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Agricultural Produce: Post-Harvest and Their Management

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A post-harvest technology is a series of processes as a part of seed production and any handling techniques or treatments applied to the economic part of a crop just harvested from the field for the purposes of transforming it into a form, condition, or composition that adds value, makes it storable or prolongs its shelf-life, and makes it useable or edible.

Post-harvest loss

The expression "post-harvest losses" means a measurable quantitative and qualitative loss in a given product occurred during the various phases of the post-harvest system. In economic terms, sum of the losses in quantity and quality of the products in vitably leads to loss of money. In addition to direct economic losses, some losses result from poor management of post- harvest systems.

Poor post-harvest handling during threshing, transportation, storage, processing, packing can lead to losses due to insect pests, rodents, spilling, losses on account of pilferage, leakage of gunny bags and rough handling. Improper drying can lead to quality deterioration

Table 1: Type of loss at different post-harvest stages

Stage of operation	Type of loss
Late harvest	Shattering losses, losses due to attack of birds and other pests
In sufficient drying of grain	Losses due to development of moulds and insects
Improper threshing	Broken grains and threat of insect development at a later stage
Poor storage	Losses caused by combined action of insects, moulds, rodents and other pests
Improper milling	Broken and powdering loss
Transport	Quantitative loss
Defective packaging	Quantitative and qualitative loss

Management strategies:

Harvesting

There is an optimum time for harvesting cereals, oil seeds and pulses depending on the maturity of the crop and the climatic conditions. In general, the harvest takes place 10 or 15 days after the grain has reached physiological maturity. At the time of maturity, the grain has specific moisture content and special physical characteristics. The most appropriate time of harvest is determined based upon the length of the growing cycles (which differ according to the crop and varieties) and also the degree of maturity of that crop.

Threshing

Threshing is the process of separating the seed from parental material, The threshing process is carried out after the harvesting but before the winnowing. There is different method of threshing we follow i.e, Hand beating or against hard surface, traditional method is treading with bullocks but, Mechanized Threshing has high efficiency, more recovery, saves cost on threshing require Less time/labor requirement and free field for next season.

Seed processing means improving the quality of harvested seed through a series of operations viz. drying, cleaning, grading, treating, bagging and labeling.

Steps in Seed processing

1. Drying
2. Cleaning
3. Grading
4. Seed treatment
5. Bagging and labeling
6. Storage
7. Milling

1) Drying: Seed drying refers to reducing the moisture levels to safer levels. Drying is aimed at preventing enzymatic and microbial activity, and provide long term storage. Therefore, the seed must be dried to safer moisture a level that does not encourage heating within the seed pile or the growth of molds, bacteria or fungi. Physiological maturity attained by the cereal and legumes at moisture content between 35 and 45%

is crop dependent. Temperature affects the storage of seeds at moisture content between 10 and 14%.

Table 2: The Ideal moisture for storage

Seed moisture content (%)	Storage life
11 to 13	½ year
10 to 12	1 year
9 to 11	2 years
8 to 10	4 years

2) Cleaning

Cleaning refers to the separation of physical impurities like trash, dirt, weed seeds etc. from the seed lots. Normally the crop at harvest mixed with a variety of foreign materials such as sand, stones Inert matter, deteriorated and damaged seeds, soil and dust particles, chaff, weed seeds and other impurities.

Cleaning of seed is done with the help of cleaner or two sieve scalpers and graders. Seed cleaners use gravity separation (screens) and air separation (fans) to separate seeds and unwanted material by size and density.

3) Grading

Grading refers to removal of undersized/ underweight seeds from the seed lot. Grading of seed is done with the help of Seed Grader, Indented cylinders and Specific gravity separators.

4) Seed treatments

Seed treatment refers to the application of biological, physical and chemical agents and techniques that can be applied to seeds to provide them protection, Seed treatment enhances the resistance of the seeds, making them stronger against pest attacks and stresses in their environment.

5) Storage

Seed storability is defined as the longevity of seeds after 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. During storage, seed quality is affected by several factors like environmental conditions during seed production, pests, diseases, seed oil content, seed moisture content, mechanical damages of seed during processing, packaging materials, pesticides, air temperature and relative air humidity in storage.

The two most important environmental factors that influence seed storage life are relative humidity, which controls seed moisture content; and temperature, which affects the rate of biochemical processes in seeds. The effects of relative humidity and temperature on storage environment are highly interdependent. High moisture and relative humidity increases the microbial activity and is accompanied by production of metabolites and mycotoxins, particularly aflatoxins, in case of oil seeds.

Table 3: The entire storage periods

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 5
5	On-farm segment	Period from purchase to planting of seed (seed in on- farm storage).farm storage).

Table 4: The activity of organisms associated with seeds in storage

Organism	Temperature		Relative humidity
	Range for multiplication	Optimum range	
Insects	21-42^{0}C	27-37^{0}C	30-95%
Mites	8-31^{0}C	19-31^{0}C	60-100%
Fungi	8-80^{0}C	20-40^{0}C	60-100%
Microbes	8-80^{0}C	26-28^{0}C	91-100%

Sanitation in storage

Good sanitation should be a continuous practice. It will minimize storage insect infestations. If storage insects are a problem, the judicious use of insecticides and fumigants, combined with sanitation, will alleviate the problem. The best procedure is not to place insect infested lots in storage with other lots unless all the insects have been killed by fumigation or insecticide treatment. In warehouse with concrete floors, seed bags should be stacked on wooden pallets to keep them from contact with the floor as considerable moisture can be transmitted through concrete floors. Seed warehouses should also be adequately ventilated (unless they are conditioned) and protected against rodents

6) Packaging: There are different storage materials are used for controlling the detoritation like Moisture and

vapour pervious containers, Moisture impervious but vapour pervious containers, Moisture and vapour proof containers

Proper packaging has a great significance in reducing the wastage and it also provides protection from mechanical damage, undesirable physiological changes and pathological deterioration during storage, transportation and marketing.

7) Storage godowns and their maintenance

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 phophide @ 3 gm/cu.m in air tight condition for 7 days. This can be done as propylatic 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.
17. Per acre or per hectare packing (small) is preferable for easy handling and effective supervision

Losses: Poor post harvesting handling during threshing, transportation, storage, processing, packing can lead to losses due to insect pests, rodents, spilling,

losses on account of pilferage, leakage of gunny bags and rough handling. Improper drying can lead to quality deterioration.

Fig 1: Stacking of seed material in storage godowns

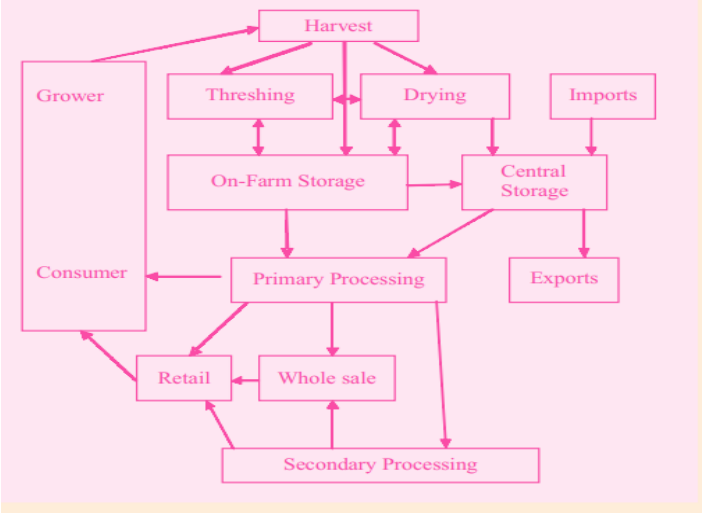

Fig 2: Flow chart of processing sequence

Fig 3: The different type of bag materials used for the storage of seeds

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