

Seed packaging considers the different types of seed

Recalcitrant seeds are seeds that do not survive drying and freezing during ex-situ conservation. Moreover, these seeds cannot resist the effects of drying or temperatures less than 10° C thus they cannot be stored for long periods like orthodox seeds because they can lose their viability e.g. avocado, mango, cocoa

Orthodox seeds acquire desiccation tolerance during development and may be stored in dry state for predictable period under defined conditions e.g. Maize, beans etc.

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Approximate limits for optimal conditions for tropical orthodox seeds and tropical recalcitrant seeds.

2. PERMEABILITY

Ability to hold the required level of moisture and gases.

Table 1. Water-vapour transmission rates for different packaging materials.
Temperature 25°C, relative humidity differential 75%-2% (From: Warham, 1986b).

| Materials | WVTR g/m ² /day |
|-------------------------------------|----------------------------|
| Jute | 3300 |
| Kraft 1 ply 80 g/m ² | 1950 |
| Kraft 2 ply 80 g/m ² | 1440 |
| Kraft 4 ply | 880 |
| Kraft 6 ply | 740 |
| Woven polypropylene | 1120 |
| PVC | 51 |
| Low-density PE | 4 |
| PE-coated kraft 10 g/m ² | 10 |
| PE-coated kraft 23 g/m ² | 4 |
| PE-coated kraft 34 g/m ² | 3 |
| Woven PE/PE/kraft laminate | 1 |

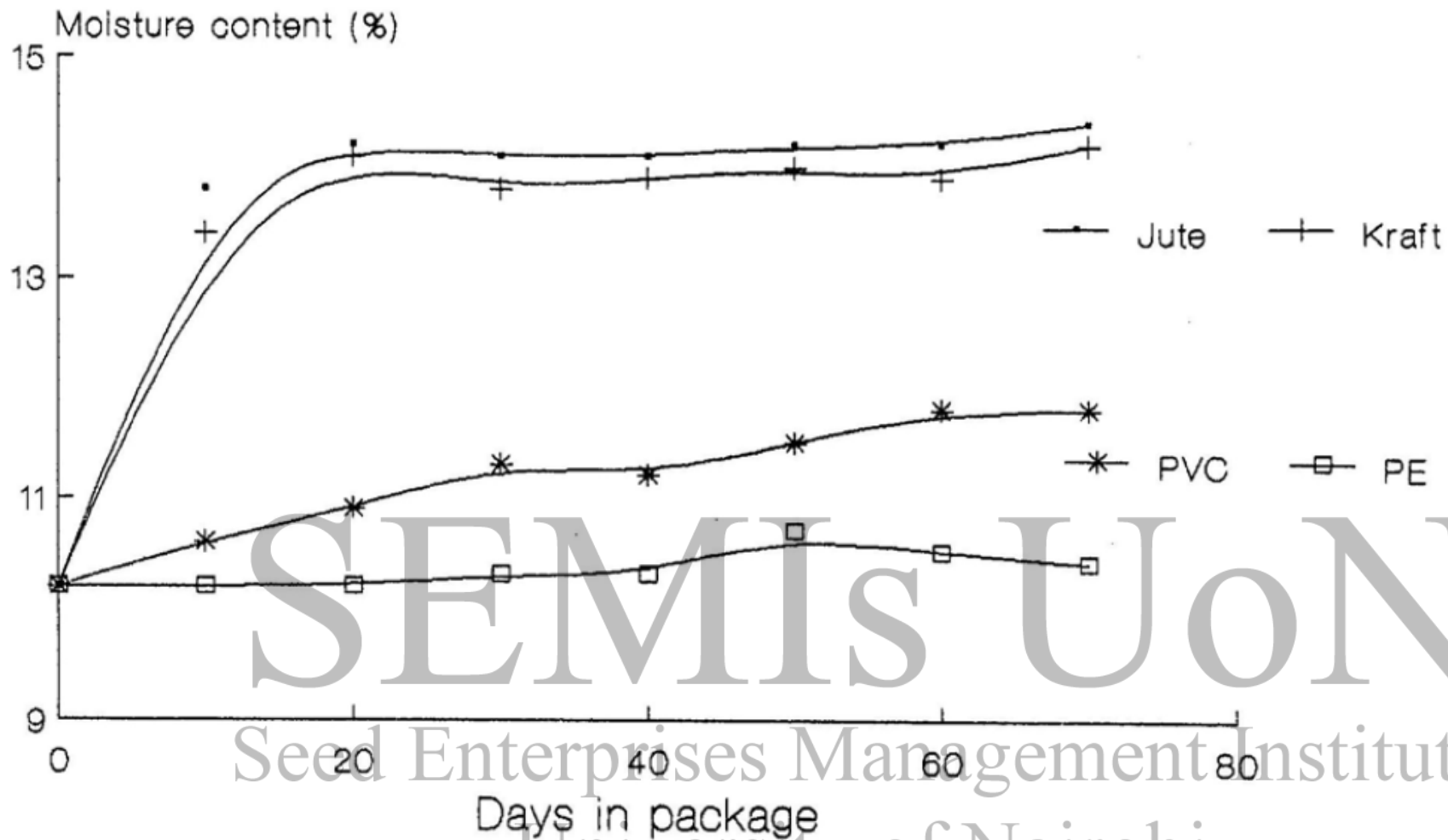


Figure 3. Increase in moisture content of wheat seed in 4 different packaging materials up to 70 days. Relative humidity was 75 % and temperature 30°C. (After Warham, 1986 a)

Materials partially impermeable to moisture and gases

This group includes primarily plastics:

Polyethylene = Polythene (PE)

Polypropylene

Polyester (PET)

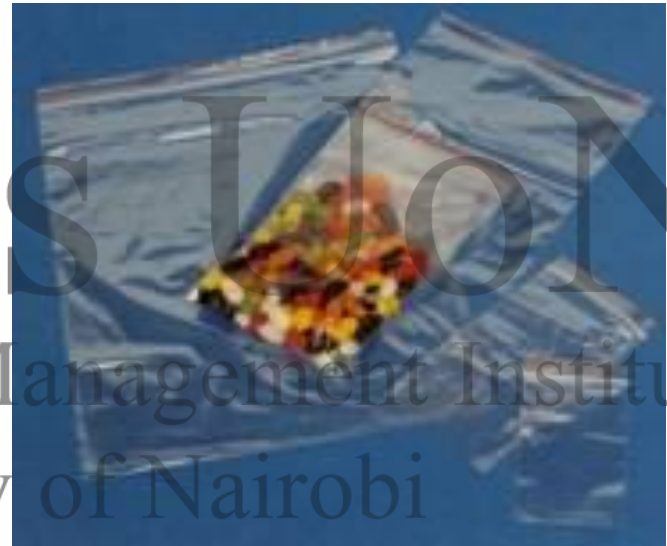
Polyamide (nylon) (PA)

Polyvinylidene chloride (PVC)

| Material | smell | flame colour | reaction |
|---------------------------------------|------------------------|--|--|
| Polyethylene PE incl. EVA *) | burnt wax | blue with yellow top, white smoke | burns; melts and drips |
| Polypropylene PP like polyethylene | | | |
| Polyvinyl chloride PVC | pungent acid | yellow/ orange with green centre | self extinguishing **) turns black and soft; . decom- poses |
| Polyvinylidenechloride PVDC | pungent acid | yellow with green edges | self extinguishing; turns black and hard |
| Polyamide PA (nylon) | burnt hair or feathers | blue with yellow top | self extinguishing; melts; hard drops; pulled out in fibres; foamy |
| Polyester PETP | sweet | yellow with blue centre; yellow-black smoke | develops a lot of soot; burns with steady flame, no drops |

Moisture impervious materials

After drying the orthodox seeds to correct moisture content, seeds can be placed in sealed moisture proof containers. This avoids extensive dehumidification requirements. Long term storage is most effective when moisture proof containers are combined with controlled low temperatures provided by refrigeration. This method has an added advantage of exclusion of oxygen. It is not suitable for recalcitrant seeds, however ego 700 gauge polythene bags.



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Moisture resistant materials

They include polyethylene or other plastic films and aluminum foil. These are resistant to the passage of moisture but over a long period of time, there will be a slow passage of water vapour tending to equilibrate the relative humidity inside and outside the container. Polyethylene is not suitable for long-term storage of orthodox seeds for genetic conservation, because there is no absolute control over moisture uptake by the seeds. It is very much suitable for short or medium term storage and has given excellent results

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Moisture previous materials

If seed store has facilities for controlling temperature and relative humidity, than permeable containers can be safely used for orthodox seeds, for several years, provided that pests can be excluded.

Examples: cotton bags, paper cardboard, fibre board, gunny bags and polysack



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Effect of Porous Seed Packaging Material on Germination

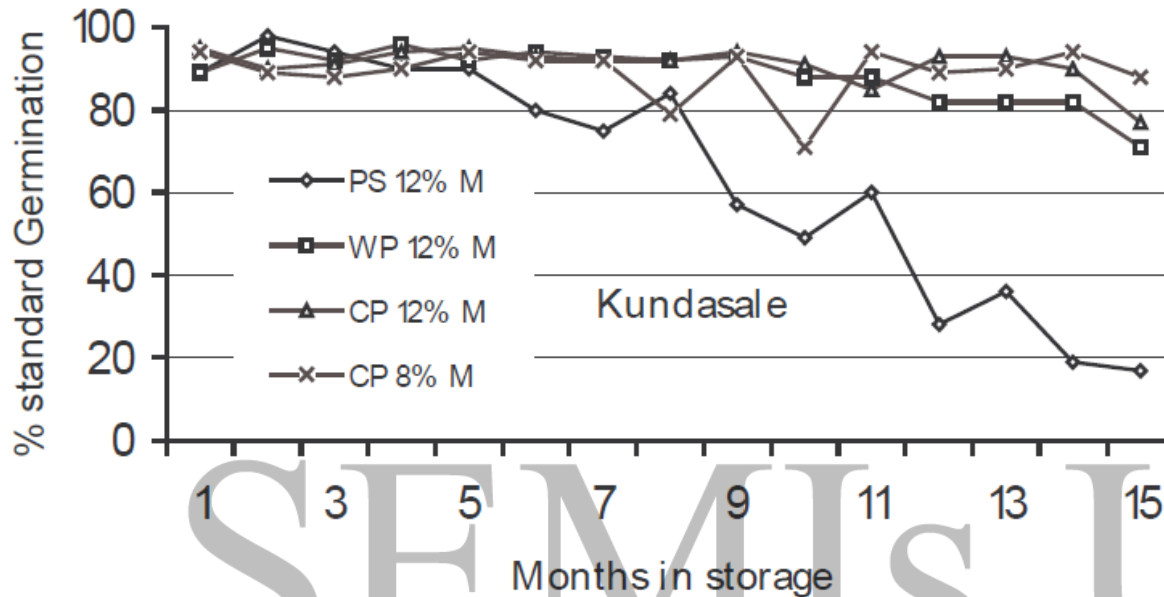
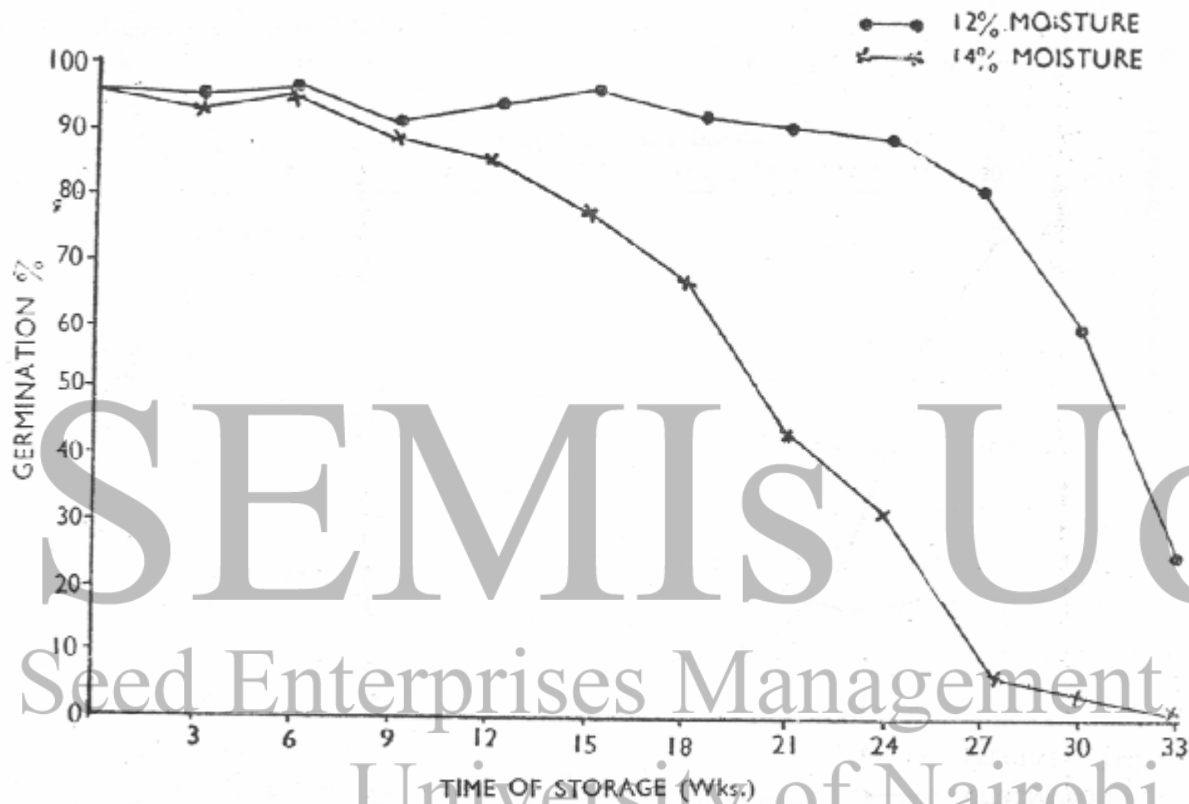


Figure 3. Effect of packing material on storability of maize seed stored at the Kundasale (PS – Poly-sack, WP – White polythene, CP – Clear polythene, M – Moisture).

- The more the packaging material allows moisture the more it reduces germination
- Use water proof packaging materials
- Germinability of seed stored in poly sack can only be maintained by cold storage (temp below 20C) and Relative humidity 55% - 60% (Mettananda *et al* 2001)



Rice stored in gunny bag, (Abeyesirwardena,)

3. INSULATION

Ability to maintain a certain level of temperature.

Use properties such as conduction and radiation to keep off heat

Example: Aluminium foil (It is mostly combined with plastic material)

4. MAXIMUM MESH SIZE

Protection against rodents and insects, i.e. ability to prevent rodents and insects from entering through openings.

Protection against entering of micro-organisms (gonidea, spores, mycelia, etc.)

Protection against impurities (e.g. dust, other seed), Protection against loss of seeds

5. MECHANICAL PROPERTIES

Ability to withstand attack by animals, particularly protection against rodents and insects.

Ability to withstand biological deterioration (rot).

Ability to withstand ultraviolet light (sunlight),

Ability to withstand tension,

Ability to withstand tear,

Ability to withstand breakage,

Ability to maintain dimension (rigidity),

Ability to be resilient (elasticity).

6. EASE IN HANDLING

Convenient size of bag, box, or other container.

Easy to hold (not slipping while handling or stacking).

Easy to stack.

Easy to open, close, and seal.

Easy to clean after use.

Ease with which labels can be attached (and kept in place), or information can be written (and maintained) on material.

Minimum storage space for empty packaging materials.

7. COST

The cost of the material in relation to value of seed.

Possibly the most important property of a packaging material is its ability to either maintain a certain level of humidity and moisture

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PACKAGING MACHINES

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SEMESTION
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Bag Filling Machine
with Stitching & Conveying

Wooden Slat Conveyor

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Foshan Nanhai Dikai Machinery Co., Ltd.

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