Diseases of Silkworm:-

1. Protozoan Diseases

2. Bacterial Diseases

3. Viral Diseases

4. Fungal Diseases.

Protozoan Diseases:

Pebrine: Pebrine was first recorded in France in 1845.In Hindi this disease is known as "Kata". The most virulent protozoan disease of silkworm is Pebrine. It is also called as "pepper disease", because of the black/brown colour spots on the body.

Causative organisms:

Pebrine is caused by the protozoan ***Nosema bombycis*** that has several strains of which most virulents are NIK-2r. NIK-3h and NIK-4m in India. The protozoa pass its life cycle through 2 stages. The infective -spore stage and vegetative stage.

Modes of transmission:

The disease is transmitted to silkworm in three different ways:

(a) Oral: Spores liberated through the faeces of infected worms or through dead larvae, contaminate the mulberry leaves given in rearing bed. Such leaves when taken by other larvae, they get infected. Again, eggs may be contaminated by such faecal matter or dead tissues containing the spores during the time of oviposition or after oviposition. The newly hatched larvae who take part of chorion of such contaminated eggs may get infection.

b) Contact: Larvae may get infection through their skin from the rearing bed contaminated with *Nosema* spore containing faecal matter or dead tissues.

(c) Transovarial: If infection occurs in 5^{th} instar stage, the adult moth normally emerges through pupal stage. However, the spores of Nosema ingested then sporulate within the oocyte and pass on to the eggs. Thus, the egg itself acquires infection from the layers (mother) and hatches into primary infected larvae. However, these infected eggs hatch in very low percentage and the hatched out larvae usually die before reaching 3^{rd} instar. These larvae act as the source of secondary infection for other larvae through their faeces or dead tissues.These larvae, if spin, form weak cocoons and exhibit pebrine symptoms and may die during or after spinning. Thus,

they serve as source of tertiary infection to other 5th instar larvae which may spin and may even live up to the adult stage.

Symptoms:

Egg: Infected eggs do not show firm attachment with the egg card due to improper deposition of glue. These eggs are pale yellow in colour and may fail to hatch.

Larvae: Primary infected larvae usually die before exhibiting any typical symptoms. Larvae having secondary or tertiary infections may show- different symptoms like loss of appetite, 'unequals' appearance due to slow and irregular growth; clean worm symptom that arises due to irregular and incomplete moulting, black pepper-like spots on the body (Fig. 3.36), irregular brown patches due to dead hypodermal cells, spitting and wasting silk instead of spinning the cocoon, etc. Infected larvae also pass soft faeces and often die after spinning without pupating.

Pupa: Live infected pupa if present inside the cocoon, may show black, swollen body with black spots on sides of abdomen.

Adult moth:

Pebrine infected adult moths show black spot on abdomen, deformed antennae, unstretched, and discoloured wings. Females usually lay eggs in irregular, loose heaps. Scales fall off easily from the body of pebrine infected moths.

Fig. 3.36. Pebrinised larva showing black spot

Detection of pebrine:

Pebrine at any stage of silkworm life cycle can be detected by observing the above mentioned symptoms. Besides, microscopic observation of homogenate / fluid from dead tissues, faecal pellets can indicate the presence of infective spores of Nosema. Again, by advanced immune enzymatic methods, presence of pebrine spores can be detected quickly.

Control measures:

(i) In grainages only disease- free layings will be allowed for rearing.

(ii) Diseased larvae if detected in rearing tray/bed should immediately be removed and burnt. All rearing appliances including the rearing room then should be disinfected with 4-5% formalin solution or by spreading bleaching powder,

(iii) Adult moths showing symptoms of pebrine should not be undertaken for any sericultural processes.

(iv)For disinfection of rearing accessories, other agents like Benomyl. Bavistin, Bengard, etc. can be used instead of routine formalin/bleaching powder.

(v) Rearing of disease resistant races of Bombyx, e.g., Nistari can be considered as an important preventive measure against pebrine.

Quick Recap (Go through after the end of this chapter).

Diseases of Silkworm:

A variety of diseases are associated with the larvae of a silk moth. These enemies not only kill the larvae but spoil the forthcoming generation also.

Some of them are protozoans, viral and few are fungal:

1. Pebrine- Protozoan

Is caused by protozoan and sweeps out the entire industry the larvae become pale yellow, reduce in size and finally reduces the yield.

2. Grasserie:-Viral

Makes the skin of larvae rough and blisters appear over it. The saliva becomes thick and yield is minimized.

3. Flacherie:-Bacterial

Caused due to indigestion ,so the worm become thin, inactive and regenerates occasionally.

4. Muscardine:- Fungi

Mortality occurs due to heavy rain and unhygienic conditions in rainy season. The worms die soon after this disease. This is due to fungi.

Beside these the ants, crows, birds and other predators are always ready to attack the insect so the industry is always managed in such a way that these things could not reach the cage.

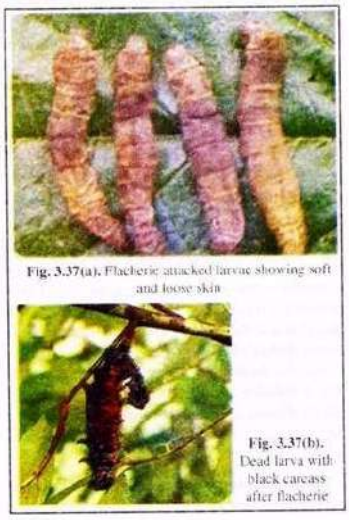

Fig. 3.37(a). Flacherie attacked larvae showing soft and loose skin

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

Fig. 3.38. Grasserie attacked larva with ruptured skin

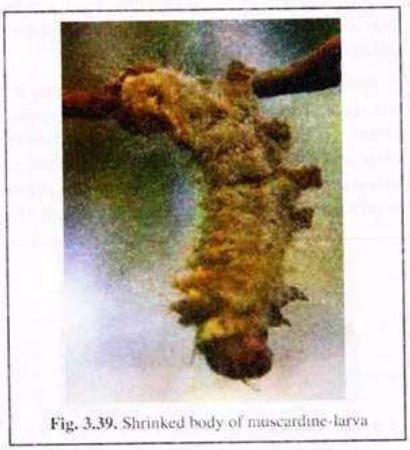

Fig. 3.39. Shrinked body of muscardine-larva