

# Dealing with Store Houses

# Stored food pests

- 80% of human food comes from grains
- 12% of harvest is lost to insects before harvest
- overall total food losses due to pests are about 20-30% destruction

# Two Pest Categories

- Primary – Cause initial injury
- Secondary – Take advantage of injury.

# Types of losses due to pests

- Direct
- Indirect

# Direct losses

- Actual consumption
  - loss of weight,
  - loss of nutrients,
  - lower germination,
  - reduced grade
  - lower market value
- Contamination
- Damage to structures or containers

# Indirect losses

- wet grain heating
- bacteria
- fungi
- aflatoxins
- parasites of humans
- control and application costs
- excessive pesticide residues
- loss of consumer confidence

# Food contamination

- Insect infestation results in grain damage that cannot be repaired
- Food defect action levels for insect contamination
- Food exceeding those levels cannot be mixed with un-infested food to reduce levels of contamination
- Food processors can be fined or sent to jail for infestations found during inspections

# Food Defect Action Levels

- Insect Filth: Ave. of 5 or more whole or equivalent insects (not counting mites, aphids, thrips, or scale insects) per 100 g sample
- Rodent Filth: Ave. of 4 or more rodent hairs per 100 g sample
- Significance: Aesthetic



# Management of Stored Food Pests

Objective:

Prevent contamination from causing rejection

- Monitor Pest Population
- Control through non-chemical means if possible
- Use Chemicals as a last resort (they can cause rejection too).

# IPM: Management Tactics

- Judicious use of insecticides
- Examples of treatment plans, associated application equipment, formulations available and some products

# IPM: Management Tactics

- Non-chemical control
  - Sanitation—
  - Physical—
  - Cultural—
- Many of the non-chemical control methods are PREVENTATIVE
  - Biological Control: ?

# General Principles for an IPM Program

- Inspect incoming material (prevention) is the first line of defense against most stored product insects.

# Inspect rail cars and trucks for spilled food and infestations



Flour in bags— examine seams of bags; check surface of bags, look under a few bags, look for holes in bags, check pallet



# Inspection of incoming materials

- Look for trails in dust to determine presence of insects
- Boxes of grain products—
  - check surface of transportation vehicle and dust residues,
  - remove inner pack,
  - check box and bottom of box,
  - check pallets
- Inspect material before putting inside kitchen pantry
  - Check cereal boxes, flour bags, or any grain containing food

# First In, First Out





# Sanitation

- It's one thing to clean out a kitchen pantry
  - Discard infested items
  - Vacuum
  - Wipe shelves down with warm soapy water

# Sanitation

- Spilled food
- Flour dust
- Trash containers
- Broken packaging
- Equipment cleaning

# Sanitation?



# Sanitation?



# Non-chemical controls

- Cold
- Heat
- Packaging
- Mechanical destruction

# Cold

- Low temperature of product can retard or kill stored product pests (less than 5 °C)
- Grain storage silos usually have aeration equipment to pull cold air into grain in winter to kill or slow development of grain pests
- Storing susceptible materials in refrigerator will slow or kill pests
- Packages placed in refrigerator will kill most stored products pests if the cold penetrates to all areas of the package (4 days for a 5 lb bag of flour)

# Heat

- Processing plants are often heated to 120-150°F for 24 hours
- Infested food can be placed in oven at 150°F for 20 minutes
- Infrared and microwaves are often used to kill pests in processing

# Packaging

- Packaging can keep products free of insects
- Newly hatched larvae can penetrate cracks 0.12 mm wide
- Waxed paper and cardboard can be penetrated by stored products pests
- 75% of this kind of infestation occurs at folds and corners of a carton
- Foil laminates can prevent most insect infestation
- Glass jars and metal drums are virtually insect proof



# Mechanical destruction

- High rpm (2,900 rpm) will kill insects and mites
- Milling and other processing equipment can mechanically destroy insect pests

# Chemical control

- Much changed with loss of Methyl Bromide
- Contact treatments -- Ultralow volume (ULV) or Ultralow dosage (ULD) applications of pyrethrins or pyrethroids
  - Fogs, mists, and aerosols cannot penetrate food to kill insects
  - They kill exposed stages and can be used regularly to prevent infestations in the facility from attacking products
- Protectant insecticides
  - Placed in cracks and crevices where insects rest.

# Protectants

- Inorganic dusts (diatomaceous earth) sometimes used to protect seeds and grains from insects
- Malathion--
  - has been registered for application to all major grains and has been used since 1958.
  - EPA tolerance is 8 ppm
  - in recent years most of the common pest species have developed resistance to malathion
  - Not widely used

# Protectants

- Chlorpyrifos-methyl (Reldan),
  - Banned in 2003
- Pirimiphos-methyl (Actellic)-- expanded registrations for stored grain insects
  - Not widely used
- Spinosad
  - Registered for stored grain use in Jan. 2005.
  - Effective against all major insect pests.
  - Like Bt, it is a bacterial by-product so is considered “natural” and can thus be used on grain for any target market (including organic).

# Protectants

- **Hydroprene** (Gentrol)-- can be fogged and sprayed for control of stored products pests
  - Gentrol Point Source
- **Methoprene** (Diacon II, Wellmark and DeGesch)
- ***Bacillus thuringiensis*** (Dipel)-- exempt from tolerance regulations. Can be applied as a surface treatment for control of lepidopteran pests

# Fumigants

- Used to kill insects in raw and packaged food
- Leave very little residue



# ProFume is replacing Methyl Bromide

- 2005 – MeBr production/importation banned
- ProFume major player now.
  - Dow AgroSciences
  - Sulfuryl Fluoride – old product, used for structural pest control for many years (Vikane)
  - Disrupts the glycolysis and citric acid cycles, works in 24-48 h
  - Cost similar to MeBr

# Phostoxin, Gastoxin, or Magtoxin

- Can be used to kill insects in all kinds of grain, including seeds because phosphine has no effect on germination
- At 68°F, fumigation time is 3 days, at 40-53°F recommended time of fumigation is 10 days; therefore treated areas must be very gastight



# Fumigation procedure for stored products pests



- Sealing

- similar to structural fumigation, but usually the infested product is placed on a concrete slab and covered with a tarp held in place with sand snakes or tape
- Plastic tarp and tape is minimum required
- Placards must be placed before start of fumigation and must contain name of fumigant, date of release, name and phone of applicator
- If area around the fumigation is occupied, monitoring within 10 ft of the fumigated area is required and levels recorded

# Fumigation procedure for stored products pests

- Release of the fumigant
  - 2 person teams responsible for release of fumigant.
  - Full face respirators with proper canisters must be available before release of fumigant