New methods employed in managing store grain pests

1. **Insect proof bins**
2. **Insect proof bags**
3. **Traps**
4. **Irradiation**
5. **Nanoparticles**
6. **Silos**
7. **Microwave technology**
8. **Controlled atmosphere**
9. **Low & high temperatures**

Contd… New methods employed in managing store grain pests

1. Insect proof bags

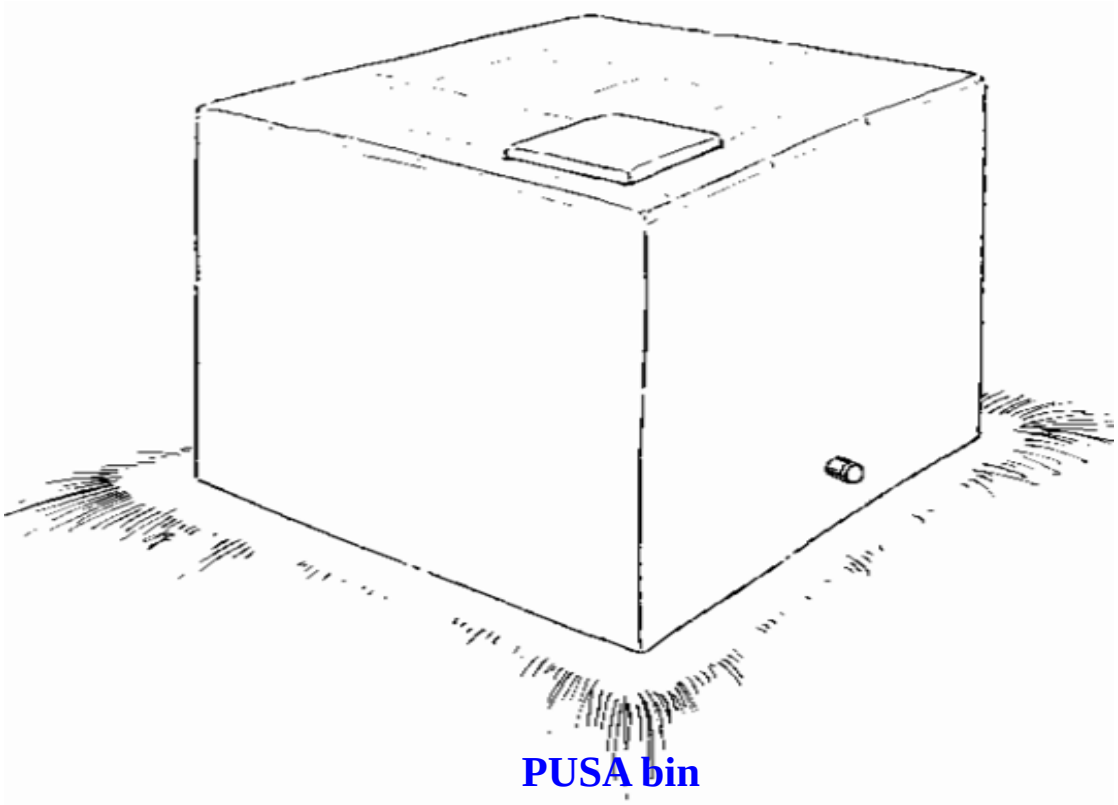
HDPE bags with lamination inside

Grain pro bag

Zero fly bag

Contd… New methods employed in managing store grain pests

2. Insect proof bins



PUSA bin

Contd… New methods employed in managing store grain pests

3. UV light trap

Contd… New methods employed in managing store grain pests

5. Nanoparticles

Some commonly used nanoparticles are

- ✓ **Silver nanoparticles like $AgNO_3$**
- ✓ **Silica like; diatomaceous earth, synthetic silica (SiO_2), sands, Silica Aerogel**
- ✓ **Aluminium oxide (Al_2O_3),**
- ✓ **Zinc oxide (ZnO3),**
- ✓ **Copper oxide (Cu_2O),**
- ✓ **Titanium dioxide (TiO_2)**

Contd… New methods employed in managing store grain pests

6. Silos

Contd… New methods employed in managing store grain pests

7. Microwave technology

- **Microwave dis-infestation seems to have a great potential as an alternative method of killing insects in stored-grain (Vadivambal *et al.* 2010).**
- **Microwave generators can be operated in continuous or pulsed mode.**
- **It kills insect stages like larvae, eggs etc.**
- **leaves no chemical residues and preserves quality**

Contd… New methods employed in managing store grain pests

8. Controlled atmosphere

- **It implies alteration of natural storage gases *i.e.* carbon dioxide, oxygen and nitrogen to render atmosphere in stores detrimental to pests**

- **It also refers to the process of changing the composition of existing atmosphere by introducing CO_2 or N_2**

- **It can be achieved in following**

1. **Adding gaseous or solid CO_2 (9-10%)**
2. **Adding N_2 gas**
3. **Removing O_2 gas(2-4%)**
4. **Allowing metabolic processes which remove O_2 or add CO_2**

Contd… New methods employed in managing store grain pests

9. Use of low and high temperatures

- **Optimal temperature for most of the storage insects is between 25º C and 33ºC**
- **Temperatures between 13ºC and 25º C will slow development**
- **High temperatures of 37º C and above will stop development**