



SEED STORAGE



By
Dr. Aninda Chakraborty

Definition:

Seed storage may be defined as the seed conservation method obtained from the harvest until they are planted for successful crop production. The seeds are required to be conserved through proper storage for a short or long period. During seed storage, moisture is controlled correctly for the protection of deterioration.

Purposes 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.
- To protect seeds from insects, pests, and diseases.
- To conserve seeds until they germinate for subsequent crop production.

STAGES/SEGMENTS OF SEED STORAGE

1	Post maturation/ Pre harvest segment	Period from physiological maturity to harvest (seed in field).
2	Bulk seed segment	Period from harvest to packaging (bulk seed in aeration drying bins, surge bins, etc.).
3	Packaged seed segment	Period from packaging to distribution (seed in Packages in warehouse).
4	Distribution /Marketing Segment	Period during distributing and marketing (packaged seed in transit and / or retailer's storehouse).
5	On-farm segment	Period from purchase to planting of seed (seed in on-farm storage).

Types of storage

a) Storage of commercial seeds

This storage of commercial seed requires the largest storage need from harvest until planting. The storage period ranges from 8-9 months. Seed must be dried to 14 per cent moisture content for starchy seed and 11 percent for oilseeds.

b) Carryover seeds

About 20-25 per cent of stored seed may have to be carried over through one season to the second planting time. The storage period may range 1-1½ year. Storage of seeds in metal bins with tight fitting lids or in a moisture proof bag will solve the problems of moisture penetration, provided the seeds are already dry enough for sealed storage.

c) Foundation stock and enforcement seed sample

It is desirable to store foundation and enforcement seeds for several years since genetic drift are minimized by reproducing foundation or stock seeds. Since the quantity of seeds involved is not large, the storage room is only a small part of the total storage area and in fact, is often a small room within a large warehouse. Relative humidity and temperature combination has to be provided for maintaining the viability. A combination of 25 per cent RH at 30°C temperature or less or a RH of about 45 per cent at 20°C or less will be ideal. The required RH can be achieved by making the room moisture proof and by using a dehumidifier.

d) Germplasm seed storage

Germplasm seeds are required to be kept for many years, perhaps very long periods. Basic requirements for such long term storage are the coldest temperature economically possible and seed moisture is in equilibrium with 20-25 per cent RH. Germplasm storage built up so far have rooms which can be maintained at 5°C to 10°C and 30 per cent RH. In addition, the stored samples are dried to perfect moisture level.

PRINCIPLES OF STORAGE

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

FACTORS AFFECTING SEED LONGEVITY IN STORAGE

1. Kind or variety of seed

Seed storability is considerably influenced by the kind or variety of seeds. Some seeds are short lived. E.g.: Onion, Soybean and Groundnut. As a general rule starchy seeds can be stored considerably for a longer period compared to proteinaceous or oily seeds because of their hygroscopic nature.

2. Initial seed quality

Seed lots having plumpy, vigorous undamaged seeds store longer than that of deteriorated. Even seed lots having good germination at the beginning of storage period, may deteriorate at a faster rate depending upon the severity of weathering damage, mechanical injury or otherwise in the field. The low quality seeds should invariably be rejected. Even at best storage conditions, the initial quality of the seed cannot be improved (except for the dormant seed) but can only be maintained.

3. Moisture content

The most important factor influencing seed viability during storage is the moisture content and the rate of deterioration increases, as the seed moisture content increases. The drier the seed the higher will be the storage life.

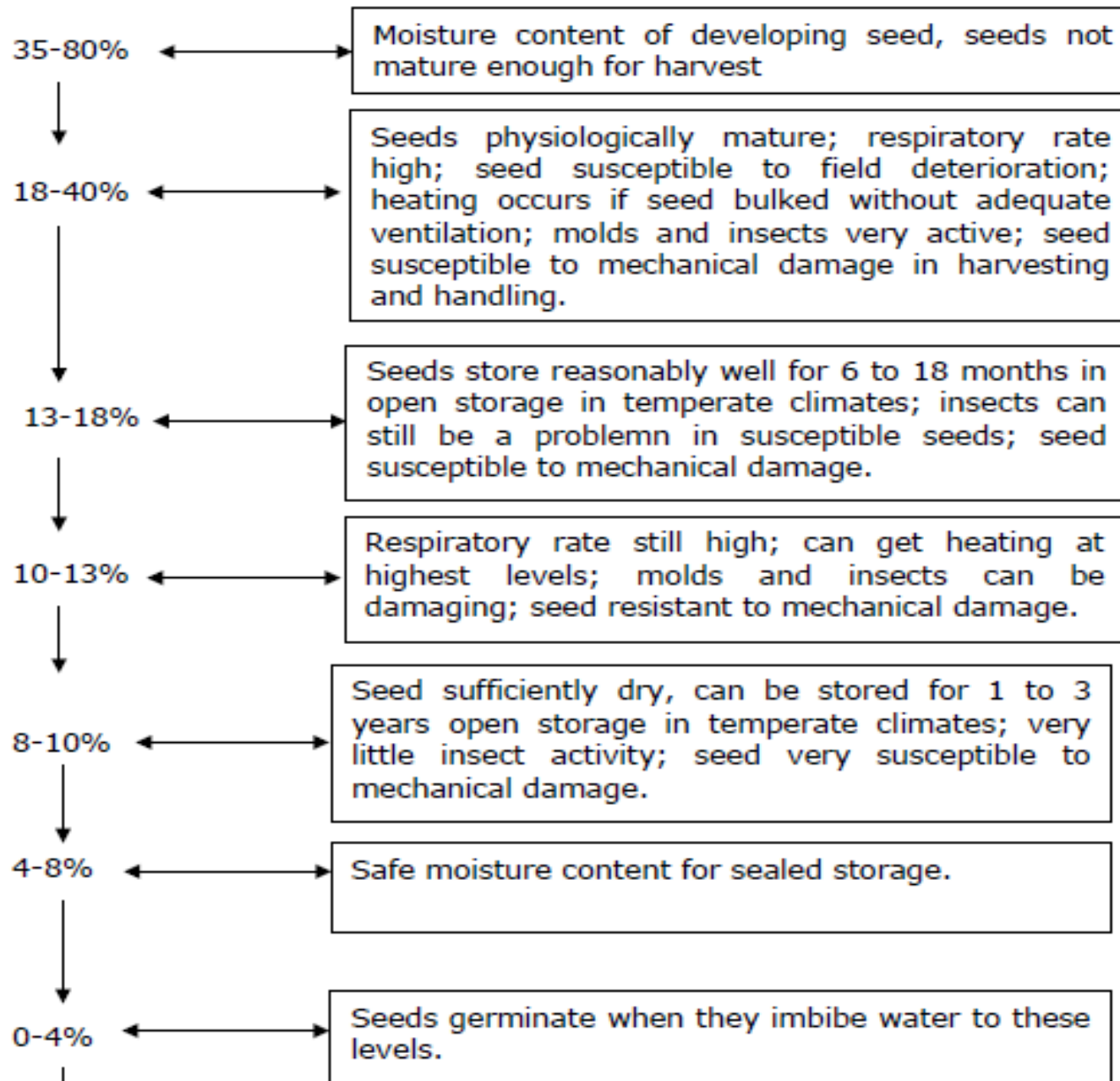
Seed moisture content (%) Storage life

11-13	-	½ year
10-12	-	1 year
9-11	-	2 years
8-10	-	4 years

4. Relative humidity and temperature during storage

Seeds are hygroscopic. They attain rather specific and characteristic moisture content when subjected to given level of atmospheric humidity at a particular temperature (equilibrium moisture content). The equilibrium moisture content for a particular kind of seed at a given relative humidity tends to increase as temperature decreases and the deterioration starts.

Role and importance of moisture content in the life of seeds



Harrington's rule:

- A one per cent decrease in moisture content nearly doubles storage potential of seed.
- A 10° F decrease in temperature nearly doubles storage potential of seed.
- Good seed storage is achieved when the percentage of relative humidity in storage environment and the storage temperature in degrees Fahrenheit add up to one hundred

5. Provenance

The seeds harvested in different climates (or) at different times show differences in viability. Because they would have been subjected to different pre harvest conditions which will have caused different amounts of deterioration by the time, the seeds are harvested.

6. The activity of organisms associated with seeds in storage

The bacteria, fungi, mites, insects, rodents and birds may do harm to seeds in storage. The general limits of temperature and relative humidity for the multiplication of the various biological agencies infesting stored seeds are,

Organism	Temperature		Relative humidity
	Range for multiplication	Optimum range	
Insects	21-42°C	27-37°C	30-95%
Mites	8-31°C	19-31°C	60-100%
Fungi	8-80°C	20-40°C	60-100%
Microbes	8-80°C	26-28°C	91-100%

Classification of packing materials or containers

1. Moisture and vapour pervious containers

These containers allow entry of water in the form of vapour and liquid. These are suited for short term storage. The seeds in these containers will attain seed equilibrium moisture with the surrounding atmosphere (eg) cloth bags, gunny bags, paper bags etc.

2. Moisture impervious but vapour pervious containers

These allow entry of water in the form of vapour and not in liquid. The seeds in the containers can't be carried over for long period in hot humid conditions (.g.) polythene bags of <300 gauge thickness and urea bags.

3. Moisture and vapour proof containers

These containers will not allow entry of moisture in the form of liquid or vapour. These are used for long term storage even in hot humid conditions if the seeds are sealed at optimum m.c. eg. Polyethylene bags of >700 gauge thickness, aluminium foil pouches, rigid plastics etc.

Seed selection for extended storability

- ✓ Store well mature seeds.
- ✓ Store normal coloured seeds
- ✓ Seeds should be free from mechanical injury
- ✓ Seeds should not have met with adverse conditions during maturation
- ✓ Seeds should be dried to optimum moisture content.
- ✓ Seeds should be treated with fungicides before storage.
- ✓ Suitable packaging materials should be used for packing.

STORAGE GODOWNS AND THEIR MAINTENANCE

- For construction of a godown, the points to be noted are as follows-
- Seed godown should be in a place where transport facilities are easily available.
- Seed godowns should not be constructed in areas near seashore. Since the high RH of atmospheric air accelerate the deterioration of seed.
- Seed godown should not be constructed in low lying water stagnating areas.
- Seed godown should be constructed in places where atmospheric RH is low, free circulation of air is possible, sunlight is adequate and elevated in nature.
- The ventilators should be at bottom for free air circulation.
- Ground moisture should not reach the floor.
- Should be rat proof with wire mesh
- Should not be near industries as smoke is injurious

In maintenance of seed in godown following points are to be considered

1. Godown should be clean and dry
2. Seed bags should not be stacked directly on floor. Should be stacked on wooden ballets.
3. The height of the stack should not be more than 6-8 bags.
4. Different seed lot should be kept separately.
5. Godown should be sprayed periodically once in a week or fortnightly with Malathion 50 EC (1 : 300 Chemical : Water) @ 5 lit. sq. m⁻¹ or 0.25% Nuvan @ 1 lit. 100 m³⁻¹.
6. Altering the chemicals at weekly intervals will give better control.
7. Seed lots can be fumigated with Aluminium phosphide @ 3 gm/cu.m in air tight condition for 7 days. This can be done as prophylactic measure and on minimum infestation by insects.
8. Seed lots should be periodically (once in month) tested for seed quality.
9. Based on seed testing result, seeds can be dried under sun for the removal of moisture. It reduces insect and pathogen infestation.
10. New seed lots should be kept away from old seed lots to avoid secondary infestation of insects.
11. Seeds should be treated with combination of fungicide and insecticide (eg.) Thiram @ 2 g kg⁻¹ + carbaryl @ 200 mg kg⁻¹.
12. Frequent supervision of each and every lot is must.
13. Seed bag should be restacked once in 3 months for free aeration.
14. Instead of gunny bags low cost interwoven polythene bags should be used to prolong the life of seed.
15. Pesticides, fungicides, fertilizers, rejects should not be stored with seed.
16. Each lot should be labeled accurately and registers for stocks should be maintained.

Maintenance of store house hygiene

1. Cracks and crevices around corners have to be brushed to eliminate hiding pests. All debris should be removed. Provision of wire meshes to windows, ventilators, gutters, drains to prevent entry of rats, squirrels, birds, etc.
2. Reduce the moisture content of seed to prevent insect build up (usually below 10%). Previously used bags, bins, etc. should be dried in the sun repeatedly.
3. Elimination of conditions which favour storage pests. Uniformly graded seeds should be used, broken seeds should be removed before bagging since they favour pest build up. Stitching of all torn bags, filling bags up to the brim, no loose packing.
4. Surface treatment of storehouse before storage with malathion dust 4% @ 25 g/sq m or malathion 50% EC spray @ 10 ml/lit of water and 3 lit of solution per sq. metre.
5. Good dunnage by arranging wooden planks or bamboo poles or spreading thick polythene sheets on the floor. Treatment of dunnage materials with malathion as specified, arrange the bags in crisscross pattern with a maximum of 15 bags and provide adequate space between the roof and the seed bags.

Prophylactic treatment of seeds

Phosphine : Available in a solid form (0.6 g pellets, 3 g tablets). The active ingredient is Aluminium phosphide mixed with Ammonium carbonate and Paraffin. After exposure to the atmosphere, the pellets decompose and release the active substance, hydrogen phosphide (PH_3), which has the same specific weight as air, and is thus evenly distributed in the fumigated material or chamber. Phosphine is also able to penetrate bags, carton boxes and other containers.

It must be borne in mind that fumigation particularly repeated fumigation, may seriously reduce the vigour and viability. This is particularly true for seeds with a higher moisture content of 14 per cent. Seeds with moisture content above 14 per cent should be dried, before fumigation.

Aluminium phosphide: Three tablets of 3 g each per ton of seed for cover fumigation (only selected blocks of bags)

Twenty one tablets of 3g each for 28 cubic metres, for shed fumigation (entire godown).
Period of fumigation - 5 days. The major advantages of Phostoxin are that it lacks residues and does not affect flavor or germination and is easy to handle.

Methyl bromide: Above 5.6°C , methyl bromide is in the gas phase and is available in cylinders similar to those used for cooking gas. Since, it is odorless, other gases such as chloropicrin are sometimes added to facilitate detection of leaks. Because methyl bromide is 3.5 times heavier than air, care has to be taken that it is properly distributed within the goods to be fumigated (fan can be used). The recommended dosage is 20 g/m^3 for 24-48 hrs.

Biotic factors of Seed Storage

Primary feeder- These insects mostly lay eggs inside or on the seed and spent a part or entire larval or pupal life inside the seed.

- 1) Rice Weevil- *Sitophilus oryzae*
- 2) Lesser Grain Borer- *Rhyzopertha dominica*
- 3) Pulse Beetle- *Callosobruchus maculatus*
- 4) Angumois Grain Moth- *Sitotraga cereallela*

Secondary feeder- This group of insects feed on endosperm from outside.

- 1) Rice moth- *Corcyra ceohalonica*
- 2) Red Flour Beetle- *Tribolium castaneum*
- 3) Khapra Beetle- *Trogoderma granarium.*

THANK
YOU

