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A Study on Eco biology and Economic Importance of Lac Insect

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ABSTRACT

Lac is a valuable natural resource that has been utilized by human civilization for centuries. It is a resinous secretion produced by several species of lac insects, primarily Kerria lacca and Laccifer lacca, which are cultivated extensively in parts of Asia, notably India and Bangladesh, as well as Myanmar, Thailand, and China. Lac culture is the most efficient system because it gives jobs to the farmers, it gives pesticides and fertilizers and require less amount of water and resin produced by lac is economically useful. It is used in medicine, ayurvedic and in many fields. They do not harm the environment and other plants. It has much demand in many countries.

KEYWORDS: Kerria lacca, Laccifer lacca, Hosanagara.

I. INTRODUCTION

Lac cultivation is an important source of livelihood for rural communities, as the lac insects and their products have a wide range of commercial applications. The lac resin, known as shellac, seedlac, or button lac, finds use in diverse industries such as paints, inks, pharmaceuticals, cosmetics, electrical equipment, automobiles, defence, railways, marine applications, surface coatings, confectionery, and textile dyeing.

Beyond its economic value, lac cultivation is also environmentally sustainable, as it does not require significant inputs of water, pesticides, or fertilizers for the host plants to thrive. The lac insects are considered eco-friendly and play a role in maintaining the ecological balance.

The versatility and environmental benefits of lac make it a valuable natural resource that has contributed significantly to human welfare throughout history. The continued cultivation and utilization of lac reflect the importance of understanding and harnessing the potential of natural products provided by various living organisms, including insects, for the betterment of society

MATERIALS AND METHODS

SYSTEMATIC POSITION OF *LACCIFER LACCA*

A number of species of lac insects are known, of this *Laccifer lacca* is by far the most important and produces the bulk of the lac for commerce. It belongs to:

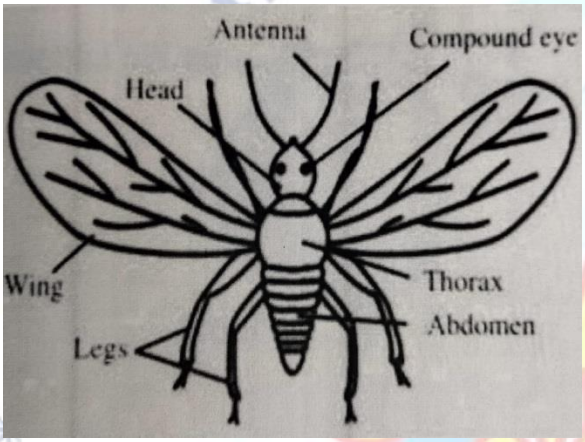
Phylum – Arthropoda
Class – Insecta
Order – Hemiptera
Super family – Coccoidea
Family – Lacciferidae
Genus – *Laccifer*
Species – l*acca*

UNDERSTANDING THE MORPHOLOGY AND LIFE CYCLE

The lac insects show sexual dimorphism. The male and female insect varies in shape, size, and also in presence and absence of body parts.

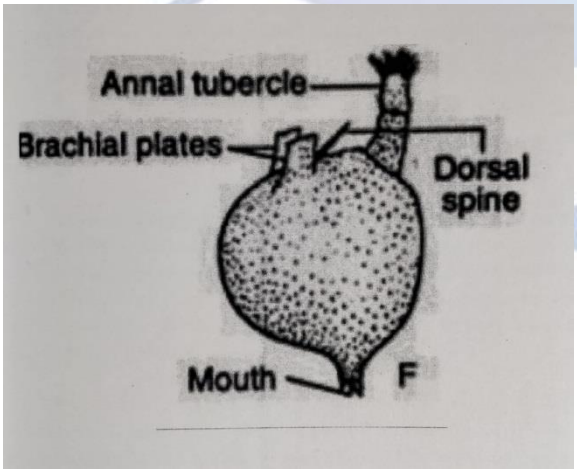
Structure of Male Lac Insect

It is larger in size and red in colour. The body is typically divided into head, thorax and abdomen. The head bears a pair of antennae and a pair of eyes. Mouth parts are absent so a male adult insect is unable to feed. Thorax bears three pairs of legs. Wings may or may not be found. Abdomen is the largest part of the body bearing a pair of cauda] setae and sheath containing penis at the posterior end.



Structure of Female Lac Insect

It is smaller in size. Head bears a pair of antennae and a single proboscis. Eyes are absent. Thorax is devoid of wings and legs. The loss of eyes, wings and legs are due to the fact that the female larvae after settling down once never move again and thus these parts become useless and ultimately atrophy. Abdomen bears a pair of caudal setae. It is female lac insect which secrets the bulk of lac commerce.



Fertilization

After attaining the maturity, males emerge out from their cells and walk over the lac incrustations. The male enters the female cell through anal tubular opening and inside female cell it fertilizes the female.

After copulation, the male dies. One male is capable of fertilizing several females. Females develop very rapidly after fertilization. They take more sap from plants and exude more resin and wax.

Life Cycle of Lac Insect

The female lac insects are capable of producing eggs, but the post-fertilization development of the eggs begins while they are still inside the female's ovary. These developing eggs are then deposited into the incubating chambers, where they hatch into larvae.

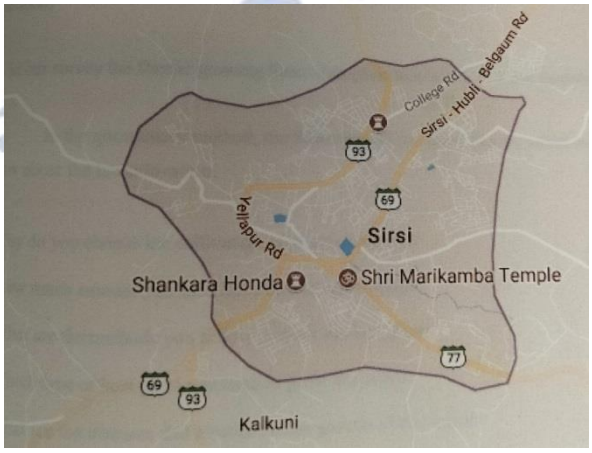
The larvae are small, boat-shaped, and red in colour, measuring just over half a millimetre in length. They have a head with antennae, simple eyes, and a proboscis, three pairs of thoracic walking legs, and a pair of caudal setae on the abdomen. The larvae wander to find a suitable location to settle and start secreting a resinous substance around their bodies, forming the lac cell.

Once fully enclosed in the lac cell, the larvae melt and begin feeding actively. The male and female lac cells differ in shape, with the male cells being elongated and cigar-shaped, and the female cells being oval-shaped. The female cell has a pair of small branchial pores and a single round anal tubular opening, through which waxy white filaments protrude, indicating a healthy condition.

The second-stage larvae undergo a brief pseudo pupation period, after which the male emerges from its cell, moves onto the lac incrustation, and enters the female cell for fertilization, completing the life cycle.

STUDY AREA

The place chosen for study is called Sirsa. Sirsi is about 109 km distance from Shivamogga. In Sirsi, the main study area is called Kathur.



We used a questionnaire method to know about lac cultivation and also observed the host plant on which the insects grow and produce the resin lac. The observation was made during the month of August to study the insect Laccifer lacca near Sirsi at Kathur (Bailmat).

In our survey, the farmer was growing the Semi alata plant as a host for the lac insects.

In the questionnaire method, the following are the questions we asked the farmer to know about the lac cultivation:

1. Why do you choose lac cultivation as your occupation?
2. How much do you earn from this lac cultivation?
3. What are the methods you follow to grow the host plant?
4. Which type of host plant do you use to grow the insect?
5. What are the diseases that affect the growth of this insect?
6. How much resin is secreted by the insect for one host plant?
7. What are the commercial uses of lac?
8. What are the pests and predators that attack lac insects?

RESULT AND DISCUSSION

The insect lives as a parasite feeding on the sap of certain trees and shrubs. The important trees on which the lac insects breed and thrive well are,

1. Kusum (Schleichera trijuga)
2. Palas (Zizyphus jujuba)
3. Babul (Acacia arabica)
4. Khair (Acacia catechu)
5. Arhar (Calamus indicus)

In our survey in Bailmat near Kathur the farmer growing semi-alata plant as a host plant and they grow many other plants as an experimental host for the insect's cultivation.

LAC CULTIVATION

Lac culture involves two important steps: (i)Inoculation and (ii) cropping. Inoculation can be carried out through artificial infection of tender branches by brood lac sticks obtained from mature lac trees immediately after harvesting. In this process, the brood lac sticks are tied in bundles of 2 or 3sticks on the branches of the host tree allowing maximum contact with the branches.

When young shoots come up on branches the brood sticks are tied adjacent to the growing tender branches in a way so that maximum contact between shoots takes place within a week or two the larvae emerge and settle down on tender shoots.

INOCULATION: - The method by which the lac insects are introduced to the new lac host plant is known as "inoculation". This may be of two types, namely "Natural infection" and "Artificial infection". When infection from one plant to other occurs by natural moments of insects, it is called natural infection. This may be due to overcrowding of insect's population and non-availability of tender shoots on a particular tree.

Artificial infection takes place through the agencies other than those of nature. Prior to about two weeks of hatching, lac bearing sticks are cut to the size of six inches. They are called " Brood lac ". Brood lacs are then kept for about two weeks in some cool place.

When the larvae start emerging from this brood lac, they are supposed to be ready for inoculation. Strings can be used for tying the brood lac with the host plant may be of different types.

In longitudinal infection the brood lac is tied in close contact with host branches. In lateral infection the brood lac is tied across the gaps between two branches. In interlaced method, brood lac is tied among the branches of several new shoots.

LAC SECRETION: - Lac is a resinous substance secreted by certain glands present in the abdomen of the lac insects. The secretion of lac begins immediately after the larval settlement on the new and tender shoots. This secretion appears first as a shiny layer which soon gets hardened after coming in contact with air.

This makes a coating around the insect and that twig on which it is residing. As the secretion continues the coating around one insect meet and fuses completely with the coating of another insect. In this way a continuous or semicontinuous incrustation of lac is formed on the tender shoots.

PROCESSING OF LAC: - Lac incrustations are removed from the twigs of host plants by scraping. The raw lac thus obtained is known as scraped lac or stick lac. Stick lac is crushed into small grains, sieved, washed with mild alkaline water and dried. This semi-refined product called seed lac or grain lac or chowrie, which is further refined by a system of hot melting, Filtration and stretching into thin sheets which are subsequently broken into brittle flakes called shellac.

Alternatively, the purified lac resin can be in the form of circular discs called button lac. If a solvent process is used to purify the raw lac, de-waxed, decolorized lac can be obtained as the end product.

The normally amber coloured resin can also be bleached lac, which is white in colour. Bleached lac has specialized demand for coating medicinal tablets, confectioneries etc.,

India is the principal lac producing country of the world. Producing approximately 18,000 metric tons of raw lac annually. About 85% of the country's production is exported to various countries. The USA, Germany and Egypt are some of the major lacs importing countries of the world.

LAC ENEMIES AND CONTROL

A Lac enemy imposes a challenge to the lac culturist, as they not only decrease the population of lac insects, but also retard the production and quality of lac. The common enemies of lac insects are known as " Chalcid ". They are small, winged insects which lay their eggs inside the lab coat either on the body of lac insect or inside the body. The larva which hatches from these eggs feed upon the lac insects, thereby causing mortality of their host. Damage done by this parasite constitutes about 5-10% of the total destruction of lac crop.

Damage done by the predators is of greater intensity (35% of the total destruction). The major predators of lac insects are the white moth and the blackish gray moth. They not only feed on lac insects but also destroy the lac produced by them. Squirrels, monkey, rat, bat, birds (wood peckers), man etc. are the enemies other than insects which destructs the lac crop in different ways. Damage is also done by climatic factors such as excess heat, excess cold, heavy rain and storm and partly by the faulty cultivation method.

Control Methods

Damage caused by the above-mentioned animals can be reduced to certain extent by the use of the following methods.

1. Artificial method: -

During the crop reaping, it is not always possible for the manufacturers to convert the large amount of stick lac to seed lac at a time. To avoid the spreading of enemies at this time from stocked stick lac, simple artificial method can be used. Bundles of stick lac should be tied with stones and immersed in fenced water (river or ponds) for about a week. This kills all the parasitic and predator insects as they cannot survive in water.

2. Biological method: -

It is an indirect method for killing the parasitic and predator insects. For this purpose, hyper-parasitic insects are used which attacks the parasitic insects of lack and kill them. These hyper-parasitic insects are however, not harmful for lac crop.

ECONOMIC IMPORTANCE OF LAC

1. Lac is used in making toys, bracelets, sealing wax, gramophone records, bangles etc...
2. It is by the jewellers and goldsmiths as a filling material in the hollows of gold and silver ornaments.
3. It in form of shellac is used as a furniture finish.
4. Waste materials produced during the process of stick lac are used for drying purpose.
5. Nail polish is a good example of the byproduct of lac.
6. The fluid lac dye obtained by dissolving crushed stick lac in water is called Alata. This dye is applied by Indian Hindu women on hands and sole of feet.
7. From the stick-lac (twigs encrusted with lac), shellac is obtained after purification.
8. Shellac is used as coating for medicines.

Medicinal properties

1. Lac is used in Ayurveda, Siddha and Unani medicine system for treatment of variety of diseases due to its following medicinal properties.
2. Anti-obesity, anti-inflammatory, anti- bilious.
3. Deobstruent (removing obstructions; power to clear or open the natural ducts of the fluids and secretions of the body).
4. Liver tonic, emmenagogue.
5. Lipid lowering.
6. Antifertility / contraceptive.
7. Aphrodisiac.

Medicinal uses of Lac

1. It is used for reducing weight.
2. It reduces heart rate.
3. It is used for strengthening the bones.
4. It is used to cure pain in bone.
5. In case of the vomiting of blood, finely powdered shellac mixed with honey is given.
6. In dentistry, it is use to make dentures and

other dental products.

7.It is used for coating the medicines.

CONCLUSION

Lac culture is the most efficient system because it gives jobs to the farmers, it gives pesticides and fertilizers and require less amount of water and resin produced by lac is economically useful. It is used in medicine, ayurvedic and in many fields. They do not harm the environment and other plants. It has much demand in many countries.

REFERENCES

[1] Pradip V Jabde – A Textbook of Applied Zoology – 1993

[2] Dr Sailesh Chatthopadhyay – introduction to Lac and Lac Culture – 2011.

[3] Rana Vikram Singh – Lac, the wonder of Nature

Online materials on Lac Insect