



Techniques of Seed Storage

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Seed storage may be defined as the preservation of viable seed from the time of collection until they are required for sowing. Seeds should be stored in such a manner, that its germination capacity and vigor should not decline.

Importance of Seed Storage

- To preserve seeds under conditions that best retain germinative energy during the interval between collection and time of sowing.
- To protect seeds from damage by rodents, birds, and insects.
- To preserve qualities of seeds collected during a year of heavy seed crops to furnish a supply during years of little or no crop.

Principles of Storage

- Seed storage conditions should be dry and cool
- Effective storage pest control
- Proper sanitation in seed stores
- Before placing seeds into storage they should be dried to safe moisture limits.
- Storing of high quality seed only i.e., well cleaned treated as well as high germination and vigour.

Purpose of Seed Storage

The purpose of seed storage is to maintain the seed in good physical and physiological condition from the time they are harvested until the time they are planted. It is important to get adequate plant stands in addition to healthy and vigorous plants.

Objective of Seed Storage

To maintain initial seed quality viz., germination, physical purity, vigour etc., all along the storage period by providing suitable or even better conditions.

Different Stages of Seeds Storage

The storage of seeds is initiated at the time of attainment of physiological maturity and maintained till the next sowing season. Hence, the different stages involved in seed storage are as follows:

- Period from physiological maturity to harvest.
- Period from harvest to packaging.
- Period from packaging to storing.

- Period from storing to marketing of seeds.
- On farm storage (Purchased seeds used for planting in the field). Storage in the godown is highly influenced by external environmental conditions. All other stages should be monitored and care should be taken to ensure the physical purity, germination viability and vigour of the seeds.

Steps in Seed Storage

The major steps involved in seed storage are:

1. Store only new, mature, healthy and well-dried seeds.
2. Keep them in dry and cool place to extend their viability.
3. Seeds easily re-absorb moisture. To maintain dryness, keep seeds in air-tight containers like tin cans or glass jars with tight fitting lids.
4. Put in some moisture absorbing material. Dry wood ash, dry charcoal, powdered milk, toasted (cooled) rice, or small pieces of newspaper are all good. The drying material should take up about one-fourth of the container space.
5. Label the containers with the type of seed, place, and date of collection.
6. If possible, include the initial percent viability of the seeds. To do this, plant some seed to see how many germinate. If 8 of 10 germinate, for example, percent viability is 80%. This information will help you to learn about how much each type of seed loses viability between collection and planting.
7. Protect seeds from insects and fungi. Before storing in containers, mix with dry ash, powdered seeds of black pepper or neem leave. Or use extract of neem, peanut, castor bean, or cotton: 1 teaspoon oil/1 kg seed. Or use naphthalene balls: 1 or 2 pieces/10 kg seed.
8. Protect from rodents and birds during storage.

Factors Affecting Storage

Biotic factors	Abiotic factors
a. Factors related to seed	• Temperature
• Genetic make-up of seed	• Relative humidity
• Initial seed quality	• Seed store sanitation
• Provenance	• Gaseous atmosphere
• Seed moisture content	• Packaging material
b. Other biotic factors	• Seed treatment
• Insects	
• Fungi	
• Rodents	
• Mishandling during sampling, testing	

Biotic Factors

1. Seed type and variety: The types and variety of seeds have a big impact on seed storage. Some seeds have a short storage life (e.g., groundnut, soyabean), others have a medium storage life (e.g., wheat, cotton), while still others, such as rice and beans can be stored for a long time.

2. Moisture content of seeds: It is the most important factor influences the storability. The amount of moisture in the seeds is the most important factor influencing seed viability during storage. Generally if the seed moisture content increases storage life decreases. If seeds are kept at high moisture content the losses could be very rapid due to mould growth very low

moisture content may also damage seeds due to extreme desiccation or in some crops. According to Harrington's thumb rule, a 1% decrease in seed moisture content doubles the potential of the seed. This rule is applicable only at a moisture range of 5-14%, because moisture level below 5% causes physiochemical changes in the seeds, whereas above 14% it is prone to insect and mold attack. The safe moisture content depends on the storage period, type of storage structure, variety of seeds and type of packaging materials used. The safe moisture levels of some seeds are as follows:

Crop	Maximum moisture content
Millets	12%
Paddy	13%
Cowpea	9%
Pulses	9%
Maize and sorghum	12%

3. Activity of insects and other microorganisms: Bacteria, fungi, mites, insects, rodents and birds may affect the seeds in storage. Bacteria do not show any significant effect on the stored seeds, since it needs water for its proliferation. Storage fungi like aspergillus and penicillium infect the seeds and produce mycotoxins that will deteriorate the seed quality. Insects and mites cause severe damage especially in warm and humid conditions. Birds and rodents cause huge loss of seeds during storage period.

External Factors

1. Temperature: Temperature also plays an important role in life of seed. Insects and moulds increase as temperature increases. The higher the moisture content of the seeds the more they are adversely affected by temperature. Decreasing temperature and seed moisture is an effective means of maintaining seed quality in storage.

2. Relative humidity (RH): Seeds are naturally hygroscopic hence they attain specific moisture content when subjected to a given level of atmospheric humidity at a particular temperature. This is called moisture equilibrium content. At equilibrium moisture content there is no net gain or loss in seed moisture content. Seeds should be stored in a dry, cool environment to maintain their quality while in storage. Equilibrium moisture content for a particular kind of seed at a given Relative Humidity tends to increase as temperature decreases. Thus the maintenance of seed moisture content during storage is a function of relative humidity and to a lesser extent of temperature.

3. Gas during storage: Increase in O₂ pressure decrease the period of viability. N₂ and CO₂ atmosphere will increase the storage life of seeds.

Classification of seeds based on storage seeds can be categorized into three types based on the longevity of the seeds during storage

1. Orthodox seeds
2. Intermediate seeds
3. Recalcitrant seeds

1. Orthodox seeds: Seeds that can be dried, without damage to low moisture contents (5 – 10%). They can be stored at subfreezing temperature 2 to 5 OC. Their longevity increases with reductions in both moisture content and temperature. Eg. Rice, Maize etc.

2. Intermediate seeds: These seeds can also be stored for longer period, but it cannot withstand low temperature. It tolerates the drying to low moisture level. Tolerate desiccation to about 10-12 % moisture content. Eg. Legumes, Papaya, Citrus etc.

3. Recalcitrant seeds: These seeds do not survive drying to any large degree and are thus not amenable to long term storage. Recalcitrant seeds killed by desiccation to 15-20% moisture content. Eg. Mango, Jack etc.

Storage Godowns and Their Maintenance

Seeds undergo deterioration due to aging in storage. This is accelerated by climatic factors and external biotic factors like insects and pathogen. Clean and hygienic godowns protect the seed from external insects and preserve the seed. Hence care should be taken in construction of godown.

Selection of storage godown

For loading and unloading operations, the storage area should be freely accessible. The seed moisture content must be maintained; hence the storage environment must be reasonably moisture proof. It is necessary to keep the godown clean and dry. Termite and rodent proof storage should be provided. There should be no fractures or holes in the storage godown's wall or floor. Spraying a neem oil solution using 200 ml of neem oil and 2 litres of water will eliminate the infestation. It is recommended for a single 200-square-foot storage space. After spraying neem oil solution, the rooms can be fumigated with the powder of sweet flag rhizome (*Acorus calamus*). Before stacking the seeds or grains, the storage godowns or rooms and storage structures or receptacle should be cleaned and made free from insects.

Seed storage structures

- For good seed storage, always use sealed containers.
- After seed has been dried properly, store it in tin cans, metal boxes, glass jars, or plastic bags or container with lids that can be sealed.

Points to remember when using sealed containers

- Never seal in moist seed.
- Use airtight containers.
- Make sure that the container is clean.
- Open the seed containers only when necessary.

Seed storage is an important process in maintaining the viability and vigour of the seeds during storage period. Different storage structures are available based on the duration of the seed storage. Storage structures can be classified into indigenous structures and modern structures.

Indigenous methods/structures

- Gourd casing
- Kuthir
- Kodambae
- Thombarai
- Earthen pots
- Mara thombai
- Kalangiyam
- Puri
- Gunny bag

Modern Storage Structures

- 1. Pusa bin:** It is constructed from unburned brick. To make it airtight, a polyethylene sheet is inserted between two brick walls. For loading and unloading, the inlet is at the top of the bin, and the outlet is at the bottom. To prevent rat damage, bins are made of a few layers of burnt bricks plastered with cement at the bottom.
- 2. Storage in metal drums:** Metal drums are used by farmers to store sorghum, maize, millets, and groundnuts. The drum's capacity is 600 kg, and it should be clean and dry before being stored. A funnel is used to load the drum with seeds, which are then snugly sealed with a cap. Seeds can be secured from rodents, and the drums can be readily fumigated to keep pests away from the seeds.
- 3. Pucca kothi:** It's an indoor building made out of charred bricks and cement. It is built on an elevated floor, and after embedding the polythene sheet, the walls should be plastered to make it airtight. The structure's inlet is at the top and its outflow is at the bottom. For wall reinforcement, the inner layer should be reinforced with iron bars. This structure is utilised to keep the stored product's moisture level at the same level as when it was first stored. The capacity of rural houses varies depending on the amount of space available.
- 4. Gharelu thekka:** This structure has a storage capacity of 1 to 3 metric tonnes. Metal base with fabricated 22 gauge sheets, rubberized cloth container, and bamboo poles for lateral support make up the structure. The construction stands at a height of 2 metres. The building is waterproof and airtight, and it may be fumigated on a regular basis.

