

The domestication and rearing of silkworms in colonial form have made them sensitive to environmental, nutritional and microbial factors, resulting in infectious and non infectious diseases leading to silkworm mortality and cocoon crop loss.. Among the infectious diseases, Grasserie, Flacherie, Muscardine and Pebrine are the major diseases of silkworm.

### GRASSERIE

Grasserie disease is also known as Nuclear polyhedrosis, milky disease and hanging disease.

**Causative agent:** *Bombyx mori* Nuclear Polyhedrosis Virus (BmNPV).

**Occurrence:** Throughout the year and the severity is more during summer and rainy seasons.

**Source of infection:** By feeding on contaminated mulberry leaves. The milky white fluid released by the grasserie larvae, contaminated rearing house and appliances.

**Predisposing factors:** High temperature, low humidity and poor quality mulberry leaves.

#### Symptoms:

- The skin of infected larvae becomes shining
- The integument becomes fragile
- Inter segmental swellings appear
- The larvae fail to moult and move aimlessly
- Skin of infected larva ruptures easily and turbid white haemolymph (blood) oozes out which contains millions of polyhedra.



#### How to Manage the Grasserie disease?

- Practice two times disinfection of rearing house, its surroundings and rearing appliances with recommended disinfectants
- An additional disinfection with 0.3% slaked lime solution is also recommended in case of high incidence of disease noticed in the previous crop
- Practice personal and rearing hygiene during silkworm rearing
- Collect the diseased larvae at the early stage of infection and ensure their proper disposal

- Apply Ankush/Vijetha as per recommended schedule and quantity
- Maintain optimum temperature and humidity in the rearing house
- Avoid overcrowding in the rearing bed and provide proper ventilation in the rearing house
- Provide sufficient quantity of good quality mulberry leaf.
- Feed Amruth as per schedule and quantity to suppress/control the disease.

### FLACHERIE

**Causative agent:** The main causative pathogens are Infectious flacherie virus (BmIFV), Densonucleosis virus (BmDENV) and bacteria such as *Streptococcus* sp., *Staphylococcus* sp., *Bacillus thuringiensis* and *Serratia marcescens*. Flacherie is also caused by the combined infection of bacteria and viruses.

**Occurrence:** Throughout the year. However, the severity of disease is noticed more during summer and rainy seasons.

**Source of infection:** By eating contaminated mulberry leaf. Dead/diseased silkworm, its faecal matter, gut juice, body fluid forms the source of contamination. The infection can also take place through injuries, cuts and wounds.

**Predisposing factors:** Fluctuation in temperature, high humidity and poor quality of leaves.

#### Symptoms:

- At the early stage of infection, symptoms are not clear and difficult to identify
- The larvae become soft and flaccid
- The growth of affected larvae retards, become inactive and vomit gut juice
- The faeces become soft with high moisture content. Sometimes chain type excreta is observed. Often, rectal protrusion is also observed
- Cephalothoracic region becomes translucent
- When infected with *Bacillus thuringiensis*, symptoms of toxicity such as paralysis, tremors and sudden death are observed. After death, larvae turn black in color and give foul smell
- The dead larvae turns red when infected with *Serratia marcescens*.



#### How to Manage the Flacherie disease ?

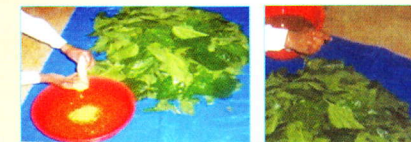
- Practice two times disinfection of rearing house, its surroundings and rearing appliances with recommended disinfectant
- An additional disinfection with 0.3% slaked lime solution is also recommended in case of high incidence of viral flacherie noticed in the previous crop
- Pick up suspected diseased larvae as early as possible and dispose them by burning/burying
- Apply bed disinfectant Ankush/Vijetha in recommended schedule and quantity
- Provide good quality leaf grown under good sunlight and recommended inputs. Do not provide over matured/over stored / soiled leaves to the silkworm
- Starvation to the silkworm should be avoided. Provide optimum spacing and environmental conditions to the silkworms
- Feed Amruth as per recommended schedule and quantity to suppress/control the disease.

### AMRUTH

An Eco and user-friendly botanical based formulation for suppression/control of Grasserie and Flacherie diseases



- The first ever curative formulation against silkworm diseases
- Mix Amruth powder in water @ 20g/liter.
- Spray/sprinkle 70 ml of Amruth solution per kg of mulberry leaf/shoot and feed to silkworms after 5 minutes
- The product is licensed to two manufacturers and it is available as Nandi Amruth/Rainbow Amruth.



Schedule	Qty. of Amruth (g)	Qty. of water (ml)	Qty. of Leaf/shoot (kg)
After 2 <sup>nd</sup> moult 2 <sup>nd</sup> feed	7	350	5
After 3 <sup>rd</sup> moult 2 <sup>nd</sup> feed	53	2,650	38
After 4 <sup>th</sup> moult 2 <sup>nd</sup> feed	90	4,500	67
<b>Total</b>	<b>150</b>	<b>7,500</b>	<b>110</b>

## MUSCARDINE

**Causative agent:** White muscardine is caused by a fungus, *Beauveria bassiana*.

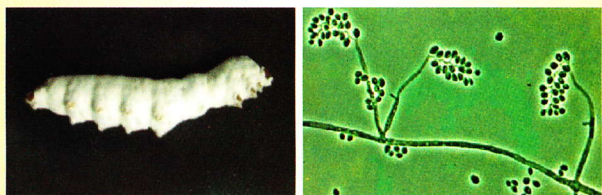
**Occurrence:** The disease prevails during winter and rainy seasons.

**Source of infection:** Mummified silkworms / alternate hosts are the major source of infection. The conidia from mummified silkworm contaminate rearing environment, rearing house and rearing bed. The infection starts when conidia come in contact with silkworm body.

**Predisposing factors:** Low temperature with high humidity.

### Symptoms:

- The larvae lose appetite and become inactive
- Nearing death, the larva becomes soft, vomits and turns flaccid
- After death, initially the larva will be soft but after few hours, it gradually become hard followed by mummification due to growth of aerial mycelia and conidia over the body and turn white in colour.



### How to Manage the Muscardine disease ?

- Practice two times disinfection of rearing house, its surroundings and rearing appliances with recommended disinfectant
- Control mulberry pests in the mulberry garden
- Pick up suspected diseased larvae before mummification and dispose them by burning
- Regulate bed humidity during rainy season by dusting slaked lime powder
- Maintain optimum temperature and humidity in the rearing house
- Apply bed disinfectant Ankush/Vijetha and Vijetha supplement as per recommended schedule and quantity.

## PEBRINE

**Causative agent:** *Nosema bombycis* and different strains of microsporidia.

### Mode of transmission

- *Per os* (Feeding contaminated mulberry leaves)
- Transovarial transmission (from infected mother moth to embryo)
- Transovum transmission (from surface contaminated eggs at the time of hatching)

**Source of infection:** The main sources of infection are dead larvae, vomited fluid, faecal matter, contaminated seat paper, trays, egg surface and alternate hosts.

### Symptoms:

- The growth of diseased larvae is retarded
- Moulting is delayed and duration is increased
- In the early stage of infection, larvae appear normal but with the advancement of infection, it loses appetite and becomes inactive
- The colour of the larvae changes to rustic brown
- The larval size in the rearing bed varies greatly
- In the advanced stage of the disease, the larvae become flaccid with vomiting and anal discharges
- After death, the larvae turn black because of secondary invasion by bacteria. The microscopic examination of these larvae reveal the presence of shining oval spores.

### How to Manage the Pebrine disease ?

- Practice two times disinfection of rearing house, its surroundings and rearing appliances with recommended disinfectant
- Rear larvae hatched from disease free layings certified by registered Seed Producer
- Control mulberry pests in the mulberry garden
- All measures of hygiene maintenance should be followed during silkworm rearing and grainage activities
- Apply Ankush/Vijetha as per recommended schedule and quantity
- Seed crops should be constantly monitored for the microsporidian diseases.



Text

M. Balavenkatasubbaiah & A.R. Narasimha Nayaka

### For further details Contact:

DIRECTOR

Central Sericultural Research & Training Institute

(ISO 9001 : 2008 Certified)

Central Silk Board, Min. of Textiles

Govt. of India, Srirampura, Mysuru-570 008

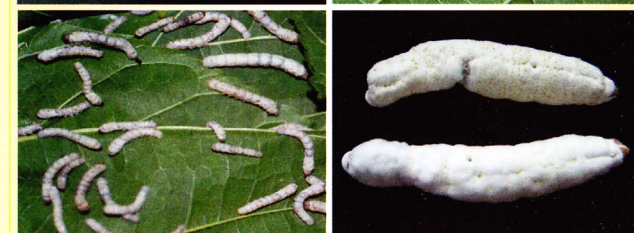
Tel: 0821-2362757, 2362406

Fax: 0821-2362845

Web: [www.csrtimys.res.in](http://www.csrtimys.res.in)

Email: [csrtimys.csb@nic.in](mailto:csrtimys.csb@nic.in)

# HOW TO MANAGE SILKWORM DISEASES DURING REARING?



Central Sericultural Research & Training Institute

(ISO 9001 : 2008 Certified)

Central Silk Board, Min. of Textiles

Govt. of India, Srirampura

Mysuru-570 008