PESTS OF MULBERRY AND THEIR CONTROL

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A general term for organisms (rats, insects, etc.) which may cause illness or damage or consume food crops and other materials important to humans. Or A destructive insect or other animal that attacks crops, food, livestock, *etc.*

Mulberry, like most of the economic plantations and field crops, is also subject to the attack of a vast pest complex belonging to a large number of insect orders and acarids. Though the frequent leaf picking and pruning of the shoot restrict the attack of pests, many of them still find enough time and place on mulberry for feeding and breeding on it. The major insect orders known to be the pest of mulberry (in order of largest number of species attacking the mulberry) are:

(a) Lepidoptera

(b) Hemiptera

(c) Coleoptera

(d) Thysanoptera

(e) Orthoptera

(f) Isoptera

besides the Acarids.

In the following pages are given the details of the species known as pests of mulberry along with their life cycle, type of damage, symptoms and period of occurrence which are very essential to be known to identify the pest, assess the damage and plan an effective control. Control measures, individual and integrated, based on the above are suggested.

A number of other pests including mollusks, *Pila globosa* have also been reported from mulberry causing occasional damage. But, their occurrence being rare and localized. Their control may be taken up following the guidelines given for the control of other pests or through reference to a specialist.

The order Lepidoptera consists of small to large sized moths and butterflies. They are of great economic importance to mulberry cultivators as a very large number of species of this order in their caterpillar stage feed on mulberry leaves or cause damage to other parts of mulberry plants.

1. Bihar hairy caterpillar, *Spilosoma obliqua* Walker (= *Diacrisia obliqua)* (Family: Arctidae)
Presence has been reported in India and Philippines

(a) *Life Cycle:* Adults are light brown with brick red abdomen, peppered with dark row of spots laterally and dorsally. 1000-2000 eggs are laid in batches on the lower surface of the leaf. Eggs hatch in 5-7 days. Caterpillars moult six times. Fully grown caterpillar measures 4.5 to 5 cm. Anterior and posterior regions are black in colour and the rest of the body is reddish brown. The pupa is dark

brown in colour and measures about 2cm in length. Pupal period lasts for 12-14days. The life cycle is completed in about 48 days.

(b) ***Type of damage and symptoms:*** Gregarious young caterpillars feed upon the chlorophyll layer of the leaf exposing the veins. Late instar caterpillars are voracious eater of mulberry leaves. The affected leaves look dead and dried and easily falloff. Clear branches without leaves can also be noticed after a-severe attack.

(c) ***Period of occurrence****:* Incidence is frequent from August to February.

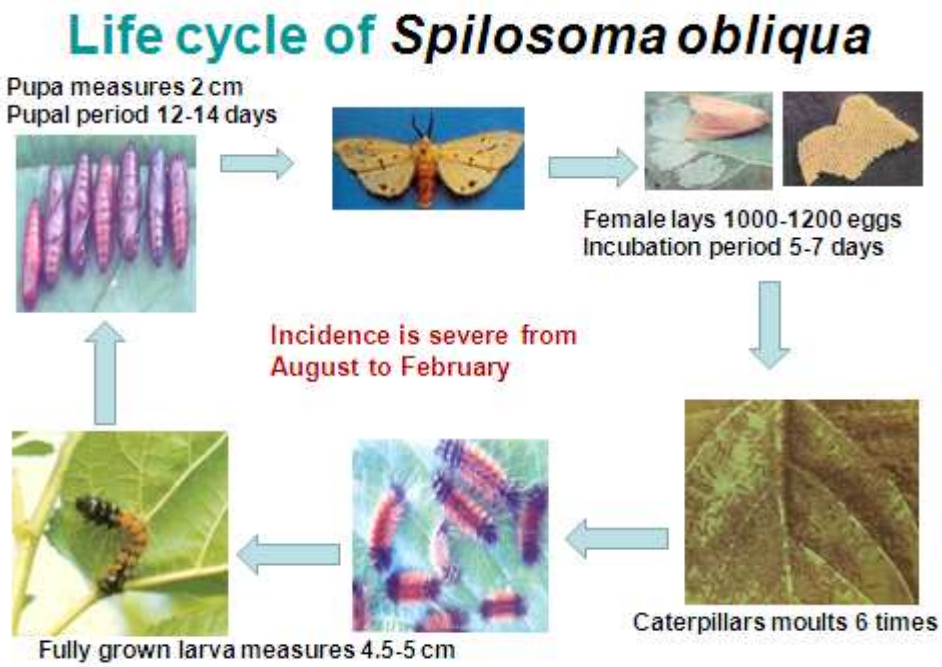
(d) ***Management/Control:***

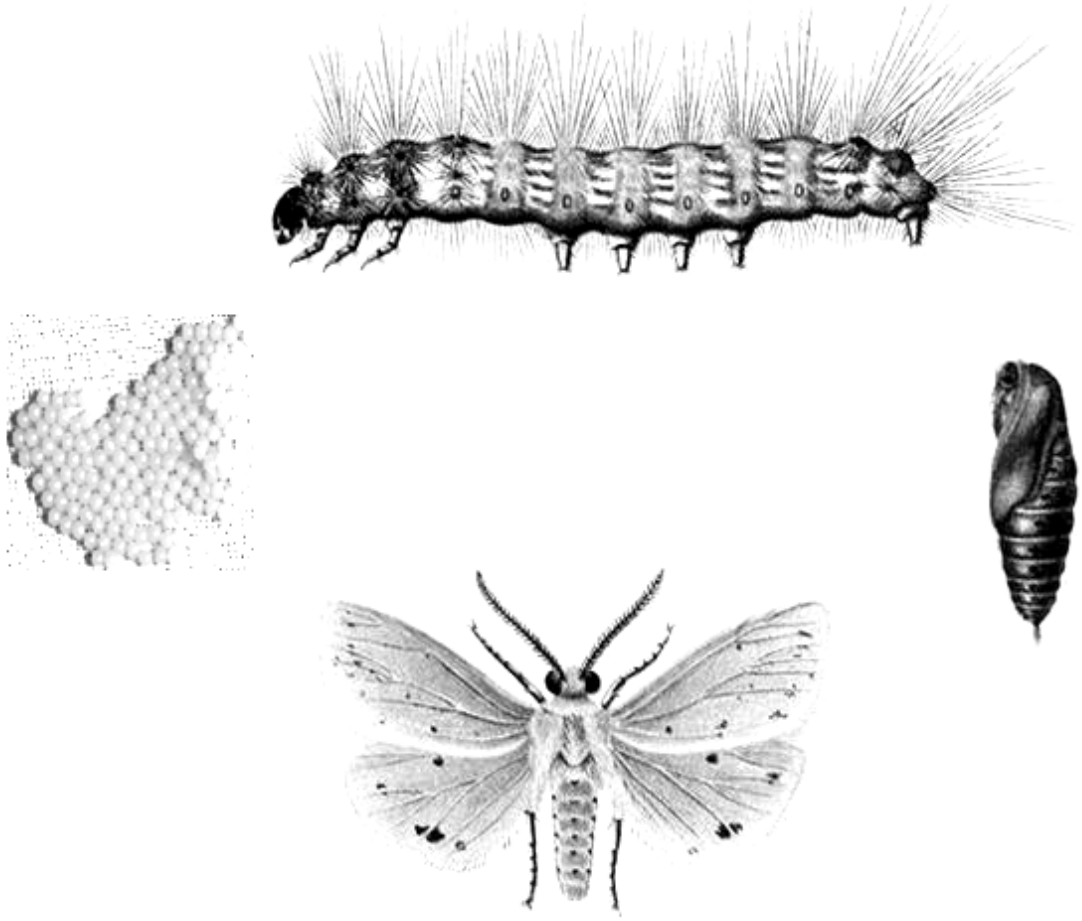
(i) Installation of light traps to attract adults.

(ii) Collection and destruction of egg masses and gregarious young instars caterpillar.

(iii) Deep ploughing and flood irrigation for exposing and killing the pupae.

(iv) Spraying of 0.2 per cent Dimethoate (safe period -13 days) or DDVP (safe period-17 days) on mulberry plants to kill the caterpillars.





2. <u>Leaf-roller</u>, *Margaronia pulverulentalis* (Family: Pyralidae).

(a) *Life Cycle:* Adults are grayish white in colour with black brown stripes on the forewings and each measures about 10 mm in body length. Adult female lays gelatinous eggs on the young leaves near the terminal buds. The caterpillars feed on leaves and produce spinning filaments when they grow which binds the leaf blades together. The caterpillars are greenish brown in colour with number of black brown spot regularly arranged on the side and back of the abdominal segments. Fully grown caterpillar measures about 20 mm in length. The mature caterpillar normally turns into pupa in the grass.

(b) *Type of damage and symptoms:* Mulberry varieties which have multi lobe leaves are relatively more prone to attack possibly due to larger surface area to bind the leaf blades together. Attack by this pest causes reduction in leaf yield. Rolled leaves of mulberry can be observed in the garden.

(c) ***Period of occurrence:*** Attack is usually noticed between the end of rainy season (February) to the end of dry season (September). However, severe damage generally takes place during dry season.

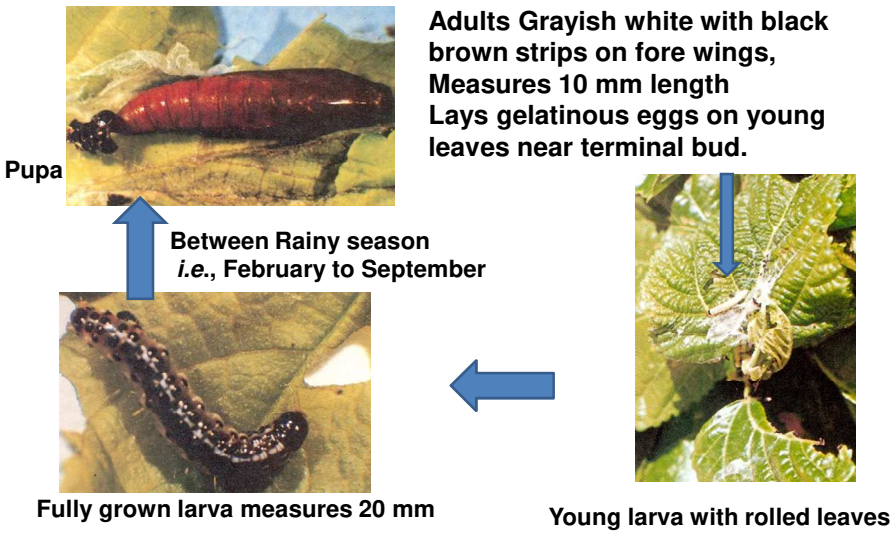
(d) ***Management:***

(i) Pruning of the infested branches followed by the destruction of the caterpillars.

(ii) Spraying of mulberry with 0.1 per cent BHC (Safe period - 11 days) or 0.2 per cent DDVP (Safe period - 17 days).

(iii) Biological control with the help of its natural enemies like *Apanteles* spp. and *Diadegma* spp.

Lifecycle of leaf roller *Margaronia pulverulentalis*



The order Thysanoptera consists of insect species commonly known as Thrips. Most of the members are plant feeders. Some species act as vectors of viral diseases of plants. Some members of this order occasionally cause serious damage to mulberry especially during summer months.

3. Thrips, *Pseudodendrothrips* spp. (Family: Thripiidae)

Pseudodendrothrips spp. has been reported from Bangladesh whereas *Pseudodendrothrips mori* has been reported from India, Japan, Sri Lanka and Viet Nam. In addition to this, other species of thrips reported from India and Sri Lanka are *Haplothrips coloratus*, *Taeniothrips glycines*, *Taeniothrips melanicornis* and *Taeniothrips claratris*. The most commonly found species of thrips in India *is P. mori*

(a) ***life Cycle:*** Adult males of *P. mori* is brownish yellow whereas female is dark brown in colour. Females are larger than males. On an average an adult measures 0.9 mm in body length. 30-

50 bean shaped yellow coloured eggs are laid by a single adult female of *P. mori* on the ventral side of the leaf. Nymphs hatch from these eggs in 6-8 days. The nymphs are pale yellow coloured. They moult four times in 15-18days. Adults are with fringed wings.

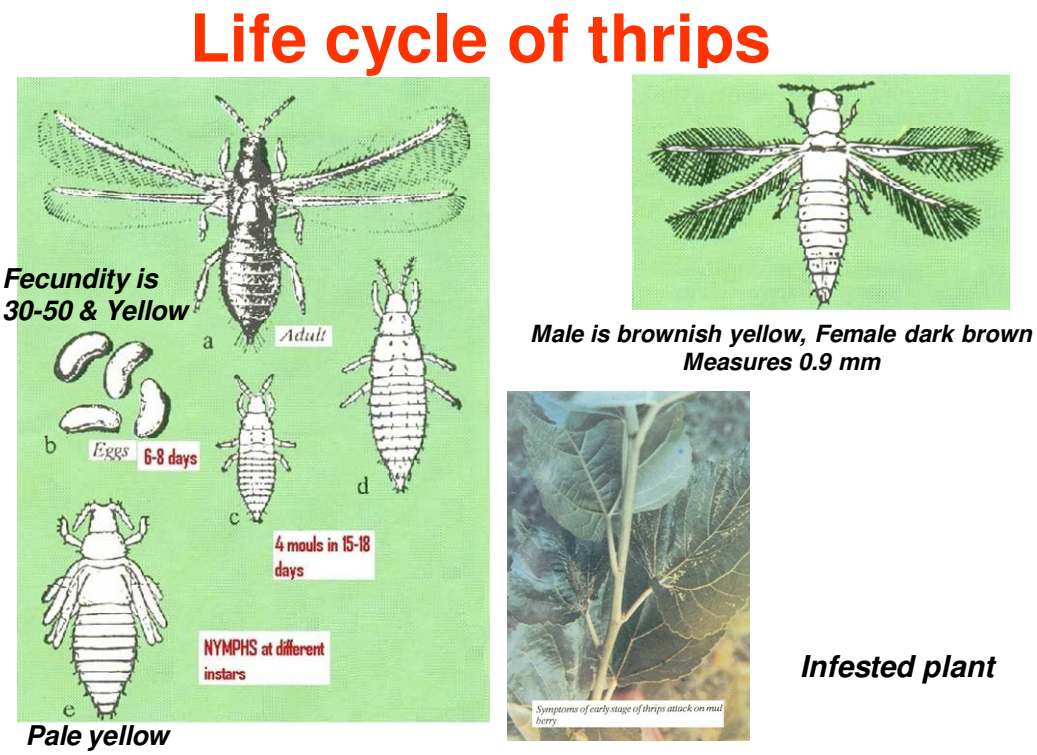
(b) ***Type of damage and symptoms:*** Thrips affect the leaves of the mulberry shoot. They injure the epidermal tissue. Early maturity, depletion of moisture, reduction in crude protein and total sugars are met with the affected leaves. Leaves become unsuitable for healthy silkworm rearing. Affected leaves show streaks in the early stage of attack whereas blotches are observed at the advance stage of attack which becomes yellowish-brown on maturity.

(c) ***Period of occurrence****:* Throughout the year however, very high in summer months.

(d) ***Management:***

(i) Sprinkler irrigation disperses the nymphs and adults.

(ii) Spraying of 0.02 percent DDVP twice at weekly intervals to kill the nymphal and adult stages. Safe period - 7 days.



4. Mealy bug *MaconelIicoccus spp.* (Family: Pseudococcidae)

Presence has been reported in Bangladesh, India and Indonesia. Indian and Indonesian species of the mealy bug have been identified as *Maconellicoccus hirsutus.*

(a) ***Life Cycle:*** Each adult female deposit from 350-500 eggs in a loose cottony terminal ovisac during a week's time. Eggs are elongated in shape and orange in colour. Hatching takes place in about

5-10 days, depending upon the climatic conditions. The crawlers are also orange in colour. Nymphs are covered with mealy substances. The females have three while males have four nymphal instars, which are passed in about 25 and 26 days respectively. Adults reproduce parthenogenetically. They mate but do not feed and die in 2-3 days.

(b) ***Type of damage and symptoms****:* The leaf yield is tremendously reduced and are depleted in nutritive values. The affected apical shoot show retarded growth and flattening of apical shoot. Thickening of the affected leaves is also observed. The leaves are wrinkled and dark green in colour.

(c) ***Period of occurrence****:* Mostly in summer months.

(d) ***Management:***

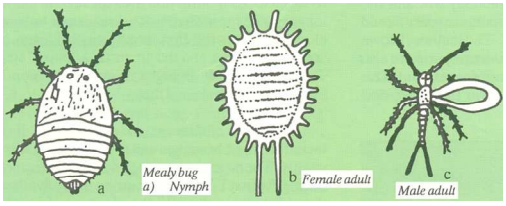
(i) Removal of the affected shoot and burning.

(ii) Spraying of 0.01 percent parathion. Safe period - 13 days.

(iii) Soil application of phorate at the rate of 4 kg per ha after pruning. Safe period - 45 days from the first application and 15 days from the last application. It should be applied in 3 equal split doses at the interval of l0days, the first application should be undertaken immediately after pruning.

(iv) Successful biological control of mealy bug can be achieved by employing predator like *Cryptolaemus montrouzieri* (Coccinellidae).

Life cycle of MEALY BUG



Mealy bug

Mealy bug on mulberry plant

Plant showing Tukra Symptoms

5. Mites, *Tetranychus* spp (Family : Tetranychidae)

Tetranychus equitorius MsGr (= *Tetranychus neocaledonicus* and *Tetranychus telarius* are reported from India and Sri Lanka. Another species *Tetranychus ludeni* has also been reported

from India. However, the most commonly occurring species *T. ludeni* and *T. equitorius* are described.

Tetranychus telarius

(a) ***Life cycle:*** Adult male *of T. ludeni* has a narrow body with distinctly pointed abdomen when compared to the female and measures about 345 µ length. The female measures about 440µ in length and is bright red in colour which subsequently changes to carmine with advancement in age. Adult female lays about 75 eggs. The eggs are laid on the lower surface of the leaves and on the webs. Eggs are spherical in shape. The first few eggs are brown in colour and in all the colour of eggs become translucent white. The incubation period is 4-5 days. The newly emerged larva is spherical in outline and creamy white in colour with 2 prominent red spots on the sides of dorsal, propodosomal region. Generally measures 176.5 µ in length. After crawling around for sometime settles for feeding. Initially the larva is greenish-yellow and subsequently turns dark green in colour. The mature larva enters a stage of quiescence by anchoring itself to the leaf surface and assumes a characteristic pose. The larval period occupies about two days. Later, they moult into protonymph, deutonymph and finally to adults. The total time taken for development from egg to adult emergence is about 10 days.

Newly emerged adults *of T. equitorius* are light pinkish in colour and later attains reddish colour with pale-yellowish legs. The adult female measures about 570 µ in length while males average body length is about 370 µ*,* Female lays 45-140 eggs. The eggs are laid on the ventral side of the leaves as well as among webs. The eggs are smooth, spherical and translucent which gradually turn into light brown in colour and measure about 133 µ in diameter. Incubation period is about 5 days. The newly emerged larvae are light amber in colour which changes to light greenish with dark lateral specks after they start feeding and ultimately to dark greenish, when they feed for sometime. The larva measures about *183* µ *in* body length. The grown up larvae enter quiescent stage by attaching itself to the leaf surface. The larval period occupies about 2days. The initial protonymph is amber in colour and

measures about *225* µ in length. This stage lasts for about two days. Before moulting in to eutonymph it passes through quiescent stage. Newly moulted duetonymph is amber colour which soon changes into light green followed by blackish-green. Males are smaller, elongated and each measures about 290 µ in length while the females are broad more or less ovoid and measures about 360 µ in length. The duetonymphal period also occupies about two days. The fully grown duetonympth after a brief period of quiescence, moults into adult. The total duration to complete life cycle is about 10 days.

(b) ***Type of damage and symptoms:*** Mites suck plant sap by penetrating the host plant tissue with sharp stylets inducing white specks at the place of feeding. With increase in the intensity of the feeding, the specks increase in number and thereby gradual increase in size and finally produce large patch. In severe case of infestation, the leaves lose their green healthy colour, sometime appears rusty in colour, gradually dry and fall - off resulting in the reduction in leaf yield.

(c) ***Period of occurrence:*** Through out the year, maximum in summer months.

(d) ***Management:***

(i) Sprinkler irrigation.

(ii) Spraying of Zolone 0.05 per cent and Thiodon 0.05 per cent. Safe period - 9 days.

6. Termites :

Members of the order Isoptera are commonly called as termites, sometimes quite erroneously called "White Ants". They are social insects and some of them are known to cause minor damage to mulberry.

Presence has been reported in India and Malaysia

(a) ***Life Cycle****:* Since several species of termites are associated with mulberry and many of them have not been identified, typical life cycle of termite is described. Wings are present only in the sexually mature males and females. During the warming season wings of these sexually mature members are broken of following a shorter flight. The individuals separate in pairs and a cell is excavated in the soil or wood where repeated matings take place. The eggs are normally deposited singly. Mature queen lays several thousand eggs. Incubation period varies from 24-90 days. Duration of development and number of nymphal instars vary greatly with the cast and usual environmental factors. Workers of colony cause the main damage.

(b) ***Type of damage and symptoms:*** Termite attack is found in all types of soil but more frequent in the sandy and red loamy soil. They feed upon the roots and bark of young and old plants. Attack of termite results in mortality of the plant. Drying plants are observed in the garden.

(c) ***Period of occurrence:*** Usually from October onwards and continues till the onset of monsoon.

(d) ***Management****:*

(i) Location and destruction of termite colonies by removing queen termite.

(ii) Treatment of mounds with phorate at the rate of 50 g per mound or 50 ml of chlordane.

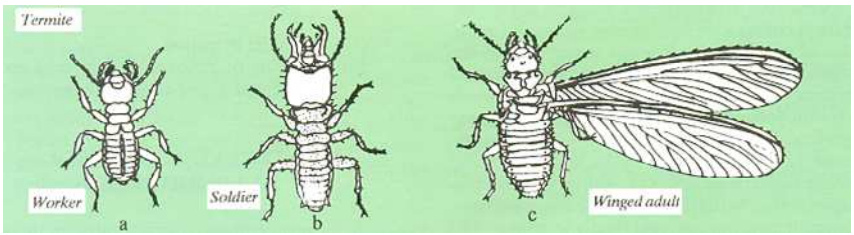
(iii) Swabbing or drenching of established plants at the base with 1 per cent chlordane. Safe period - 25 days.

This order Acarina belongs to class Arachnida. Members of this order are commonly called as mites and are characterized by having four pairs of legs in the adult stage. Some acarids act as pests of mulberry.

Life cycle of termites

White Ants

White Ant infested mulberry bush



Members of this order Coleoptera are commonly called as beetles and weevils. This is the largest order in the animal kingdom and exhibits great diversity of form and habits. Some members of this order act as pests of mulberry.

7. Stem girdler beetle, *Sthenias grisator* (Family: Cerambycidae)

Presence has been reported in India

(a) ***Life Cycle****:* Adult insect is a stout built longicorn beetle with strongly developed mount parts. Female deposits eggs underneath the bark of the girdled branch at night. The incubation period is about 8 days. The grub tunnels into the wilting branches and feeds. Grubs turn into pre-pupa and pupa inside the tunnel. The whole life cycle lasts for 7 to 8 months. .

(b) ***Type of damage and symptoms:*** This beetle has a peculiar habit of ringing the stems, the bark and wood are neatly cut around the main stem or branch leaving a clear girdle. The portion above the girdle gradually wilts and dies. Girdled branches of the plant or wilting plants are observed in the garden.

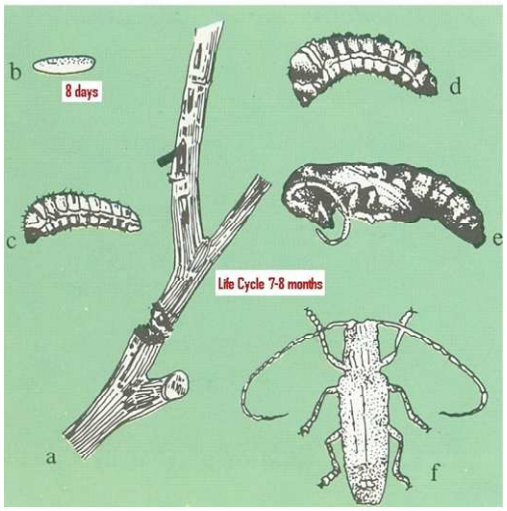
(c) ***Period o f occurrence:*** Throughout the year.

(d) ***Management****:*

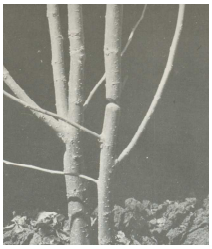
(i) Cutting and burning of the branches and stems showing the symptom of beetle attack.

(ii) Swabbing of the base of main stem or branches with 0.1 percent BHC solution (Safe period - 11 days) or 0.1 per cent malathion emulsion (Safe period -13 days)

Life cycle of Girdler



Stem Girdler
a. Affected stem
b. Egg
c. & d. Grubs
e. Pupa
f. Adult



Girdled branch of mulberry
