WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 7, Issue 10, 206-218. Review Article ISSN 2277–7105

A REVIEW ON *LACCIFER LACCA*

Reshma B. V.[1], Nithin Manohar R.* and Anaha V. I.

[1]Dept. of Pharmacology, Sree Krishna College of Pharmacy and Research Centre, Parassala.

Article Received on
27 March 2018,
Revised on 16 April 2018,
Accepted on 07 May 2018
DOI: 10.20959/wjpr201810-12282

***Corresponding Author**
Nithin Manohar R.
Dept. of Pharmacology, Sree Krishna College of Pharmacy and Research Centre, Parassala.

ABSTRACT

Lac is the scarlet resinous secretion of a number of species of lac insects, of which the most commonly cultivated species is Kerria lac.Lac (also called Laksha) is a slick serum and secretion from a scale insect species *Laccifer lacca*. These insects suck the sap of several plants and bushes and secrete lac as a protective covering. *Laccifer lacca* looks like tiny spots on plants. Lac/Lakh or Laksha is a resin and wax mixture secretion from the scale insects as a hard protective covering. It is a natural commercial resin of animal origin. It has a reddish or dark-brown colour with a disagreeable smell. *Laccifer lacca* is used in the conditions of injuries, fungal infections, eczema, scabies and herpes. Internal uses include treatment of diarrhea, dysentery, intestinal parasites (worms), internal bleeding disorders, hiccup and cough. In Unani, Lac is considered tonic for liver, stomach and intestine. It is a haemostatic. Shellac is a form of purified Lac and thin yellow and orange flakes. The purification process of Lac involves heating and filtering. Sometimes, it is also bleached to get white Shellac. In Ayurveda, Siddha and Unani system of medicine Lac is used for treatment of variety of diseases. Lac is used in various industrial purposes, used as a dye in textile industry.

KEYWORDS: *Laccifer lacca*, Lac insect, Resin secretion, Synthetic dye, Bleeding disorders.

INTRODUCTION

Lac is the scarlet resinous secretion of a number of species of lac insects, of which the most commonly cultivated species is Kerria lacca. Cultivation begins when a farmer gets a stick (broodlac) that contains eggs ready to hatch and ties it to the tree to be infested.[1] Thousands of lac insects colonize the branches of the host trees and secrete the resinous pigment. The coated branches of the host trees are cut and harvested as sticklac.The harvested sticklac is

crushed and sieved to remove impurities. The sieved material is then repeatedly washed to remove insect parts and other soluble material. The resulting product is known as seedlac. The prefix seed refers to its pellet shape. Seedlac which still contains 3–5% impurities is processed into shellac by heat treatment or solvent extraction.

Lac (also called Laksha) is a slick serum and secretion from a scale insect species *Laccifer lacca*. These insects suck the sap of several plants and bushes and secrete Lac as a protective covering. *Laccifer lacca* looks like tiny spots on plants having no limbs and covering with slick serum. Sometimes, these insects are difficult to recognize and we can only see resin excreted by them. Lac scales are main cash crops and are cultured in Burma, India and Thailand. Lac is collected from the plants. Before using it for several purposes, it has to undergo heating and filtering processes for purification.[2]

Lac used in ayurvedic medicine and Unani Medicine is a pure form of Lac collected from the plants and no other ingredient is mixed with it. To remove its impurities and dust particles, it undergoes some natural purification processes, which includes washing it with hot water, heating and filtering it. It is also processed with herbs, herbal juices and mixed with herbal powder or extract for before using it therapeutically. Lac/Lakh or Laksha is resin and wax mixture secretion from a scale insect as a hard protective covering. It is a natural commercial resin of animal origin. It has a reddish or dark-brown colour with a disagreeable smell.

CATEGORY

Phylam — Arthropoda

Class — Insecta

Order — Hemiptera

Super-family — Coccidae

Family — Lacciferidae

Genus — Laccifer

Species — Lacca

MAJOR CONSTITUENTS

The major constituent spresent in lac is the resin (70-80%);sugars, proteins, and soluble salts – 2-4;colouring matter – 1-2;wax – 4 –6;sand, woody matter, insect bodies and other extraneous matter– 8-12;a volatile oil is present in traces. Lac contains a water soluble red dye.[8]

COMPOSITION OF LAC

Lac is a mixture of several substances, of which resin is the main constituent. The approximate percentage of different constituents of lac is given below.

Resin – 68 to 90%

Dye – 2 to 10%

Wax – 5 to 6%

Mineral matter – 3 to 7%

Albuminous matter – 5 to 10%

Water – 2 to 3%

USES OF *Laccifer lacca*

The use of lac dye goes back to ancient times. It was used in ancient India and neighbouring areas as wood finish, skin cosmetic and dye for wool and silk. In China it is a traditional dye for leather goods. Lac for dye has been somewhat replaced by the emergence of synthetic dyes,[3] though it remains in use, and some juices, carbonated drinks, wine, jam, sauce, and candy are coloured using it. Lac is used in folk medicine as a hepatoprotective and anti-obesity drug. It is used in violin and other varnish and is soluble in alcohol. This type of lac was used in the finishing of 18th-century fowling guns in the United States.

Laccifer lacca has following healing properties.

- Astringent
- Anthelmintic
- Coagulation modifier

- Anti-hiccup
- Antipruritics
- Anti-arthritic
- Anti-inflammatory
- Antiulcerogenic

Therapeutic Indications

Laccifer lacca is applied over the skin in skin diseases. It stops bleeding in wounds and injuries, heals skin ulcers, speeds up recovery process of ulcer, wounds and other skin diseases.

External uses

Injuries, Fungalinfections, Eczema, Scabies, Herpes.

Internal uses

Internal uses include treatment of diarrhea, dysentery, intestinal parasites (worms), internal bleeding disorders, hiccup and cough In unani, lac is considered tonic for liver, stomach and intestine. It is homeostasis (causes bleeding to stop), resolvent of obstructions, jaundice, dropsy, kidney, and to reduces fat. Lac is used in Unani medicine system to make medicine 'Safoofe muhazzil' an anti-obesity drug.

Purified Lac is used in Ayurvedic medicines and Unani medicine. The methods of purifications are different in these sciences. Lac can also be processed with some medicinal herbs and herbal juices to make it effective in desired health conditions. However, it comes from animal origin, but it has a great significance in management of joint disorders, osteoporosis, osteomalacia, osteoarthritis etc. It is also helpful in obesity, renal and spleen disorders, jaundice, backache problems, leprosy, ulceration, epilepsy and chicken pox. It is an amazing liver tonic, when taken with other liver stimulant herbs.

LOW BONE MINERAL DENSITY

Lac has some amazing benefits in making of bone support capsules. SHUDH LAKSHA means a natural supplement as per Ayurveda. It makes bone stronger and helps in re-gaining natural bone mineral density. Generally, it is used with guggul in several ayurvedic joint supplements. Lakshadi guggul is a common ayurvedic medicine, which contains Lac as a

main ingredient. It is used for joint disorders and in diseases that occur due to loss of bone mineral density such as osteoporosis and osteomalacia.

BLEEDING DISORDERS

Chinese practitioners also use lac for relief to gum bleeding, menstrual bleeding, and fainting after birth.

OBESITY

Lac is used as an anti-obesity drug and is used in most of the skin cosmetic products.

USES IN MEDICINAL AND COSMETIC INDUSTRY

Lac has been used in many pharmaceutical industries for long now and mainly is involved in tablet formulation, binding ability, matrix formulation, humidity tolerance but lac cannot be stored for long due to which this has be termed as a dislike to many preparations. And in some juices, carbonated drinks, wine jam, sauce, and candy are colored using Lac.[11]

Dentist has been using lac in many forms and in various ways since long time. Most of them use lac as a binding texture for dentures. In addition, lac is used in dental schools for preparation of moldings and artificial calculus. And it posses antifertility activity.[13]

Lac and Shellac has been used in most of the cosmetic products and is mainly used as component in hair sprays, lipsticks, chewing gums and many candies and other cosmetic products.

Purified Lac, which is also called as shellac, is used in coating properties and is considered as natural glue.

MEDICINAL USES OF LAC

For medicinal purpose the purified stick lac is used. This is known as Shellac.[12]

- It is used for reducing weight.
- It reduces heart rate.
- It is used for strengthening the bones.
- It is used to cure pain in bones.
- In case of the vomiting of blood, finely powdered Shell lac mixed with honey is given.
- In dentistry, it is used to make dentures and other dental products.
- It is used for coating the medicines.

Lac has been used for the welfare of human beings from the great olden days No doubt the development of many synthetic products have made its importance to a little lesser degree, but still it can be included in the list of necessary articles. Lac is used in making toys, bracelets, sealing wax, gramophone records etc. It is also used in making grinding stones, for filling ornaments, for manufacturing of varnishes and paints, for silvering the back of mirror, for encasing cable wires etc., Waste materials produced during the process of stick lac is used for dying purpose. Nail polish is a good example of the by-product of lac.

TRADITION AND HISTORY OF LAC

The word lac is derived from the Sanskrit word lākshā, which represents the number 100,000. It was used for both the lac insect (because of their enormous number) and the scarlet resinous secretion it produces. Lac has been used in India from time immemorial for several purposes, from the epic of Mahabharat it has been recorded that Kauravas built a palace of lac for the destruction of Pandavas. We come across references of lac in the Atharvaveda and Mahabharata, so it can be presumed that ancient Hindus were quite familiar with lac and its uses. Scientific study of lac started much later. In 1709 Father Tachard discovered the insect that produced lac. First of all Kerr (1782) gave the name Coccus lacca which was also agreed by Ratzeburi (1833) and Carter (1861). Later Green (1922) and Chatterjee (1915) called the ac- insect as Tachardia lacca (kerr). Finally, the name was given as *Laccifer lacca*.

This resin has been used for making traditional and tribal bangles,[2] and still used as sealing wax by the India Post.[3] It is also used as wood finish, skin cosmetic and dye for wool and silk in ancient India and neighboring areas.[4][5] Lac resin was once imported in sizeable quantity into Europe from India along with Eastern woods.[6][7] Lac has been used in India from thousand years. The detailed habit and behavior of Lac insect is given in Atharva Ved. In Mahabharata, Kauravas built a palace of Laksha, the Laksha Griha (Laksha=Lac; Griha=Home) as a conspiracy to kill Pandavas. Lac has diverse uses. It is used for making dyes, filling the hollow gold and silver ornaments, making of bangles etc. The fluid lac dye obtained by dissolving the crushed stick-lac in water is called Alakta or Alta. This dye is applied by Indian Hindu women on hands and sole of feet.

On the other hand human beings never seem to tire of discovering the mysteries of nature. But the animals seem to be greater experimenters as some of them have astounded most human beings by their complex, strange and at times bizarre performance. One of such performer known to man from good old days is the tiny insect that has given a very valuable

product in the form of lac, to the civilization of man. Lac is a natural resin of animal origin. It is secreted by an insect, known as lac-insect In order to obtain lac, these insects are cultured and the technique is called lac-culture. It involves proper care of host plants, regular pruning of host plants, propagation, collection and processing of lac.

SYNONYMS

SANSKRIT: Laksha

HINDI: Lakh

ENGLISH: Shellac

BENGALI: Gala

GUAJARATI: Lak

TELUGU: Kommolakka, lakka

TAMIL: Komburrki

MALAYALAM: Arakku, Ambalu

ARABIC: Luk

SPECIES

Kerria lacca - the true lac scale

Paratachardina decorella - the rosette lac scale

Paratachardina pseudolobata - the lobate lac scale

Carmine (E120) - Another pigment extracted from an insect.

Lacquer - A product that was at one time made from lac, but in modern common usage now refers to a separate product with similar properties.

Shellac - A protective coating.

SHELLAC

Shellac is a form of purified Lac and thin yellow and orange flakes. The purification process of Lac involves heating and filtering. Sometimes, it is also bleached to get white Shellac In Ayurveda, Siddha and Unani system of medicine Lac is used for treatment of variety of diseases. In Ayurveda, Lac is considered astringent (Ras/taste), cool (Veerya/potency), and Pungent (Vipaka/post-digetsive effect). It balances pitta-kapha dosh and promotes strength. The purified Lac is used in Ayurveda for treatment of hiccups, cough, coughing up blood or blood stained mucus and dhatu-gat fever.Lakshadi guggul /Laksha Guggul, contains Lac along with guggul, hathjod, arjuna, ashwagandha and Nagbala. This medicine is indicated in fracture of bone, improper bone alignment and ostealgia/Pain in a bone. Another important formulation is Chandan Bala Laxadi Tail. This medicated oil is used in treatment of chronic fever, remittent fevers, lumbago, myalgia, epilepsy and hysteria. Also Read Vatha Kesari Thailam.

HOST TREES

There are several hosttreesare availabe for the growth of lac insects. *Laccifer lacca* can be cultivated on either cultivated or wild host trees. 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.

In India the most common host trees are.

- Dhak (Butea monosperma)
- Ber (Ziziphus mauritiana)
- Kusum (Schleichera oleosa) (reported to give the best quality and yield).[8]

Estimated yields per tree in India are 6–10 kg for kusum, 1.5–6 kg for ber, and 1–4 kg for dhak.[9] The bugs' life cycles can produce two sticklac yields per year, though it may be better to rest for six months to let the host tree recover.[10]

PRODUCTION LEVELS

India exported significant amounts of sticklac derivatives, especially lac dye, from the 1700s to the late 1800s. Production declined as synthetic dyes emerged, and after the late 1940s, production of seedlac and shellac also declined due to replacement.[9] In the mid-1950s, India annually produced about 50,000 tons of sticklac and exported about 29,000 tons of lac; by the late 1980s the figures were about 12,000 tons and 7,000 tons, respectively. By 1992-93,

India's lac exports fell further to 4,500 tons. In the same period, Thailand's production increased somewhat, with annual lac exports of around 7,000 tons in the 1990s, mainly of seedlac. China exported only about 500 tons of shellac per year in the 1990s but produced more lac internally: 4,000-5,000 tons of sticklac and 2,000-3,000 tons of shellac in Yunnan province, with additional, smaller production in Fujian province. While India, Thailand, and China are the major lac producers, Bangladesh, Myanmar, Vietnam, and Sri Lanka also play small roles.[9]

HARVESTING

Lac is harvested by cutting the tree branches that hold sticklac. If dye is being produced, the insects are kept in the sticklac because the dye colour comes from the insects rather than their resin. They may be killed by exposure to the sun.[9] On the other hand, if seedlac or shellac is being produced, most insects can escape because less coloured pale lac is generally more desired.[9]

CULTIVATION OF LAC FROM LAC INSECTS

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. (Fig. 33 a, b). Abdomen is the largest part of the body bearing a pair of caudal setae and sheath containing penis at the posterior end.[9]

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. (Fig. 34. b) 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 secretes the bulk of lac for commerce.

FERTIIZATION

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

The females after fertilization are capable of producing eggs. But it has been noticed in case of lac insects that the post fertilization developments start when the eggs are still inside the ovary. These developing eggs are oviposited into the incubating chambers (formed inside the female cell by the body contraction of females). A female is capable of producing about one thousand eggs (average 200-500). Inside incubating chamber, the eggs hatch into larvae.[9]

The larvae are minute, boat shaped, red coloured and measure little over half millimeter in length. Larva consists of head, thorax and abdomen. Head bears a pair of antennae, a pair of simple eyes and a single proboscis. All three thoracic segments are provided with a pair of walking legs. Thorax also bears two pairs of spiracles for respiration. Abdomen is provided with a pair of caudal setae.

These larvae begin to wander in search of suitable centre to fix them. This mass movement of larvae from female cell to the new off-shoots of host plant, is termed as “swarming”.

The emergence of larvae from female cell occurs through anal tubular opening of the cell and this emergence may continue for three weeks. The larvae of lac are very sluggish and feed continuously when once they get fixed with the twig. In the meantime the larvae start secreting resinous substance around their body through certain glands present in the body. After some-time the larvae gets fully covered by the lac encasement, also known as lac cell. Once they are fully covered, they moult and begin to feed actively.

The cell produced by male and female differ in shape, and can be easily distinguished sometimes later. Male cells are elongated and cigar shaped. There is a pair of branchial pores in the anterior side and a single large circular opening covered by the flap in the posterior side. (fig. 26, a). It is through the posterior circular opening that the matured male lac insect emerges out of its cell.

Female cell is oval, having a pair of small branchial pores in anterior side and a single round anal tubular opening in posterior side. Through the anal tubular opening are protruding waxy white filaments, secreted by the glands in the insects body, which is an indication that the

insect inside the cell is alive and is in healthy condition. These filaments also prevent the blocking of the pore during excess secretion of lac.

Larvae moult in their respective cells. It is the second stage larva which undergoes pseudopupation for a brief time, whereby it changes into adult stage. Now the male emerges out from its cell, moves on lac incrustation and enters the female cell for fertilization. In this way the life cycle is completed.

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 shining layer which soon gets hardened after coming in contact with air. This makes a coating around the insect and the 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 semi-contmuous incrustation of lac is formed on the tender shoots.

CULTIVATION OF LAC

Cultivation of lac involves proper care of host plants, regular pruning of host plant, infection or inoculation, crop-reaping, control of insect pests, and forecast of swarming, collection and processing of lac.

The first and perhaps the most important prerequisite for cultivation of lac is the proper care of the host plant. It is the host plants on which lac insects depend for their food, shelter and for completion of their life cycle. There are two ways for the cultivation of host plants. One is that plants should be allowed to grow in their natural way and the function of lac-culturist is only to protect and care for the proper growth of plants.[9]

PRESENT POSITION IN INDUSTRY IN INDIA

Lac is produced in a number of countries including India, Thailand, Mayanmar, China, Indonesia, Vietnam and Laos. India and Thailand are the major producers, producing on the average 1700 tonnes of lac annually, followed by China. India alone, accounts for about 70/o of global lac production.

Former Bihar is the most important lac producing state of India. The Indian council of Agriculture Research has established Indian Lac Research Institute at Namkum in Ranchi district of Jharkhand.

Two main competitors of Indian lac are (i) Thailac, which accounts 50% of the total lac exported, and (ii) Synthetic resion, which have replaced lac in certain field. Shellac being a versatile resion, there is immense scope of increasing its utilisation in various fields and there is also scope to modify it to meet particular need.

CONCLUSION

Shellac is a resinous secretions produced by lac insects. The present review has brought out overall details of lac regarding its characteristics, distribution, folk lore uses, medicinal uses and scientific studies carried out. It has been noted that there are some areas not much explored like chemical characteristics of the lac, active ingredients, principle compound quantification and parameters for quality assurance.

REFERENCES

1. Sri narahari pandit; raj nighantu; English transilation by sankhyadhar s. Chandra; chaukhambha orientalia; Varanasi, 2012; 266.
2. Kakim A.H. bustanul mufradat, new delhi: idarae kitabul shifa, 2002; 196: 516.
3. Prasad P.V.N.R., illustrated bhaisajya kalpana vijnana, chowkhamba krishnadas academy, Varanasi, 2008; 170-171.
4. The Ayurvedic Formulary of India, 2nd edition, Ministry of Health and Family Welfare, New Delhi, 2003; 1; 70, 134, 151.
5. Ayurvedic Pharmacopeia of India, Ministry of Health and Family Welfare, New Delhi; 2016; part-1; vol-9; p.114.
6. K.R. Khandelwal, practical pharmacognosy techniques and experiments, 2nd edition, nirali prakashan, pune, 2000; 25.1 to 25.9.
7. C.K. Kokate, A.P. Purohit, S.B. Gokhale; Pharmacognosy, 50th edition
8. Sharma. S et al, Faculty of Pharmaceutical Sciences, Jodhpur National university, International Journal of Universal Pharmacy and Biosciences, July-August 2013; 2(4).
9. Green, C. L (1995) "5:Insect Dyes"Non -Wood Forest Products 4: Natural colourants and dyestuffs Rome: Food and Agriculture Organisation of the United nations. Retrieved 3 july 2014.

10. Derry, Juliance(2012)"Investigating Shellac: Documenting process, Defining the products. Projectbased Master thesis, University of Oslo p.28, Retrieved 3 July 2014.
11. Finn, Angel (15 Aug 2011)"Shellac & Food Glaze, Gentle world, Retrieved 3 july 2014.
12. Baitar IZAA, Al Jami Li Mufradat Al Advia Wal Aghzia, Vol. IV. New Delhi: Urdu translation by CCRUM, 2003; 253-254.
13. Aisha Praveen et al, Immunology, Endocrine & Metabolic Agents in Medicinal chemistry, 2016; 16(1).