

Muga silkworms are prone to several diseases caused by bacteria, viruses, and fungi, with flacherie, grassarie, pebrine, and muscardine being the most prevalent. These diseases pose significant challenges, particularly during seed crop rearing, due to fluctuations in temperature and humidity, which lead to disease outbreaks and reduced seed cocoon production.

The incidence of diseases varies by location and season, with climatic factors like temperature, humidity, and rainfall playing a critical role. Pebrine is independent of climatic conditions, but other diseases are strongly influenced by environmental changes.

Key Causes of Disease Outbreaks:

- High temperature and humidity
- Poor-quality seeds and less nutritive foliage
- Overlapping rearing cycles at the same site
- Contaminated rearing plots and appliances
- Unhygienic rearing practices

Effective disease management involves maintaining hygiene, using quality seeds, and ensuring proper rearing practices. This pamphlet provides information on common diseases of muga silkworms, their symptoms, causal organisms, and effective control measures.

1. Pebrine Disease:

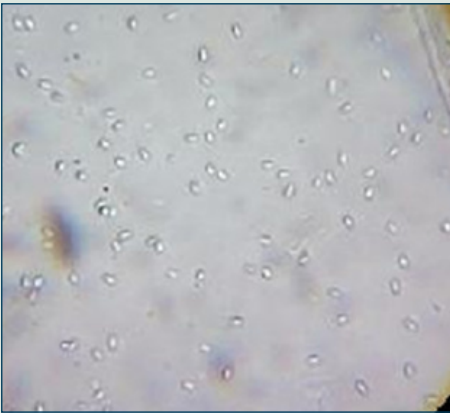
Pebrine is a microsporidian disease caused by *Nosema antheraea*, leading to significant losses in muga silkworm rearing. Known locally as “Phootuka Bemar,” it is characterized by black spots on the silkworm body in advanced stages.

Occurrence:

Affects all seasons but is more prevalent in autumn and winter. It impacts all developmental stages.

Symptoms:

- **Egg Stage:** Poor hatching, irregular eggs, and heavy infection leading to no hatching.
- **Larval Stage:** Poor appetite, sluggish growth, black spots, and weak cocoons.
- **Pupal Stage:** Flabby, luster less pupae, black spots, failed metamorphosis.
- **Adult Stage:** Improper emergence, poor egg laying, discolored scales, and distorted wings.



Pebrine spores under microscope

Causal Organism:

Caused by *Nosema antheraea*. Transmission occurs through eggs (vertical) or contamination of leaves, rearing appliances, and soil (secondary/tertiary).

Control Measures:

- Mother moth examination (Fujiwara method) and disinfection of eggs (0.2% sodium hypochlorite).
- Use disease-free seeds and ensure proper disinfection of tools, plants, and rearing sites.
- Remove and destroy infected worms, cocoons, and debris.
- Prune and disinfect rearing plants; avoid rearing on the same site for 5-6 months after an outbreak.
- Thorough disinfection of rearing and grainage areas with 5% bleaching powder solution.
- Dispose of grainage debris properly in soak pits.

These measures help control the spread and minimize losses due to pebrine.

2. Flacherie Disease:

Flacherie, locally known as Mukhlaga Bemar, is a bacterial and viral disease causing severe losses in muga silkworm rearing. It thrives under high temperature, humidity, intermittent rainfall, and poor-quality foliage, promoting microbial growth.

Occurrence

- Predominantly during monsoons and post-monsoon (July–September).
- Spreads through contact and contaminated leaves.

Symptoms

- Worms become lethargic, lose appetite, and excrete semi-solid faeces.
- Swollen anal region with ruptured excreta resembling chains.
- Larvae become soft, black, and translucent, eventually toppling and dying.
- Vomiting of gut juices and black discoloration of haemolymph.

Causal Organisms

- Bacteria: *Pseudomonas aeruginosa*, *Bacillus thuringiensis*, etc.
- Outbreaks linked to high temperature, humidity, and unsuitable foliage.

Control Measures

- Use disease-free seeds and disinfect rearing sites with 0.2% sodium hypochlorite or a lime-bleaching powder mix (9:1).
- Maintain hygiene: avoid damp sites, overcrowding, and feed age-specific quality leaves.
- Dust with 3% slaked lime during high disease incidence.
- Remove and burn dead or diseased worms.
- Prune host plants to ensure uniform leaf age.

3. Grassarie Disease:

Grassarie, also known as Jaundice or Phularog, is a contagious viral disease of muga silkworms caused by fluctuating temperature and humidity. It spreads through contaminated foliage, diseased worms, and unclean rearing sites.

Symptoms

- Larvae fail to moult; integument becomes fragile and swollen.
- Body tissues and haemolymph disintegrate into turbid white fluid containing hexagonal polyhedral bodies.

Causal Organism

- Caused by *Borrelina sp.* (Baculovirus family).

Control Measures

- Disinfect rearing sites with 0.2% sodium hypochlorite or a lime-bleaching powder mix (9:1).
- Dust 3% slaked lime in fields with prior disease incidence.
- Remove and burn retarded or diseased larvae.
- Avoid overcrowding, frequent handling, and feed silkworms quality leaves.

#### 4. Infectious flacherie

It is a major viral disease of muga silkworm caused by Baculoviruses. High temperatures clubbed with high humidity, and poor-quality host plant leaves are predisposing factors.

##### Symptoms:

- The infected silkworms are sluggish in movement.
- Lethargic and weak.
- The anal portion of the larvae becomes swollen and ruptured.
- After 2-3 days of infection the silkworms die.
- Infectious flacherie is contagious in nature.

##### Control Measures:

- Feeding of quality and stage-specific leaf.
- Disinfection of the rearing site with 0.2% sodium hypochlorite solution or sprinkling of lime and bleaching powder at 9:1 ratio before rearing.
- Maintain hygienic conditions of the rearing field.



Symptoms of different mugas silkworm diseases. 1) Pebrine; 2) Flacherie; 3) Grasserie; and 4) Muscardine.

#### 5. Muscardine Disease:

Muscardine, commonly called Bhekur Rog, is a fungal disease of muga silkworms caused by parasitic fungi. It manifests in different forms depending on the spore color, with white and green muscardine being common, and brown muscardine occurring rarely.

##### Occurrence

This disease mainly affects muga silkworm rearing during late autumn and winter, particularly in Aghenua and Jarua crops.

#### Symptoms

- Larvae become inactive, lose appetite, and their bodies harden and bend dorsally.
- Oily substance oozes out, followed by diarrhoea and vomiting.
- Dead larvae appear chalky, spongy, and fragile with reduced body fluid.
- After 2-3 days, a white powdery layer of conidia covers the mummified bodies.

#### Causal Organism

- Caused by *Beauveria* sp., which infects through skin penetration by fungal conidia.

#### Control Measures

- Maintain dry, hygienic rearing conditions; avoid dampness.
- Brush silkworms in sunny areas; ensure proper ventilation.
- Collect and burn diseased worms and plant twigs after rearing.
- Burn rice husk/dry weeds to dry the rearing site.
- Spray Serichlor (2%) or Blitox (50% CoC) @ 2.5 g/l on leaves and soil before hatching.
- Sprinkle lime and bleaching powder mix (9:1) on rearing plot soil before brushing.

Effective disease management in Muga silkworms requires a combination of preventive measures, including maintaining hygiene, using disease-free seeds, and timely intervention. Regular monitoring, proper disinfection, and controlling environmental factors are crucial for reducing disease outbreaks and ensuring optimal silk production.

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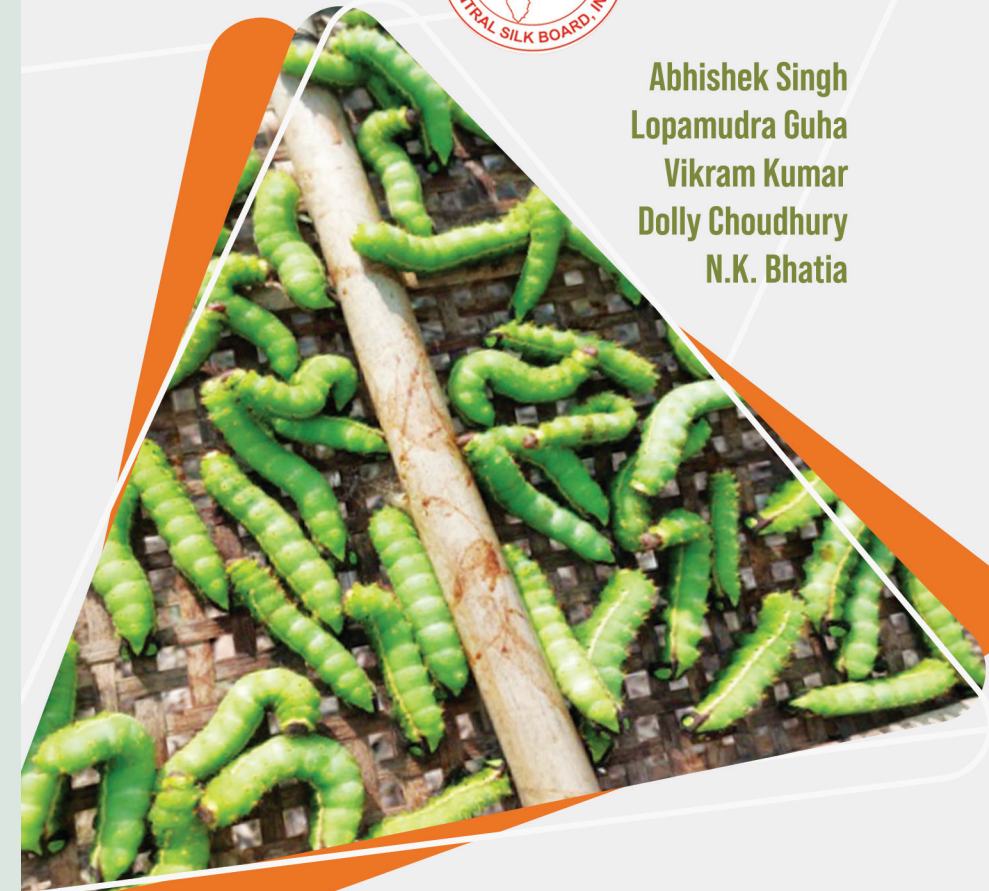
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# Muga Silkworm Disease Prevention

## A Comprehensive Guide for Farmers



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