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**Annotated List of Some of the Insect Pests of
Host Trees of Lac and their Control**

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Trees on the sap of which, lac insects thrive are called lac hosts and so far 95 species of plants have been recorded as such Roonwal, 1953. Besides the lac insect itself, several other insect species also feed and thrive on these lac hosts. They may feed either on the sap of the hosts like the lac insect or on their various vegetative and floral parts. Thus these insect pests not only cause damage to the lac hosts themselves but also offer direct competition to the lac insect by devitalising the host trees. Some of the pests of the lac hosts have been known to inflict very severe damage in seasons of serious outbreaks, resulting in poor lac yields. Attempts have been made to control a number of these pests in the past. This annotated list records some of the more common and serious pests of the lac hosts found in Bihar, the chief lac-growing state of India: wherever suitable and effective methods of control have been evolved, they are also included in this list so that it will be of use both to cultivators and to research workers engaged on the problem of pest control.

For convenience of reference, insects that feed on, and cause damage, to the host plants in a variety of ways are classified into the following five groups:—

- (1) Biting and chewing insects.
- (2) Piercing-sucking insects.
- (3) Boring insects.
- (4) Leaf-rollers.
- (5) Gall-makers.

(1) *Biting and chewing insects.*

ISOPTERA

Termitidae

Odontotermes obseus Rambur (White ants or termites or *deemak*).

This is the common mound-building species. It attacks practically all parts of a plant and feeds on the bark of the three chief hosts viz. *palas*. (*Butea monosperma* Syn. *B. frondosa*), *ber* (*Zizyphus mauritiana* Syn. *Z. zujuba*), and *Kusum*

Schleichera oleosa Syn. *S. trijuga*). It is least injurious to the last one which is comparatively a hardy tree.

The termites (Fig. 1) become most active after the first showers of rain with the advent of rainy season. They construct covered earth tunnels as far upwards as the infectable thin branches are present (Annual Report 1950-51) and sometimes even on the lac covered branches and attack the bark under cover.

Control

Scrape the earth tunnels from the tree trunks as they are observed and expose the termites to the attack of their predaceous insects. In Ranchi District the most important and common natural enemies of termites are the two species of ants, viz. the black ant *Lobopelta* sp. (*loha cheenta*) and the small red ant, *Solenopsis geminata rufa* Jer. (Negi 1933).

Wherever possible the trunks of trees infected with lac or awaiting infection may be painted upto a height of about 1-2 ft. from the ground with a fairly thin paste made with water of equal parts of 50% Benzene Hexachloride (50% Wettable Gammexane, I.C.I.) and slaked quick-lime or one part of Paris Green or Lead Arsenate and two parts of quick-lime slaked with as little water as possible (Glover 1937). The cost of Benzene Hexachloride (Gammexane) treatment comes to one anna per tree.

Incidence of white ants in concentrated areas can be considerably reduced by periodical fumigation of termitaria. Petrol was found to be the easiest to handle. First the mound is scraped off to the ground level and the diameter of the mound-covered area ascertained. Then holes are drilled 12 inches deep in the levelled mound area at the rate of one hole for every six inches of diameter and one ounce of petrol injected in each hole and the holes closed with thick mud (Beeson 1934).

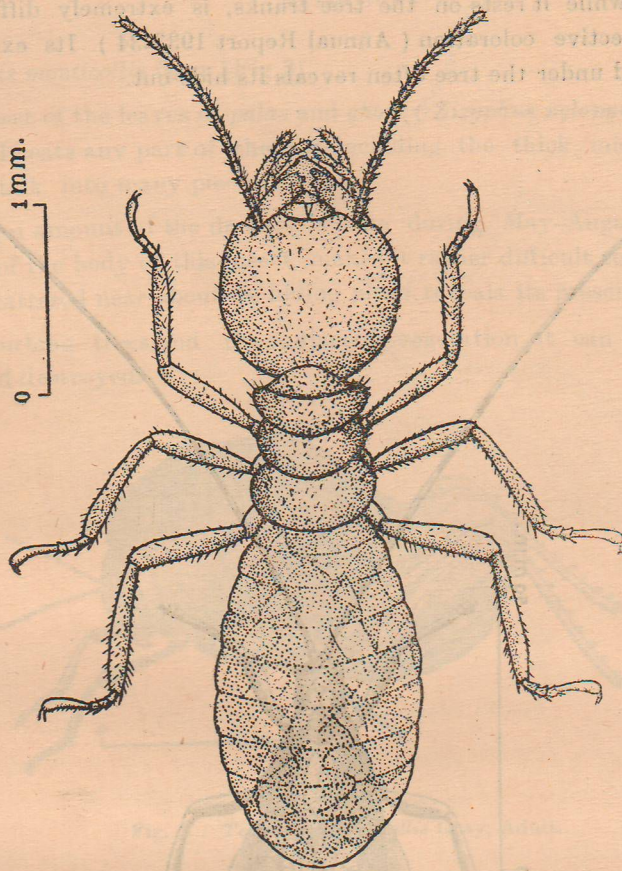


Fig. 1 : *Odontotermes obeseus* Rambur, Adult worker.

ORTHOPTERA

Tettigoniidae

Sathrophyllia rugosa L. (Fig. 2)

It feeds mostly on the young leaves of *palas* and to some extent on leaves of *kusum*. It is a serious pest on *palas* during April - August, and does most of the damage during night.

It causes characteristic injury in the form of holes and large patches in leaflets and nibbles at bark of young shoots or gnaws them as well as the leaf stalks and causes them to fall.

Hand-picking although a satisfactory control, is, however, a tedious process since *S. rugosa* while it rests on the tree trunks, is extremely difficult to locate owing to its protective coloration (Annual Report 1933-34). Its excreta scattered on the leaves and under the tree often reveals its hide-out.

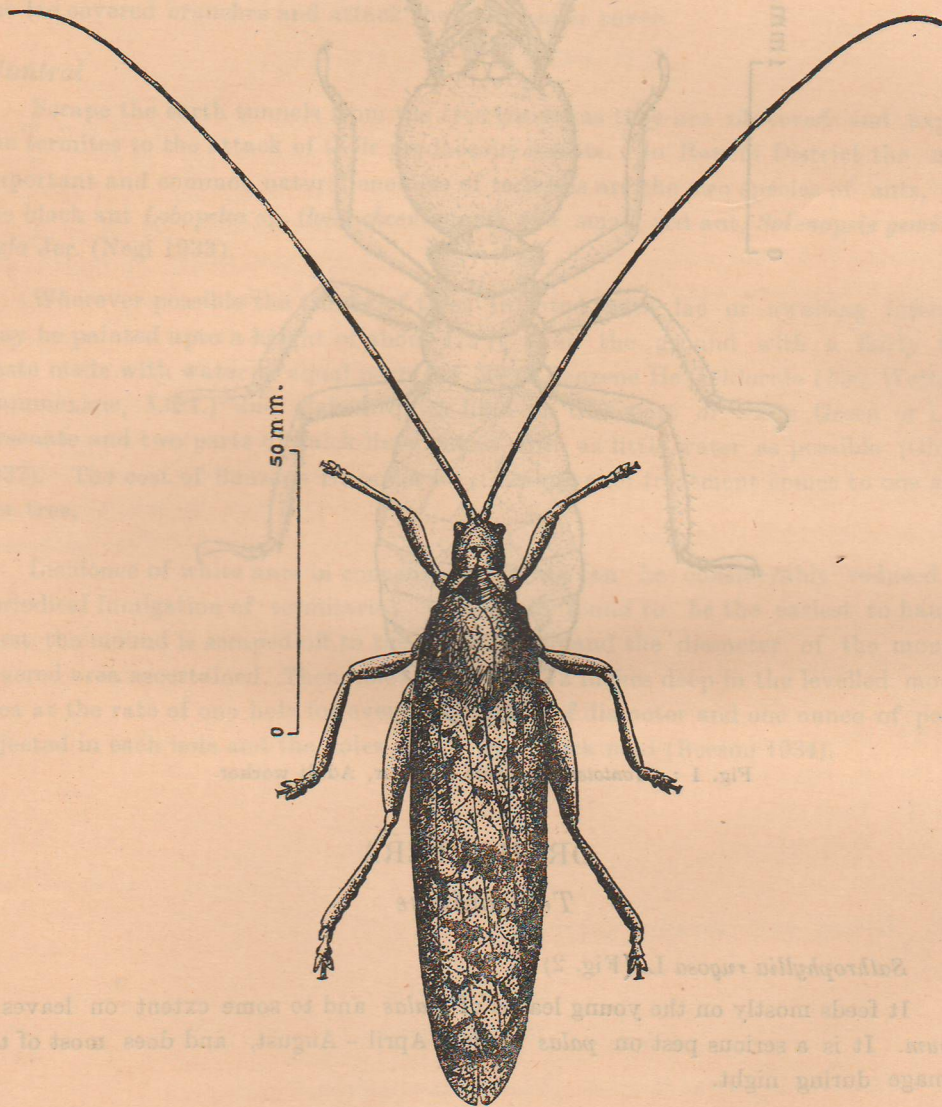


Fig. 2 *Sathrophyllia rugosa* L., Adult.

Acridiidae

Teratodus monticollis Gray (Fig 3)

It is a pest of the leaves of *palas* and *ghont* (*Zizyphus xylopyra*) and sometimes also of *ber*. It eats any part of the leaf including the thick mid-rib of *palas* and cuts its leaf-stalk into many pieces.

Maximum amount of the damage is done during May-August. Dull-green or straw colour of the body of this insect makes it rather difficult to locate. However, the excreta scattered near about its hiding place reveals its presence.

On disturbing trees and the adjacent vegetation it can be collected with hand-nets and destroyed.

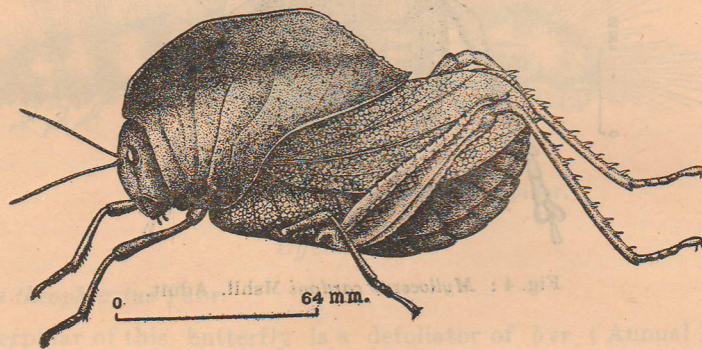


Fig. 3 : *Teratodus monticollis* Gray, Adult.

COLEOPTERA

Circulionidae (Weevils)*Myllocerus cardoni* Mshll (Fig. 4)

This and several other species of weevils are defoliators of a wide range of host plants including *ber*, *ghont*, *kusum* and *palas* during April-November.

They generally start eating a leaf from the periphery in characteristic small semicircles. They do not damage the mid-rib or other thick veins.

They conceal themselves either on the under-surface of the leaves or in their axils, specially of the budding shoots.

When disturbed they feign death and drop to the ground as if dead (Maxwell-Lefroy 1909). They can, therefore, be collected by shaking the branches and collecting them on cloth-sheets spread under the trees and destroyed.

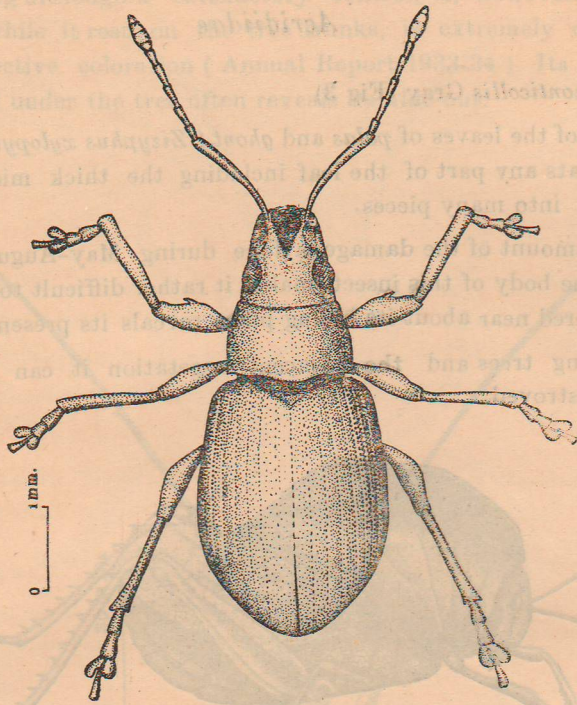


Fig. 4: *Myllocerus cardoni* Mshll. Adult.

LEPIDOPTERA

Noctuidae

Selepa (Plotheia) celtis Moore.

The larva of this moth is at times serious defoliator of *dumber* (*Ficus glomerata*) and *kusum*. There are at least five generations during the year (Annual Report 1931-32).

Lymantridae

Thiacidas postica Wlk.

The hairy caterpillar of this moth is a defoliator of *ber* and *ghoni*. They are found in large numbers in January and October.

Arctiidae

Diacrisia obliqua Wlk.

The caterpillar (Fig. 5) of this moth, popularly called the Bihar Hairy Caterpillar, is found on young *kusum* seedlings probably having its access from certain other low herbage on which it occurs.

Several hundred eggs are laid on *kusum* leaf. The larva hatches in 3-4 days and feeds on the soft portion of the leaf, leaving the mid-rib and primary veins. The caterpillars are numerous during July-October.

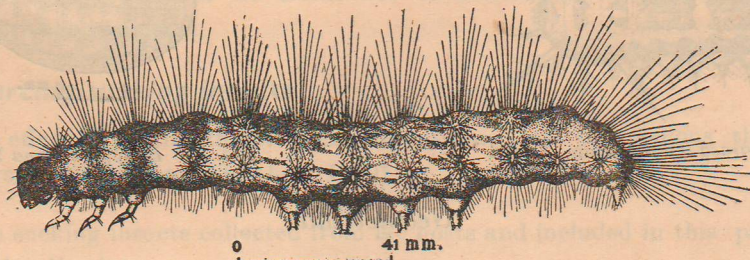


Fig. 5 : *Diacrisia obliqua* Wlk. Caterpillar.

Lycaenidae

Tarucus theophrastus Fabr.

The caterpillar of this butterfly is a defoliator of *ber* (Annual Report 1937-38). It eats the softer tissues of the leaf-blade and leaves the veins.

The larvae were collected in July and adults emerged in October.

Limacodidae

Parasa lepida Cram. *Natada nararia* Moore and *Belippa laleana* Moore.

The caterpillars of this family of moths are defoliators of several lac hosts e.g. *kusum*, *palas*, *sandan* (*Ougeinia dalbergioides*), *jallary* (*Shorea talura*), *sal* (*Shorea robusta*) and *pithor* (*Zizyphus rugosa*) (Annual Report 1931-32).

The limacodid caterpillars are slug-like, with hairy retractile head, legs and sucker-feet. The Caterpillars of the genera *Parasa* (Fig. 6) and *Natada*, called the "Nettle-grubs", possess short but strong hairs on the body and limbs, which when touched produce irritation on the human body. Caterpillars of the genus *Belippa* (Fig. 7), called the "Gelatine-grubs", have a thick smooth semi-transparent mass of skin without visible segmentation. Pupation takes place in a very hard round or oval cocoon having a distinct lid for the emergence of the imago.

Control-Spraying the larvae with 4% phenyl or picking them with gloved hands and killing them by dropping in 4% phenyl were found to be effective. Cost of hand-picking comes to Rs. 3/10/- per 1000 trees.

Recently it was found possible to control *Parasa lepida* Cram on mango trees and Citrus plants with B.H.C. and D.D.T. sprays. The former was, however, found to be more effective than the latter (Ananthan arayanan & Abraham, 1955).

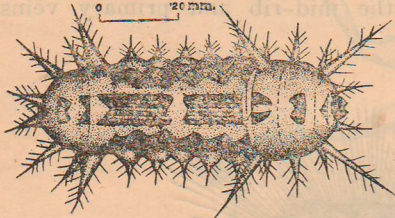


Fig. 6 : *Parasa lepida* Cram , Larva.

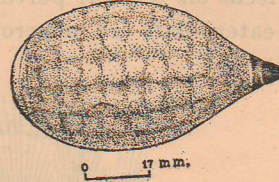


Fig. 7 : *Belippa laleana* Moore, Larva.

Geometridae

Semiothisa fidoniata Guenele.

The larva of this Geometrid is a defoliator of the *Khair* plant (*Acacia catechu*). Larvae collected during November-December emerged as adults towards the end of December.

Spraying with Nicotine-soap solution is an effective method of control, though expensive (Annual Report 1931-32).

A cheaper method is to shake the trees vigorously, when the Geometrid larvae hang down by long silken threads. A long stick is then swept through the threads and the collected larvae can be killed by dipping in 10% phenyl. As the pupation takes place in soil a further precaution should be taken. The soil round the trees should be dug and turned over to bring the pupae to the surface so that they may either be killed by exposure to sun or destroyed by its enemies (Annual Report 1932-33).

In general pests of host trees belonging to the biting and chewing group may be kept in check to a large extent either by use of stomach or contact poisons (Metcalf and Flint 1939).

(i) Stomach poison spray :—

| | | |
|---------------|-----|-----------|
| Lead Arsenate | ... | 1 oz. |
| Water | ... | 1 gallon. |

(ii) Contact poison spray :—

| | | |
|----------------|-----|------------|
| Tobacco leaves | ... | 2 lbs. |
| Soft soap | ... | 2 ozs. |
| Water | ... | 8 gallons. |

Water should be heated in drums and tobacco leaves and soap added. The mixture should be allowed to boil for half an hour, water being added to compensate for loss by steam and evaporation. The solution may then be allowed to cool, decanted and used as required (Annual Report 1931-32).

Care should however be taken not to allow these insecticides to come into contact with the lac insect.

(2) Piercing-sucking insects

The effect of sucking insects upon trees is much less conspicuous than that of defoliators or other groups (Graham 1929).

The sucking insects collected from lac hosts and included in this paper belong to the order *Hemiptera*.

HEMIPTERA*Pentatomidae**Tessaratoma javanica* Thunb.

This attractively multicoloured pentatomid is a sporadic pest of *kusum* during June-August. The adult as well as nymphs suck the sap from the young-shoots and developing buds and cause "die-back".

When disturbed or handled it ejects a liquid from the stink glands which irritates the eye if received in it.

Hand-picking and killing in 2% Formalin or Kerosene oil in water was found to be a good control (Mehra and Kapur 1955). Cost of hand-picking comes to approximately Rs. 2/13/- per 1000 medium sized trees of *kusum*.

*Coccidae**Aonidiello (Aspediotus) orientalis* Newst.

It is a serious scale insect pest of *ber*, *kusum* and to a less extent of *ghont* (*Zizyphus xylopyra*) and *palas*. A serious attack retards the growth of the trees. Young *ber* trees at any rate may be killed if attack is severe (Glover 1933).

There are three main periods of infestation viz. February-March, May-June and October-November.

Lecanium longulum Doug.

The host plants affected by this coccid are *arhar* (*Cajanus cajan*), *kastura* or *kadam kapur* (*Acacia farnesiana*), *khair*, *ber*, and *Flemingia congesta* (Annual Report 1932-33).

Cercopidae

Machaerota planitia Dist.

This Cercopid is primarily a pest of *ber* and to a less extent of *ghont*. Its nymphs form small calcareous tubes on the branches and cause "die-back" by sucking the sap from the terminal shoots.

It can be controlled by pruning and burning the infested tips of shoots (Annual Report 1933-34).

Coccids in general can be controlled by the following contact insecticides:—

(i) Paraffin distillate—Completely refined low boiling paraffin distillate (closely allied to kerosene) gave a very good result. Mortality from this was 91% ten days after spraying and 100% at the end of three weeks. The trees were unharmed.

(ii) Nicotine-soap solution—Preparation of this insecticide has been described under Biting and Chewing insects.

(iii) Kerosene-soap emulsion (O' Kane 1924):—

| | | |
|--------------|---|-------------------|
| Kerosene oil | — | 2 gallons |
| Soft soap | — | $\frac{1}{2}$ lb. |
| Water | — | 1 gallon |

Water is boiled and soap dissolved in it. Kerosene is added to the mixture while still boiling hot and stirred until a thick creamy fluid results. Stirring is the key to success. Oil will separate if not stirred properly. Stock solution may be kept in sealed drums.

For use one part of stock solution is mixed with three parts of water. This concentration does not scorch the leaves. Different dilutions may, however, be made for different foliage as the susceptibility of foliage to scorch varies considerably. Spraying should preferably be done in the evening or on cloudy days and not in full heat of the sun as this tends to scorch.

All these sprays are fatal to lac insects and should not be used on lac-infected trees.

(3) **Boring insects**

LEPIDOPTERA

*Indarbelidae**Indarbela tetraonis* Moore

The caterpillar (Fig. 8) of this moth is a borer of the stem of *kusum*, *ber*, and *Albizia lucida*. Its presence may be detected by the peculiar masses of excrement and silk-webbing with which the larva covers the bark on which it feeds. The adults emerge during May-July.

Injection of the following poison, which is not harmful to the trees themselves, into the borer-holes is often very effective :—

| | | | |
|------------------------------|-----|-----|------------|
| Paradichlorobenzene | ... | ... | 6 fl. ozs. |
| Petroleum or Burma Shell Co. | | | |
| Furnace oil | ... | ... | 4 gallons. |

The above quantity is sufficient for about 2000 trees with a dose of 8 cc. (Glover 1937). The insecticide is injected into the tunnel and it is closed with clay.



Fig. 8 : *Indarbella tetraonis* Moore Larva.

(4) **Leaf-rollers**

LEPIDOPTERA

*Schreckensteineidae**Hieromantis ioxysta* Meyr.

The larva of this small moth rolls the leaf-edges of tender leaves of *kusum* or shelter and feed on the entire leaf-tissue. The larvae are found from April-October but are numerous during rains. It forms a transparent cocoon within an open meshwork of silk threads on the surface of the leaf.

Lead Arsenate and Nicotine-soap solution spray are effective insecticides (Glover 1937), though the former is a costly one. Being harmful to the lac insect they should not be sprayed on trees bearing lac.

(5) **Gall-makers****COLEOPTERA***Curculionidae**Pachyonix quadridens* Chev.

This weevil causes galls on *palas* leaf-petioles (Annual Report 1941-42). An elongate central chamber contains one larva.

The infected leaf-petioles should be cut from the trees and burnt.

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Summary

The host trees of the lac insect are also attacked by a number of other insects. These pests either damage different organs of the host trees or share with the lac insect their sap on which the lac insect thrives, and thus tend to lower the vitality of the trees.

The pests described in this paper are classed in five groups viz. biting and chewing insects, piercing-sucking insects, boring insects, leaf-rollers and gall-makers. Chemical and mechanical control methods for each group and where necessary for each pest are described. Chemical control methods include the use of stomach poisons, contact insecticides and fumigants. Mechanical control methods include hand-picking, pruning and burning of infected shoots.

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