



ROLE OF STORAGE CONDITIONS OR TYPES IN REDUCING POST HARVEST LOSSES



Present situation of storage

Between 25-50% of the total grain value (quantity + quality) is lost between harvest and consumption in developing countries





Quantity Losses

| Post-harvest stage | Mean (%) |
|---------------------------|-----------------|
| Cutting | 3.0 |
| Transportation | 3.6 |
| Threshing | 1.6 |
| Drying | 2.0 |
| Storage | 10.7 |
| Milling | 14.7 |
| TOTAL | 35.6 |



Reasons for post harvest losses

1. Poor product coming into storage
2. Poor storage management
3. Poor quality paddy + poor milling techniques



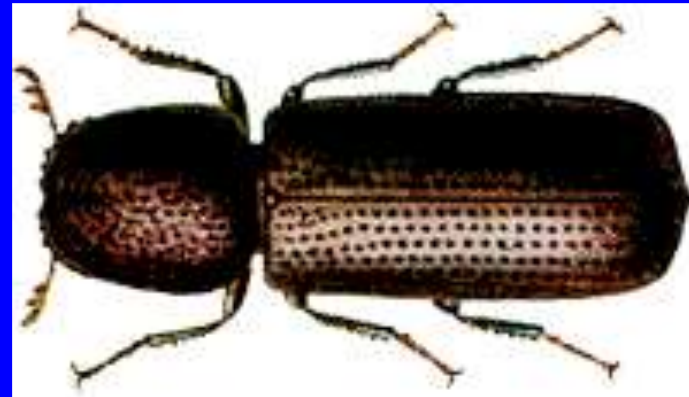
What is required of a good storage system

- ❖ Prevention of moisture re-entering the grain after drying
- ❖ Protection from insects, rodents and birds
- ❖ Ease of loading and unloading.
- ❖ Efficient use of space
- ❖ Ease of maintenance and management.



Pest of stored grains

- ❖ Insects
- ❖ Pathogens
- ❖ Rodents
- ❖ Birds





Rats

Species

- ❖ Black rat or House rat (*Rattus rattus*)
- ❖ Norway rat or Common rat (*Rattus norvegicus*)
- ❖ House mouse (*Mus musculus*)

Damage

- ❖ Feed on grain
 - ❖ rats 25 gm of food per day,
 - ❖ mice 3-4 gm per day
- ❖ Spoilage and contamination of grain
- ❖ Damage materials -tarpaulins, bags, electric cables



Rat management

- ❖ Keep the store clean-remove any spilt grain
- ❖ Store bags in tidy stacks set up on pallets,
- ❖ Store any empty or old bags and fumigation sheets on pallets, and if possible in separate stores
- ❖ Keep the store free of rubbish
- ❖ Keep the surrounding area free of tall weeds
- ❖ Keep the area in the vicinity of the store free of any stagnant water



Fungi

Most common :

- ❖ Aspergillus and Penicillium
- ❖ Grain spoilage and mycotoxins (poisonous)

Determined by:

- ❖ Moisture content of the stored grain
- ❖ Temperature
- ❖ Condition of the grain going into storage
- ❖ Length of time of grain stored
- ❖ Amount of insect and mite activity in the grain.



Fungi

Control

- ❖ Moisture content (12-14%)
- ❖ Heat
 - ❖ dry heat at 65°C for 6 days
 - ❖ hot water treatment at 52-55°C
- ❖ Fungicides
 - ❖ Dithane M-45 and Benlate at 3 grams kg⁻¹.

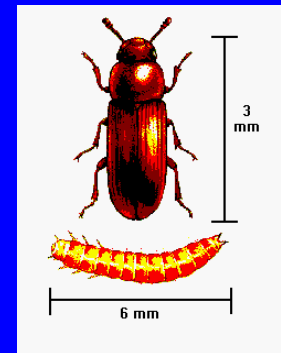
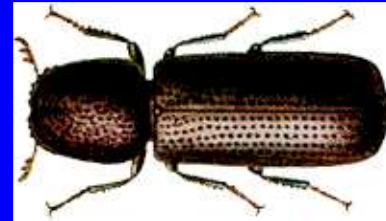


Common Post harvest insects

- ❖ **Lesser grain borer** (*Rhizopertha dominica*),
- ❖ **Rice weevil** (*Sitophilus oryzae*),
- ❖ **Angoumois grain moth** (*Sitotroga cerealella*),
- ❖ **Red flour beetle** (*Tribolium castaneum*)

Lifecycle

- ❖ Beetles 15-18 days
- ❖ Moths 28 - 35 days





Ideal Conditions for pest

Environment Conditions

- ❖ Temperature 20 - 40°C
- ❖ Relative humidity 60-70%

Mixing grain lots

- ❖ old and new

Time

- ❖ Longer storage >no insects



Present on farm storage situation in Asia



Traditional Bag Storage





Granary





Woven Basket





Clay Pots





Concrete Bin





Steel Bins

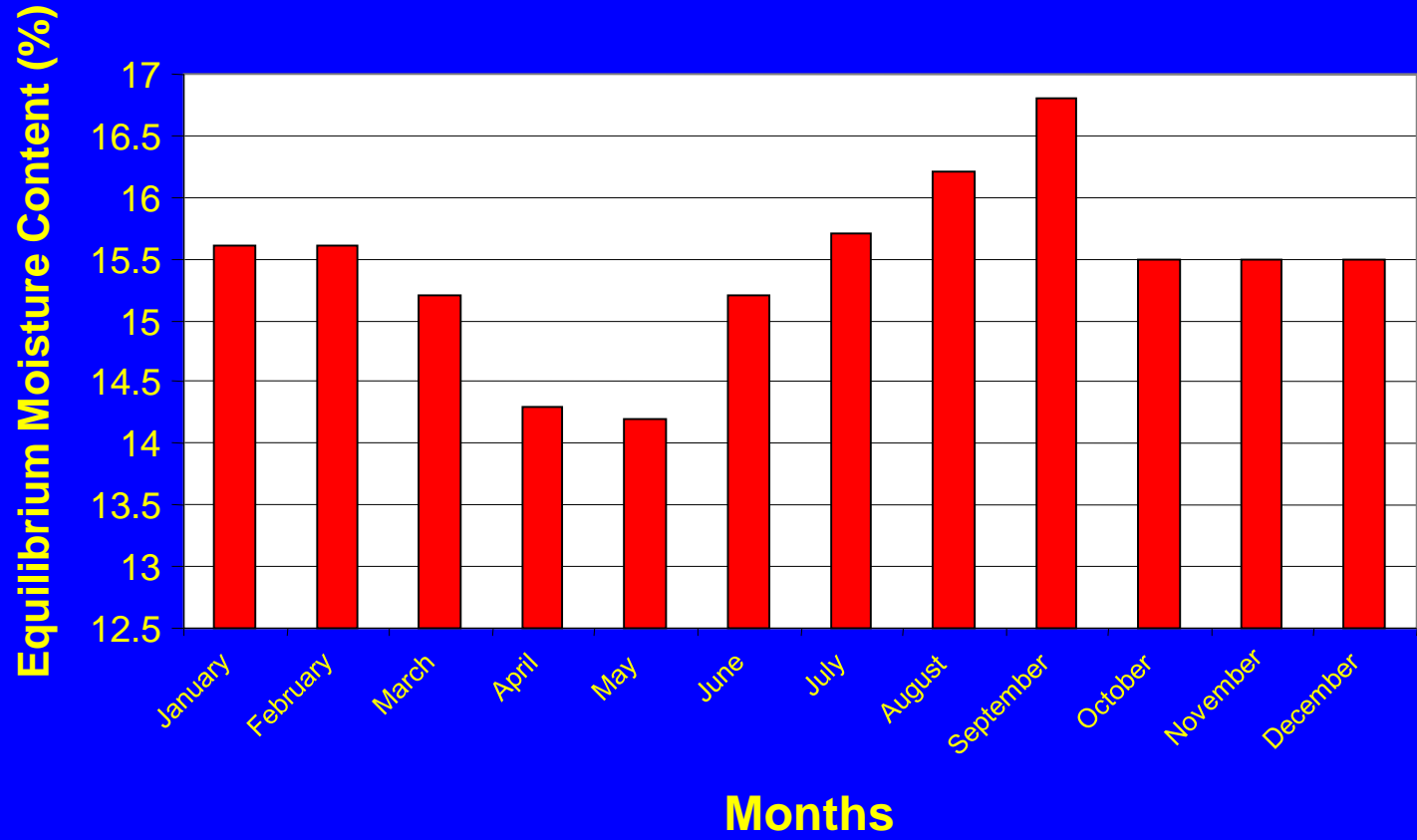


Bag storage





Equilibrium Moisture Content





Summarizing existing on farm storage situation

- ❖ Grain is stored in open systems in bags or open granaries
- ❖ Grain is exposed to insects, rodents and bird attacks
- ❖ High equilibrium moisture content >14.0
- ❖ Grain is not always protected from rain



Farmers Present Practices

1. Sell excess immediately after harvest (indebted or poor storage)
2. Dry grain to 10-11% before storage
3. Take grain out and re-dry during storage period
4. Store **seed** in "sealed" containers



Present commercial storage situation in Asia



Commercial bag storage system

- ❖ Open to atmosphere
 - ❖ moisture uptake,
 - ❖ pest problems
- ❖ Store in batches
- ❖ Clear headways and walkways
- ❖ Relatively easy to fumigate





Commercial Bulk Storage

- ❖ Not popular in Asia
- ❖ Efficient use of space
- ❖ Easy to control pests.
- ❖ Sealed for fumigation
- ❖ Less problems with rodents and birds





Commercial hermetic system

- ❖ Grain stored in bags
- ❖ Protected against moisture uptake and insects
- ❖ Rat and pig damage is reduced
- ❖ Big potential in Tropical areas
- ❖ 5-300 metric tons





Parameters, that should be evaluated during storage

1. In store atmosphere (O_2)
2. Grain moisture content
3. Seed germination is prohibited
4. Insects population is reduced
5. Grain quality is maintained



Example of a Good Storage

Seed

- ❖ Air conditioned room

Grain

- ❖ Hermetic storage (longer than 1 month)
- ❖ Open pallets (less than 1 month)

50kg woven plastic bags





Priorities Management Options

1. Good hygiene -cleanliness in store, clean bags
2. Hermetic storage
3. Bag dipping
4. Phosphine tablets
5. Fumigation-last resort





Storage Hygiene

- ❖ Keep storage areas clean.
- ❖ Clean storage rooms after they are emptied
- ❖ Placing rat-traps and barriers in drying and storage areas. Cats deter and help control rats and mice
- ❖ Inspect storage room regularly to keep it vermin proof.
- ❖ Inspect the stored seeds once a week for signs of insect infestation.



Evaluating a seed store

| | Store 1 | Store 2 | Store 3 |
|-------------------------------|---------|---------|---------|
| Grain Protection | | | |
| Moisture content | | | |
| Insects | | | |
| Rodents | | | |
| Birds | | | |
| In store Hygiene | | | |
| Storage above floor (pallets) | | | |
| Clearways (0.5m) | | | |
| Batch storing | | | |
| Clean | | | |
| Management strategies | | | |
| Store cleaning after season | | | |
| Bags cleaned, dipped | | | |
| Fumigation options | | | |