

Lecture 10

Storage

**Drying & Storage Engineering
(PFE-304)**

STORAGE

- Storage is an interim and a repeated phase during transit of agricultural products from producer to processor and its products from processor to consumer .
- Storage is responsible for **7% loss** in post harvest handling
- Effect of rural economy by **70%**, where grains are stored at farm level

If **food wastage** were a country, it would be the **3rd largest** greenhouse gas emitter.



Source: WRI's Climate Data Explorer (2011)



Food and Agriculture Organization
of the United Nations

STORAGE

Location of storage of grain and quality control

1. On farm
2. At collection points serving a number of farms
3. At terminals points where grain is processed or moved forward in still larger bulks.

Deteriorations caused by Insect and microorganisms :-

- (i) Deterioration in the quality of grains, caused by microorganisms:
- (ii) Alteration in chemical constituents of grain owing to its metabolism
- (iii) Insects and rodents cause damage by eating and contamination.

Damages in stored grain

• 1. Direct damages

- ✓ Insects consumes germ, some endosperm
- ✓ Contamination may be with dead bodies, cast skin, excreta, odour
- ✓ Tunneling in wooden parts resulting in the weakening of the structure

2. Indirect damages

- ✓ Create heating and migration of moisture
- ✓ Distribution of parasites to man.

Sources of infestation

1. Field



2. Infested gunnies



3. Infested transport



4. Infested godowns

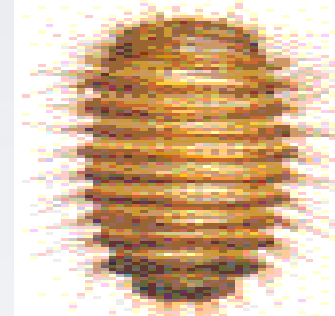


5. Infested stocks

Types of Insects

1. Major insects

- ✓ Attack the food grains directly and destroy them completely . e.g. Khapra larvae



2. Minor insects

- ✓ Follow the destruction already started by the major insects

- ✓ cannot directly destroy the grain

- ✓ e.g Laemopheous minutes



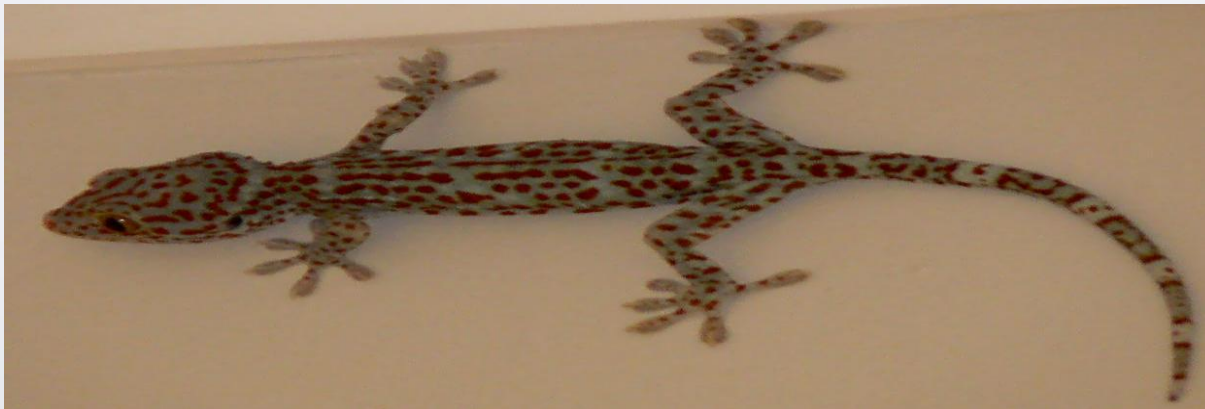
3. Incidental insects

- ✓ May or may not harm the stored food grain
- ✓ Contaminate the grain with their presence



4. Parasites or predators insects

- ✓ Depends on the above types of insects



Common insects of stored grains

Common name	Pest	Host
Rice weevil	<i>Sitophilus oryzae</i> , <i>S. zeamais</i> , <i>S. granarius</i>	Rice, wheat, sorghum, barley, maize
Khapra beetle,	<i>Trogoderma granarium</i>	Cereals, groundnut and pulses
Angoumois grain moth	<i>Rhyzopertha dominica</i>	Paddy, maize and wheat
Lesser grain borer	<i>Sitotroga cerealella</i>	Rice, wheat and maize
Pulse beetle	<i>Callosobruchus chinensis</i> , <i>C. maculatus</i>	Pulses, bean and gram
Tamarind/Groundnut Bruchid	<i>Caryedon serratus</i>	Ground nut, tamarind and other legumes
Cigarette beetle	<i>Lasioderma sericorne</i>	Wheat flour, cereal bran, peanuts, cocoa beans, spices, turmeric, chillies, ginger, stored tobacco, cigarette
Drug store beetle	<i>Stegobium paniceum</i>	Turmeric, coriander, ginger, dry vegetable and animal matter
Sweet Potato weevil	<i>Cylas formicarius</i>	Sweet Potato
Potato tuber moth	<i>Pthorimaea operculella</i>	Potato

Common name	Pest	Host
Red flour beetle	<i>Tribolium castaneum</i> , <i>Tribolium confusum</i>	Broken grains, damaged grains, milled products, machinery
Long headed flour beetle	<i>Latheticus oryzae</i>	
Saw toothed grain beetle	<i>Cryptolestus minutus</i> , <i>Laemophloeus pusillus</i>	Dry fruits ,roce heat, maize,cereals andoil seeds
Rice moth	<i>Corcyra cephalonica</i>	Cereals, oilseeds nuts, dry fruits, rice and pulse
Fig moth or almond moth	<i>Ephestia cautella</i>	
Indian meal moth	<i>Plodia interpunctella</i>	Maize, cereals, dry fruits, groundnut, and cereals products

Rats



- ✓ One rat consumes 10 kg of grain in a year
- ✓ Contaminates more than 10 times what it actually eats, with its urine and excreta.
- ✓ One rat drops 25 to 150 pellets and 10-20 ml urine in a day besides shedding its plenty of hair.
- ✓ . Rats also spread fatal diseases like plague, jaundice, rat bite fever, typhus etc.

- ✓ There are 118 species of rats found in India
- ✓ Common rats are house rats/ black rat, house mouse, brown rat Indian mole rat. large bandicoot rat, short tailed mole rat, Indian field mouse.



Rat control measures

- Sanitation in houses and godowns is significantly helpful in reducing the rat menace.
- Waste grain should be removed, grain sacks should be stored about 50 cm above the floor, and the grain should be protected with concrete, wire or sheet metal.
- In order to avoid the entry of rats in houses/godowns, tin plates should be fitted to the doors and windows at the bottom in such a way that once they are closed, no space is left for making entry by the rats.

In construction of a rat proof godown, following things are to be given due consideration:-

- The foundation is kept deep and the plinth is constructed about 1 m above the ground level in “L” shape having collar projected from all the sides.
- A godown should not have provision of steps.
- Fitting of wire netting to the drain pipes.
- If corrugated sheet or asbestos sheet is used for ceiling, the space between the wall and ceiling should also be covered with wire netting.

- The chemical used to kill rats and mice are called rodenticides.
- Rodenticides are usually mixed with baits such as fresh meats, rice, peanut butter etc. The bait must be mixed as directed because too little may not poison.
- Rats traps are also used to control rat menance.

