

Silkworm diseases and pests

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Protozoan disease- Pebrine

- In Hindi this disease is known as 'kata'.
- **Causative agent and infection:**
- *Nosema bombycis nageli*
- Infection- Transovarian (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.

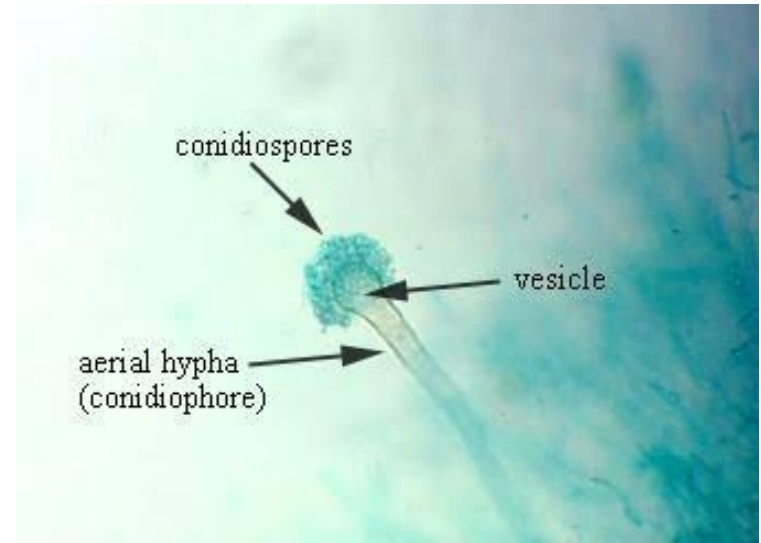


- **Symptoms:**
- Eggs loose adherence capacity, poor hatching , laid in clumps.
- Infected larva shows black spots like pepper.
- They show Sluggish, retarded growth and development.
- Pupa heavier and flimsy
- Moths with deformed body.
- **Control:**
- Use of disease free eggs and moths
- Sterilization of rearing house and equipments with 2% formalin.




Fungal disease - Muscardine

- **A) White Muscardine**
- **Causative agent and infection**
- *Beauveria bassiana*
- 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 loses appetite, becomes inactive.
- Moist specks appear on body.
- Body becomes limp losing 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.
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- **Symptoms:**
- larva loses appetite, becomes inactive.
- specks appear on body, become 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
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- **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 .
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- **Control:**
 - Disinfection of rearing house and equipments with 2% formalin
 - Rearing bed should be kept dry
 - Destruction of infected worms.
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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) Sotton disease

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

Mode of Action

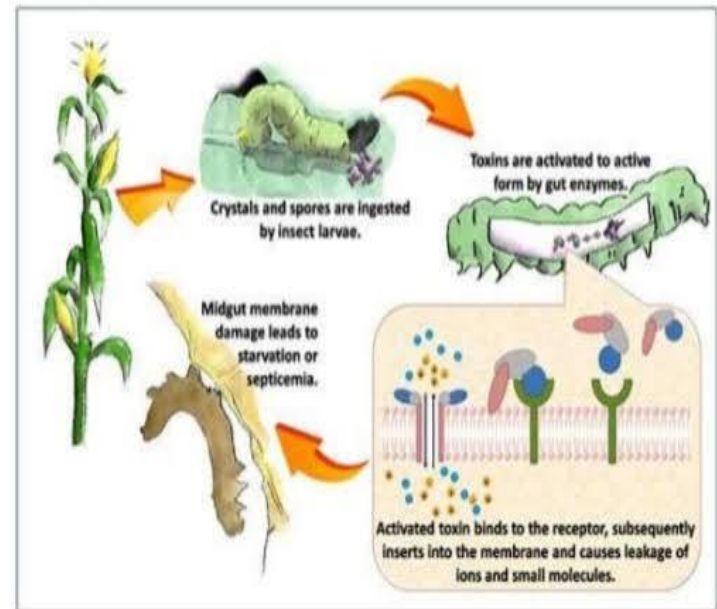



Fig. Showing the mode of action of crystals produced by *Bacillus thuringiensis*

- Dead larva head appears hook shaped.
- Body becomes dark brown and organs are liquefied.
- Body starts rotting producing foul smell.
- **Control:**
- Prevention of swallowing of toxic substance
- Destruction of diseased larvae.



c) Septicaemia

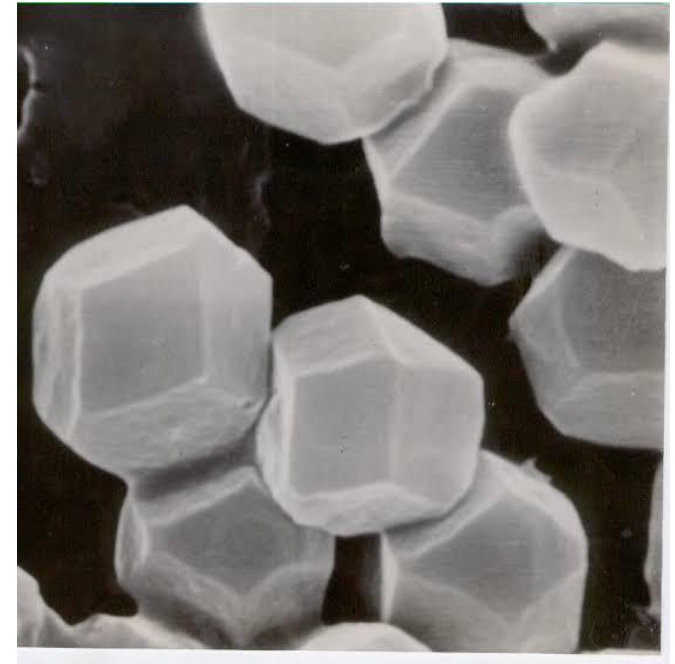
- **Causative agent and infection**
 - *Bacillus sp.*
 - Caused due to multiplication of bacteria in haemolymph.
 - Infection through wounds or injury in skin
 - **Symptoms**
 - Swollen thorax, vomiting, abdominal legs loses gripping.
 - Body becomes soft and discolored, body wall ruptures producing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



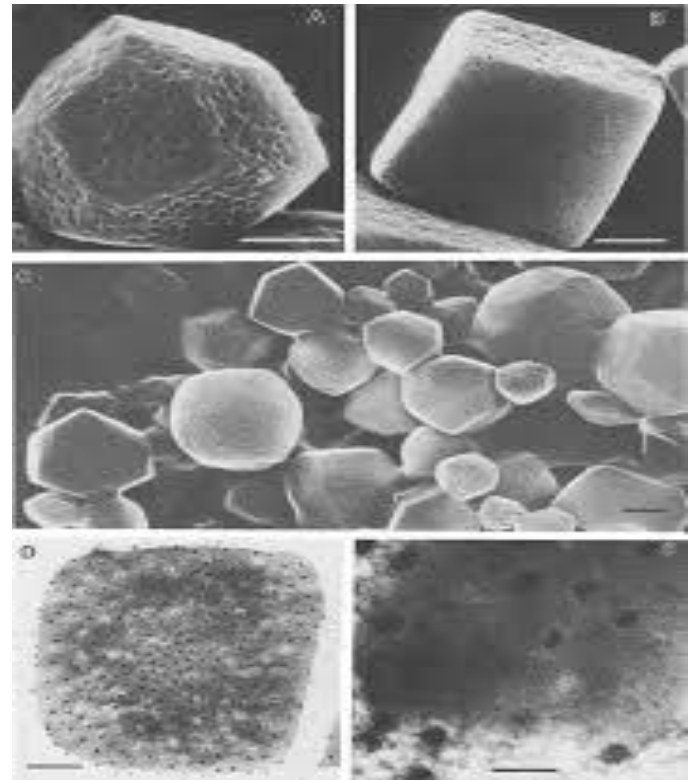
B) Infectious flacherie viral disease


- **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 expels whitish excreta and spoils bed.
 - Goblet cells ruptures releasing polyhedra into alimentary canal.
 - It passes out with excreta, spreading the disease.
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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.
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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.
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Silkworm pests- Uzi fly

- The **uzi fly**, *Exorista bombycis* is a serious parasitoid of the silkworm, *Bombyx mori*, causing 10-15% damage to the silkworm cocoons.
- Adult is blackish grey, with four prominent longitudinal lines on thorax.
- The female uzi fly 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 Measures**
 - Exclusion method: Provide wire mesh/nylon net on all windows/doors.
 - Cracks and crevices should be sealed
 - Place uzi traps inside the rearing house to trap uzi flies emerging inside.
 - Biological control: Release *Nesolynx thymus* (a pupal parasitoid of the uzi fly) inside rearing house on 2nd day of V instar.
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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.



References

- <https://www.slideshare.net/nhomthatnice/silkworm-rearing-technology>
- A book of Animal systematics & diversity-IV and Applied Zoology-II(Nirali prakashan)
- **For Images-** https://www.researchgate.net/figure/Pebrine-disease-of-silkworms-caused-by-N-bombycis-A-A-normal-5th-instar-silkworm_fig1_308390342/amp
- <http://silks.csb.gov.in/murshidabad/diseases-and-pests-of-silkworms/>
- <http://silks.csb.gov.in/pune/MR/diseases-and-pests-of-silkworms/>
- https://www.researchgate.net/figure/a-SEM-of-Bombyx-mori-nuclear-polyhedrosis-virus-85000-Bar-1-m-b_fig1_236591879