I. FAQ:

1. **What is the significance of cereals storage?**

Ans: The significance of cereals storage are;

- To ensures a continuous flow of goods in the market.
- To protects the quality of the products from deterioration.
- To fulfill the demand especially the seasonal demand, on a continuous basis.
- It helps in the stabilization of prices by adjusting demand and supply
- Storage is necessary for some period for further processing of the raw materials.
- Storage provides employment and income through price advantages.

2. **What is the requirement for storage of grains?**

Ans: Losses occur in food during harvesting, transportation and storage. The largest loss of post- harvest is during storage of grains. These losses arise from attack of insects, micro-organisms and animals; improper handling. When serious infestation by the pests occurs there is extensive weight loss accompanied by damage to quality. Intense insect activity often results in mold growth which not only completes the destruction of the feedstuffs but also poses serious health risks to humans and animals. Hence, efforts are made to store the grains in the safest possible way.

3. **Mention the facility for small scale storage?**

Ans: PAU bin: This is a galvanized metal iron structure. Its capacity ranges from 1.5 to 15 quintals. Designed by Punjab Agricultural University.

Pusa bin: This is a storage structure is made of mud or bricks with a polythene film embedded within the walls. Developed by ICAR.

Hapur Tekka: It is a cylindrical rubberised cloth structure supported by bamboo poles on a metal tube base, and has a small hole in the bottom through which grain can be removed.

4. **What is the difference between cover and plinth storage and bulk storage?**

Ans: For large scale storage of bags Cover and Plinth Storage (CAP) is used. It is a brick pillars to a height of 5mts from the ground, with grooves into which wooden crates are fixed for the stacking of bags of food grains. The structure can be fabricated in less than 3 weeks. It is an economical way of storage on a large scale. Bulk or loose storage is by dumping the grains in large quantity inside closed storage structures. Pest infestation can be controlled as these are airtight conditions.

5. **What do you understand by bag storage?**

Ans: These are one of the commonly used practice in our country. The bags may be made of jute or plastic and the grains are placed inside the bags and sealed. Each bag contains a definite quantity, which can be bought, sold or dispatched without difficulty. It is easier to keep separate lots with identification marks on the bags. The bags which are identified as infested on inspection can be removed and treated easily.

6. **Write a short note on quantitative losses of grains during storage?**

Ans: Quantitative or weight losses**:** In India, losses during storage may range from 33% to 73% due to insects. It is reported that number of damaged kernels increased from 2.7 to 48. 5%, when wheat was stored in untreated bags for 5 months. Government of India Committee for estimates of losses indicated that when insect damage was quantified, losses in various food grains were 3% in wheat, 2% in rice, 2% in jowar, 3% in bajra, 5% in millets, 5% in gram and 5% in pulses, and on an average it was 2.55%.

In paddy storage, quantitative losses caused by insects were reported to be 2.5 – 5.8% in 8 months of bag storage. 4.6% in 6 months in jute bags and bins 10% in gunny bags during 12

months of storage.

7. **Comment on losses of seed viability during storage?**

Ans: Retention of seed viability during storage is essential to increase crop productivity. Insects attack to the seed, first damage the germ which is softer than the kernel and as a result its germination is lost.

8. **What are the sources of insect infestation during storage of grains?**

Ans: Some storage insects like paddy moth and lesser grain borer infest grains right on the standing mature crop to stored crops. Such infestation is termed as horizontal infestation.

2. Lateral infestation of storage insects is common. They occur during post-harvest operations from previously infested crop. They can come from threshing floor, previously used and infested transport system and stored grains left from last season's harvest in the same storage. This infestation is also called cross infestation**.**

3. After storing, insects infest grains from surfaces of the storage containers/ bags where the insect's egg or larvae or adult would be harbored and is called as latent infestation.

4. A number of coleopteran beetles and weevils are also capable of migrating upward or downward among the grain bulk irrespective of the pressure. Thus infestation commenced on the top of the bulk grains may migrate to bottom and vice versa, known as vertical infestation**.**

9. **What are the Factors responsible for insect damage in stored grains?**

Ans: Factors responsible for insect damage in stored grains are

1**.** Higher grain moisture content in the grains. The safe moisture levels are 14% for paddy, 13% for milled rice, 12 % for wheat and 10% for oilseeds and 9% for pulses.

2. Less fluctuations in diurnal and seasonal temperatures.

3. Unscientifically fabricated/ constructed traditional storage structures, which are generally neither moisture proof not can prevent cross infestation of the insects.

10. **What are the hygienic control measures to be taken for stored commodities?**

Ans: The most efficient methods of preventing damage is to keep the stores as clean as possible. The small size of insects makes cleanliness a most important aspect of control measures. Practical hygienic control measures vary with different kinds of storage. Through cleaning of store rooms, warehouse or mills at periods when they can be emptied, and careful inspection of all material when brought in for storage or processing reduce to a minimum the residual insect populations which persist in store house etc. In warehouses, granaries and flourmills cleaning can be done by using vacuum cleaners. These allow ledges to be efficiently cleaned. It is important to clean all accumulations of cocoons and webbing.

11. **What are the physical measures for controlling the infestation?**

Ans: The dependence of insects on physical conditions within grain stores makes them susceptible to control by modifying their environment.

(a) Cold: The storage of material at temperatures below 13°C is effective in preventing insect infestation. Temperature of about 15°C and below inhibits the breeding of saw-toothed Grain Beetle, O. surinamensis. All stages of C. maculates were killed when subjected to temperatures of 0° C or less for 32 days, eggs being more susceptible than other stages. This technique is not appropriate for the tropics due to the high cost of achieving low temperatures.

(b) Heat: Heat treatment has given good results for treating retail stores and storerooms. In mills, temperature from 40°C to 54°C in all parts of the mill for a period of ten to twelve hours can kill all the insects. Heat is not satisfactory for the treatment of nuts and dried fruits. Grains can also be passed through special machines at temperatures of 54°C to 60°C for 30 minutes,

to kill any insect infestation. High temperature through solar radiation may kill the developing larvae of insect pests (e.g. C. maculatus).

(c) Gamma irradiation: Much attention has been focused recently on the possibility of using gamma irradiation to control insects in stored grain and grain product. Dosage of 25 kilorads of gamma radiation could be effectively used to eradicate the immature stages of C. cephalonica.

12. **What are the types of fumigation used as control measures?**

Ans: (a) Fumigation under sheets: The development of methyl bromide fumigation under-gas proof systems for products such as grain, groundnuts and cocoa beans is commonly practiced. This kills all the insects present and the sheets are then left out on the stacks to prevent the uptake of atmospheric moisture and re-infestation by insects. Methyl bromide fumigation and the storage of various commodities under vapour-proof sheets are two techniques, they are phosphine fumigation and gas discharge to disinfest stored food commodities. Phosphine is supplied in various forms: pellets and tablets, and bags /sachets. The use of this gas serves the immediate need to control the insect pests of grain in storage quickly and effectively.

(b) Spot fumigation: Fumigants used for this include ethylene dibromide, ethylene dichloride and carbon tetrachloride. The fumigant is contained in small sachets and the rate of application is 5 cc for each bags of 50 kg.

13. **What are the natural methods to control infestation?**

Ans: Natural methods to control infestation are

a. Vegetable oils: The practice of adding a small quantity of vegetable oil (1-15 ml per kg seed) to the grains of legumes to protect them against insects is common. The vegetable oils tested were the African palm, cotton seed, Maize, groundnut, rice bran oil, soyabean, coconut, jatropha curcas L., Pongamia glabra neem (A indica), Bassia longifolia, Bassia trifolia, mint (Mentha spp) etc. Crude oils seem to perform better than purified oils and non-edible oils

better than edible oils. The main effect of the oil coating is on the ability to prevent hatch of the bruchid eggs, the oil acting as an ovicide.

b. Ashes: Ashes of the three plant species Afzelia africana, Parkia africana and Ceiba pentandra provided effective control of C. maculatus in cowpea. However, a large quantity of ash (ash volume equal to that of grain) was required. It has been suggested that free movement of the adults for oviposition is prevented by the wood ash filling the inter-granular spaces.

c. Resistant varieties: A number of factors such as high protein content, seed, texture, and a pod wall factor have been linked to resistance of cowpea varieties to C. maculatus

14. **How the insect pest management is carried in rural storages?**

Ans: In rural sector food grains are generally stored in unscientific traditionally fabricated bulk storage structures, which are neither moisture proof nor can prevent the infestation of insects. Insect pest management in rural storages includes 3 main activities or actions, which should be taken care by the farmers in sequence, are as follows:

1. Appropriate drying of the harvested crops and threshed grains,
2. Dis-infestation of storage containers or structures or stores.
3. Use of grain protectants.

15. **How are the insecticides and fumigants compounds as a classified as curative treatment?**

Ans: i) Knock-down insecticides: The chemicals capable of quick immobilizing or killing insects are usually aimed against flying insects, this can also kill the insects on surfaces as well in the cracks and cervices. Such chemicals are pyrethrin spray, lindane smoke generator or fumigant traps.

ii) Grain protectants: Mixing of chemical dusts with food grains is not recommended. However, these can be mixed with grains meant only for seed purposes. Pyrethrum dust, malathion, deltamethrin and BHC dusts are normally used as seed protectants against storage insects.

iii) Fumigants: A fumigant is a chemical, which at required temperature and pressure can exist in gaseous state in sufficient concentrations to be lethal to a given organism. A number of fumigants explored and used for control of storage insects are as follows:

a) Ethylene dibromide (EDB): it is highly toxic liquid filled in glass ampoules with sealed nozzles, suitable for fumigation of food grains stored in reasonably airtight structures.

b) EDB+: It is a mixture of EDB and carbon tetrachloride in a ratio of 1:8 w/w and has a greater penetration power and hence can be used for bagged storage under gas proof covers. It is equally effective in rural storage structures.