Silkworm diseases and pests

Protozoan disease-Pebrine

- In Hindi this disease isknown as 'kata'.
- **Causative agent and infection**:
- *Nosema bombycis nageli*
- Infection-Transovarion(through ovary) or orally(consumption of infected leaves)
- Also from diseased and dead larva.
- Microspores are oval and refractile.
- Spores hatch in digestive tract, reaches blood and affects all organs.

•**Symptoms**:

•Eggs loose adherence capacity, poor hatching , laid in clumps.

•Infected larva shows black spots like pepper.

•They show Sluggish, retarded growth and development.

•Pupa heavier and flimsy

•Moths with deformed body.

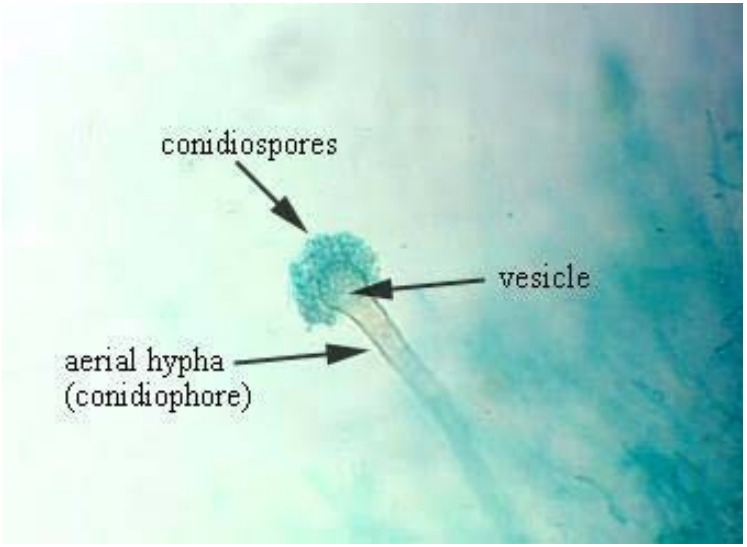
•**Control**:

•Use of disease free eggs and moths

•Sterilization of rearing house and equipments with 2% formalin.

Fungal disease -Muscardine

- **A) White Muscardine**
- **Causative agent and infection**
- *Beauveriabassiana*
- Highly contagious disease. Main source of infection is dead larva.
- Fungi shows 3 stages: conidium, vegetative mycelium & aerial mycelium
- Conidium-oval , germinate in 6-8 hrs, spread throughout body.



•**Symptoms:**

•In early infection larva looses appetite, becomes inactive.

•Moist specks appear on body.

•Body becomes limp loosing elasticity, they cannot move and die.

•After death body becomes hard and stiff.

- **B) Green muscardine**
- **Causative agent and infection**
- *Spicaria prasina*
- Infection occurs through skin by conidia.
- Conidia germinate in 15-20 hrs after infection.
- Conidia-oval/round , light green in colour.
- Germ tube penetrates the body.

•**Symptoms:**

•larva looses appetite, becomes inactive.

•specks appear on body, becomes large specks and appear dry & concave.

•After death worms start becoming stiff and hard.

•Within 2-3 days body covered with mycelia.

•After 10-15 days body bears fresh green conidia.

- **C)Yellow muscardine-**
- **Causative agent and infection**
- *Paecilomyces farinosa*
- Conidia are oval/ spherical shaped & appear yellow.
- **Symptoms**:
- Similar to other muscardine disease.
- Body covered with yellow mycelia

- **D) Aspergillosis/ Brown muscardine**
- Caused by genus *Aspergillus*
- Process of infection similar to other muscardine, but infection is localized.
- **Symptoms**:
- Serious disease of chawki worms
- Infected worms become lustrous and die.
- In late age worms body area not covered with mycelia rots easily .

- **Control**:
- Disinfection of rearing house and equipments with 2% formalin
- Rearing bed should be kept dry
- Destruction of infected worms.

Bacterial disease-A) Flacherie

•The term flacherie refers to flaccid condition(Body becomes soft & loose) of larva.

•it is syndrome associated with bacterial disease.

•The infection is mainly due to consumption of contaminated leaves.

•**Symptoms**:

•Larva becomes motionless and lethargic.

•Body becomes soft, they stop feeding.

•Larva fails to moult.

Fig. 3.37(a). Flacherie attacked larvae showing soft and loose skin

Fig. 3.37(b). Dead larva with black carcass after flacherie

B) Sotto disease

- **Causative agent and infection**
- *Bacillus thuringenesis*
- The bacteria produces toxin which kills the worms.
- Infection occurs orally or through wounds.
- Bacteria affects nervous system.
- **Symptoms**:
- Silkworms looses appetite, becomes sluggish.
- Body shrinks, shows paralysis and dies.

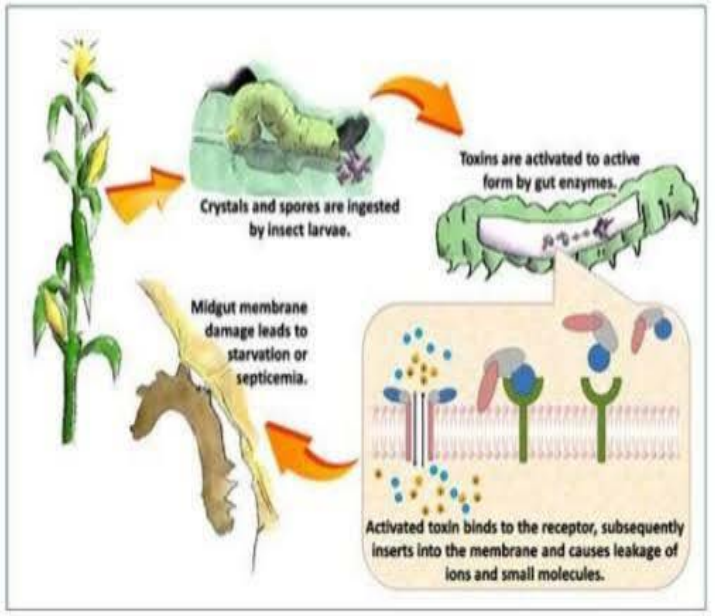


Fig. Showing the mode of action of crystals produced by *bacillus thuringiensis*

1. http://muou.sc.mahidol.ac.th/images/mechanism_bt.jpg

•Dead larva head appears hook shaped.

•Body becomes dark brown and organs areliquefied.

•Body starts rotting producing foul smell.

•**Control**:

•Prevention of swallowing of toxic substance

•Destruction of diseased larvae.

C) Septicaemia

- **Causative agent and infection**
- *Bacillus sp.*
- Caused due to multiplication of bacteria in haemolymph.
- Infection through wounds or injury in skin
- **Symptoms**
- Swollen thorax, vomiting, abdominal legs looses gripping.
- Body becomes soft and discolored, body wall ruptures producing foul smell.
- Worms appear black in color.
- Quick rotting of body of worms.

•**Control**:

•Avoid high temperature and humidity

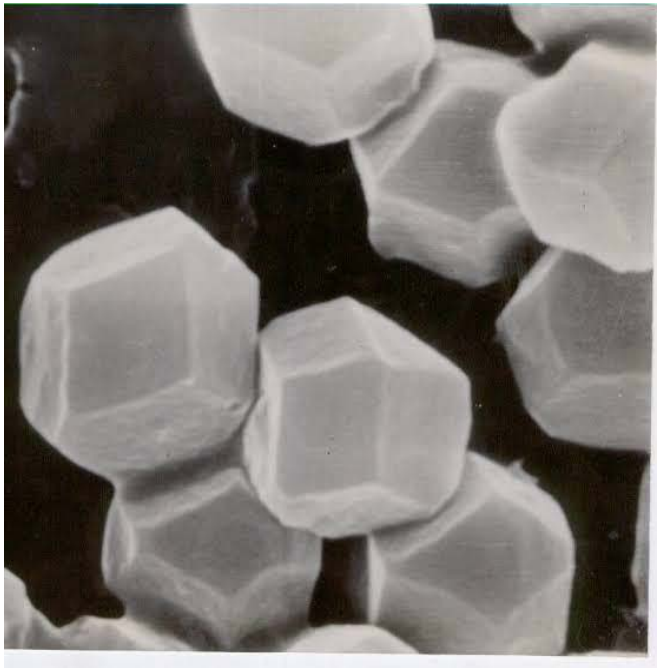
•Care to avoid injury to worms , overcrowding etc.

Viral disease-A) Grasserie, Nuclear polyhedrosis virus disease

- **Causative agent and infection**:

Borrelina bombycis

- Silkworm gets infected when it feed on contaminated mulberry leaves.
- The milky white fluid released by the grasserielarvae, contaminated silkworm rearing house and appliances are the sources of infection.
- After ingestion protein coat dissolves and viral rods are released.
- Rods attack midgut cells, releasing infectious subunits .
- These subunits enters nucleus of cells as well.



•**Symptoms**: Skin shows oily and shining appearance.

•Skin becomes thin and fragile. Inter-segmental regions are swollen

•Skin ruptures easily releasing body fluids containing polyhedra of viruses.

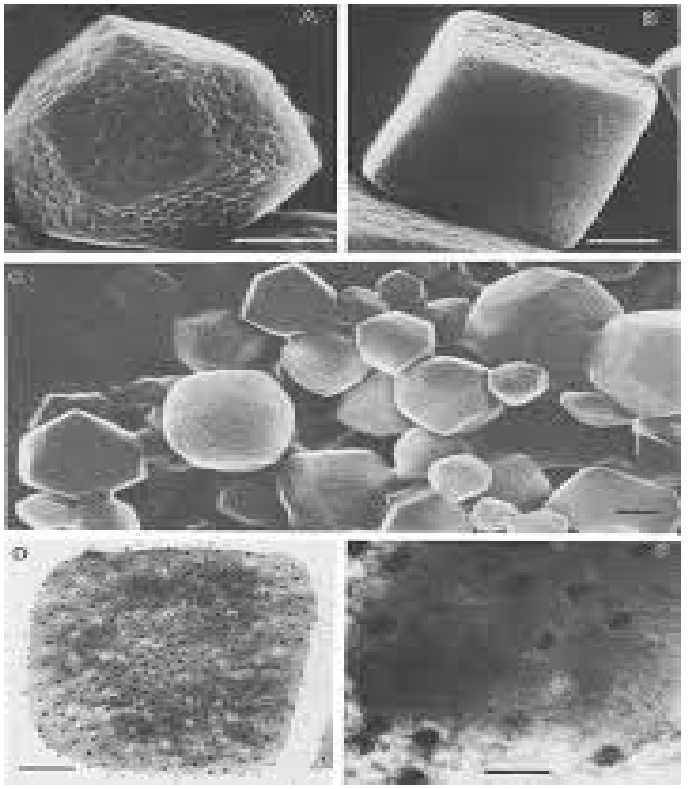
•Younger instars loose coordination, fails to moult and dies.

B)Infectious flacherie viral disease

- **Causative agent and infection-**
- Infectious flacherie virus type I or *Morator*virus
- The virus is globular in shape and measures 30-32nm in diameter
- Infection occurs orally.
- Virus infects goblet cells.
- **Symptoms**: transparent body, retarded growth
- Vomiting of gastric juice, diarrhoea.
- Spreads through contaminated leaves.

C) Cytoplasmic polyhedrosis

- **Causative agent and infection-**
- *Smithia*virus.
- Polyhedra found in cytoplasm of midgut cells
- Size is 0.5-1.5 micrometer . Appears hexagonal in shape.
- Infection through polyhedra contaminated mulberry leaf.



•**Symptoms**:

•Slow stunted growth, larval stage is prolonged.

•Midgut becomes opaque and pale yellow.

•Worms expells whitish excreta and spoils bed.

•Goblet cells ruptures releasing polyhedra into alimentary canal.

•It passes out with excreta, spreading the disease.

D) Kenchu disease

- **Causative agent and infection-**
- Kenchu virus
- Spherical / tetragonal virus of about 0.27nm in diameter.
- Single oral ingestion is sufficient .
- **Symptoms**: After 2-3 hrs. Worms appear pale and dull
- worms display vary large head.
- After death, body shows brownish patches
- Infected larvae produces flimsy cocoons.

Control :

- Rearing of silkworms under hygienic conditions
- Proper ventilation and spacing.
- Practicing personal and rearing hygiene.
- Collect the diseased larvae and ensuring its proper disposal.
- Maintaining optimum temperature and humidity in the rearing house.

Silkworm pests-Uzi fly

•The **uzifly**, ***Exoristabombycis***is a serious parasitoid of the silkworm,*Bombyxmori*,causing 10-15% damage to the silkworm cocoons.

•Adult is blackish grey, with four prominent longitudinal lines on thorax.

•The female uzifly enters into rearing house, settles on silkworm body for egg laying.

•Female lays creamy white eggs, one at a time.

•She lays one or two eggs on each silkworm larva in intersegmental regions

•After 2-3 days, egg hatches into maggots . Maggots enters inside the larva by making small holes and feed on internal contents

•The fully grown maggot cuts the integument of Silkworm and comes out

•The maggot pupates in a dark corner or cracks & crevices and transformed into adult.

•Early instar infection -death of worms before spinning.

•Infection after middle of 5th instar, worms mature 2 days earlier producing poor quality cocoons.

•**Control Measues**

•Exclusion method: Provide wire mesh/nylon net on all windows/doors.

•Cracks and crevices should be sealed

•Place uzitraps inside the rearing house to trap uziflies emerging inside.

•Biological control: Release *Nesolynxthymus*(a pupal parasitoid of the uzifly) inside rearing house on 2nd day of V instar.

Dermestid beetles

•Some important species are-*Dermestes cadverinus*, *D. valpinus*, *D. vorax*etc.

•Adults -oval , elongated dark brown in colour.

•Larva -reddish brown covered with hairs.

•**Damage**: larva and adults attracted by smell of stifled cocoons and dried pupa

•They Bore into cocoons to eat dried pupa

•Damaged cocoons are unfit for reeling.

•Also damage pierced cocoons stored in grainages.

•**Control:**

•Rearing house and storage rooms should be cleaned periodically

•Storage of rejected cocoons should be avoided

•Wooden equipments dipped in 0.2% malathoin solution

•Fumigation with methyl bromide kills beetles.

THE END