AYURPUB.com
INTERNATIONAL AYURVEDA PUBLICATIONS

REVIEW ARTICLE *ISSN 2456-0170*

LAKSHA: A COMPREHENSIVE REVIEW

[1]Dr Alla Sujit Prakash Reddy [2]Dr. Lalitha B R
[1]PG Scholar, [2]HOD & Professor, Department of Dravyaguna GAMC,
Bengaluru-Karnataka

ABSTRACT

The base for Ayurvedic treatment is the quality of chikitsa chatushpada. Dravya is second among chikitsa chatushpada and the qualities it should possess are bahukalpa, bahuguna, sampanna and yogyata. Sampanna also includes genuinity and purity of dravya. The practice of adulteration has an influence on the therapeutic potency of the drug. Hence it is important to know the quality of the drugs that are used in herbal formulations. Lac is a drug which has diversified uses in medicaments as well as in commercial industries. Due to high demand and organic nature, lac can be easily adulterated. Colophony is commonly used as adulterant. Sometimes, Aleuritic acid, tannins etc are mixed with organic material to bring appearance like lac. In this article an attempt is made to review about Laksha (*Laccifer lacca*) throwing light on classical description as well as its life cycle, microscopic evaluation including Substitutes and Adulterants. Thus this review comprises detailed description about Laksha thereby highlights elaborate identification techniques which is very much required for Standardization.

KEYWORDS: *Laksha*, Animal resin, Standardization, Aleurtic acid, identification.

INTRODUCTION

Plants are the backbone of all types of life on Earth and are an essential resource for human well-being. They are the major source of oxygen, food, shelter and shade on earth since no animal is able to supply the components necessary without plants. Since pre-historic times, plants are widely used for medicinal purposes. There are many pharmaceutical industries which are depending on medicinal plants for their products. The demand of medicinal plants in herbal pharmaceutical industry can be well understood by the fact that annual global export value of pharmaceutical plants in 2012 was over US$2.2 billion.

Medicinal value of a plant is distributed in different parts like leaf, root, fruit etc which has definite cellular structures. Apart from this, medicinal value of plants is also present in acellular materials like latex, exudates, gall etc. One of the exudates, being commercially very strong and commonly used is lac.

In India lac is known since Vedic period. Lac products were used as decorative materials even in 1200 B.C. During 17th century, lac dye and shellacs were introduced to Europe, then it became commercially important. Lac is therefore interwoven with the culture, social and economical evolution of our civilization.

Lac is a unique material which is a most valuable gift of Nature to man and it is the only resin of animal origin. Because laksha

is acellular and amorphous in structure, it is difficult for identification and due to its specific chemical composition has scope for adulteration in markets.

LAC

Scientific name: *Laccifer lacca*

Family: *Lacciferidae* **.**

History:-

In Mahabharata, the Kauravas commissioned the architect, Purochak, to design and build palace that could easily set ablaze so that the Pandavas could be got rid of. The architect is said to have built "Yatugriha" (or "Lakshagriha"), a beautiful palace of lac which could actually be burnt down completely as planned.

Vedic period [1]:-

In Rig veda(1/167/3, 3/6/1, 4/6/3) and Atharvaveda(10/4/24), 'Ghrtachi' is mentioned as synonym of Laksha.

Vernacular names[12]:

- Sanskrit – Laksha.
- Hindi – Lakh.
- Bengali – Gala.
- Gujarathi – Lak.
- Telugu – Kommolakka, lakka.
- Tamil – Komburrki
- Malayalam – Arakku, Ambalu.

SYNONYMS[5,6,8]:- Alakta, Amogha, Bhutavasa, Daarvi, Deeptahva, Gandhamaadani, Garaadhika , Ghonta, Jatu, Keetaja, Krimidravya, Krimija, Krutrimabhutavasa, Laksha, Laktakaha , Palaashi, Pittari, Palankasha, Rangamaata, Yaava, Vishwashaarada, Vruksaamya.

GANA AND VARGA [2,3,4,5,6,7,8,9,10.]

1.Sushruta Samhita	Lakshadi varga
2.Dhanwantari Nighantu	Chandanadi varga
3.Madanapala Nighantu	Karpuradi varga
4.Raja Nighantu	Pippalyadi varga
5.Kaiyadeva Nighantu	Oshadhi varga
6.Bhavaprakash a Nighantu	Haritakyadi varga
7.Rajavallabha Nighantu	Oushadhaashrayaparicche da varga
8.Saraswati Nighantu	Chandanadi varga
9.Priya Nighantu	Kasturyadi varga

MACROSCOPIC EXAMINATION OF POWDER OF LAC [11] :-

1	Shape & Structure	Curved
2	Colour	Outer Surface- Inner Surface- Dark Brown Dark Brown
3	Taste	Bitter
4	Odour	Odourless
5	Fracture	Short
6.	Size	Length 20 cm; Thickness 5 mm

PHYSICOCHEMICAL EVALUATION OF POWDERED DRUG OF LAC

Sl/no	Parameters Result	Results
1	Moisture Content	2.50%
2	Ash Value	1.85%
3	Acid Insoluble ash	0.00%
4	Extractable Matter	
4.a	Water Soluble	4%
4.b	Alcohol soluble	12%
6	Melting Point	80-85%
7	Optical Rotation	12

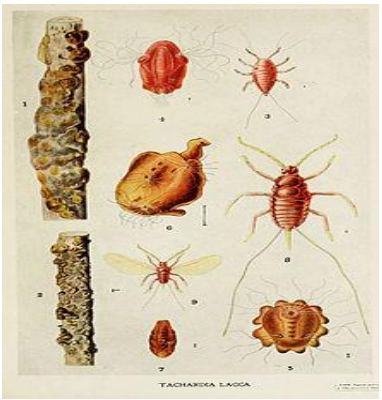
Lac is a resinous substance prepared from a secretion that encrusts the bodies of a scale insect. The word lac is derived from sanskrit

word laksha. Laksh meaning a lakh or hundred thousand. To produce 1 kg of lac resin, around 300,000 insects lose their life. Lac is the name given to the resinous secretion of the tiny lac insect (*Laccifer lacca*). The insect lives on the juice of various trees which are grown for their use. The Palasha tree (*Butea monosperma* syn. Frondosa) has been referred to as 'Lakshataru' in subsequent Sanskrit literature, as it is known to be the most common lac host that sustains the lac insect. Even Euphorbiaceae *(Aleurties laccifer*), Moraceae (*Ficus Sp*.), Rhamnaceae (*Zizyphus jujube*) and Sapindaceae (*Schleichera trijuga*) are common lac hosts. The insect resembles cochineal in life history and structure also. Lac is found most abundantly on the smaller branches and twigs.

Life Cycle[12]:-

The insert starts its life as a minute boat-shaped, red coloured larva, 0.3 mm long and 0.25 mm broad. The larvae emerge in large numbers at certain times of the year from the lac cells of the female insect and crawl over the surface of twigs and branches of plants they infest. A healthy female produces 300 – 1,000 larvae. After a brief period and depending on favourable weather conditions, the larvae emerge from the cell in search of suitable places for settlement; and larval emergence may continue for several weeks. After settling, the larvae start secreting lac from glands distributed under the cuticle all over the body, except the mouth parts, the two breathing pores and the anus. It thus gets encased in a cell of its own secretion, which increases in size with the growth of the insect.

The female larva becomes swollen and assumes the form of a pear-shaped or roundish bag which completely occupies the space inside the lac cell. After the final or third moult, the female is sexually mature and is fertilized by the male which has a life of 62-92 hrs after emergence. Lac secretion by the female continues, and the size of the insect as well as that of the enveloping lac cell increases at a fast pace; the female lac cell eventually attains a size which is several times that of a male lac cell. The female continues to secrete lac until the eggs are laid. Even the unfertilized female is as capable of producing lac and fertile progeny as the fertilized female.

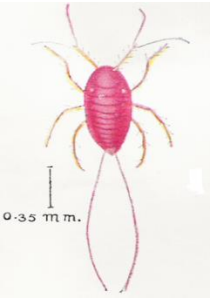


Female insect

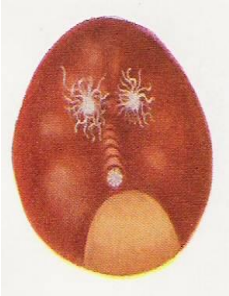
(Female insect)

Male insect

Female insect



Larva



Female adult- advanced stage

Microscopic features

Cell is a fundamental unit of living organism. It contains a cell wall and consists of the protoplasmic components and non-protoplasmic materials. Since Lac is non-living in nature, it is difficult to identify its microscopic features. But when the powder is treated with some chemicals like **Chloral hydrate, Sudan III, Ruthenium red, FeCl3,** it exhibited features like **Tannins, Oil globules, Mucilage etc.** Figure 2

Preparation of solution and indications:-

1. Chloral hydrate solution: Dissolve 50 g of chloral hydrate in 20ml of distilled water. A valuable clarifying agent for rendering tissue transparent and clear, by freeing them from most of the ergastic (non-living byproducts of protoplasmic activities) substances, but leaving calcium oxalate crystals unaffected.

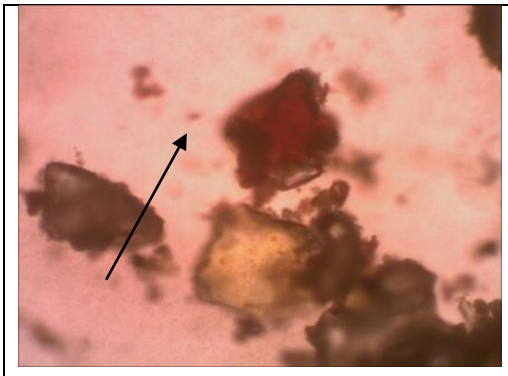
2. Ferric chloride solution: Dissolve 5g of ferric chloride in 100ml of distilled water. Observation of bluish or greenish black colour indicates presence of tannin.

3. Ruthenium red: Dissolve 0.008 g of ruthenium red in 10 ml of 10per cent solution of lead acetate (freshly prepared) used for identification of most kinds of mucilage containing tissues.

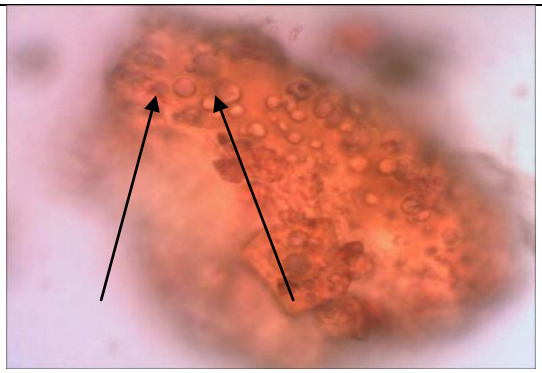
4. Sudan Red III: Dissolve 0.5g of Sudan red in 100 ml of glacial acetic acid AR.

Used for examining the presence of fixed oil.

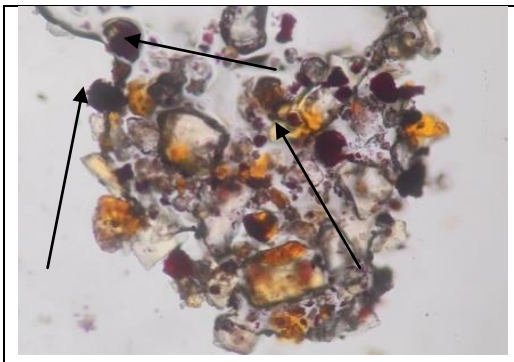
Microscopic image:-



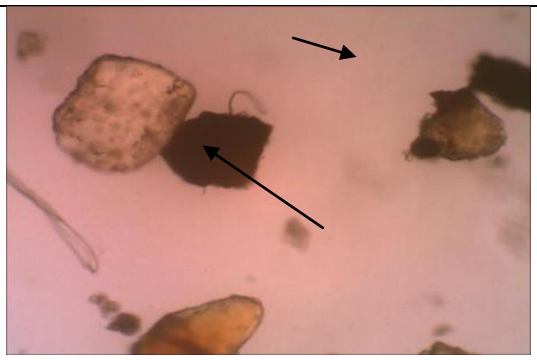
Chloral hydrate solution– tannins present



Sudan Red III - oil globules



Ferric chloride solution – tannins present black colour



Ruthenium red- mucilage

Types :-

LAC INSECT – The commonest and most widely occurring species of lac insect in India is *Laccifer lacca* (Kerr), which produces the bulk of commercial lac. They are soft bodied, Coccid group of order Homoptera. Lac has nine genera and 87 species all over the world.

Laccifer species and their distribution in India

Species	HostPlants	Area Recorded
L.ablizzae	*Croton Caudatus geiseler* and other plants	Darjeeling
L.ambigua misra	----	Jhansi
L.chinensis	*Cajanus cajan* (linn.) Millsp and other plants	Assam
L.communis	*Ficus mysorenis* Heyne and other plants	Mysore
L.ebrachiata	*Ficus elastic* Roxb	Manbhum & Bangalore
L.fici	*Ficus religiosa* linn., *F.bengalensis* Linn, and *Butea monosperma*	Monghyr & Coimbatore
L.indicola kapur syn. L.indica misra	*Zizuphus mauritiana* Lann.	Bihar
L.jhansiensis Misra	*Ziziphus mauritiana* Lann.	Jhansi
L.kudia Misra	*Kydia calycina* Roxb.	Assam

Among them ***Kerria lacca*** is commercially most important**.**

Strains of lac insect:- Two strains of the lac insect are commonly recognized in India. ***Rangeeni*** and ***Kusumi*** are the two strains available. Lac crops raised from them are

named after the months in which they are harvested. Each strain completes its life cycle twice a year, but here seasons of maturity differ considerably.

Lac Strains	Crops	Inoculation	Harvesting
Rangeeni	Katki	June-July	October-November
	Baisaki	October-November	June-July
Kusmi	Aghani	June-July	November-December January-February
	Jethwi	January-February	June-July

Chemical Constituents [13]:-

Stick lac contains 70-80% of resin, sugars, proteins, colouring matter (1-2%), wax (4-6%), extraneous matter (8-12%) and volatile oil in traces.

Lac resin consists of inter-esters of hydroxy fatty acid derivatives.

Aleuritic acid is the main constituent 35% of resin, while shellolic acid and its isomers along with kerrolic acid and butolic acid are persent to a small extent. It resembles carnauba wax to a great extent. The colouring matter contains laccaic acid which is water soluble.

Rasapanchaka[14]:-

Rasa:- Kashaya ,Tikta

Guna:- Snigdha ,Hima, Laghu.

Veerya:-

Anushna - Bhavaprakasha Nighantu

Sheeta - Madanapala Nighantu

Ushna - Dhanvantari Nighantu

Doshaghnata:- Kapha Pitta hara.

Karma[14]:-

Artinuth, Balya, Bhutanashini, Krimighna, Raktadoshahara, Twakdoshahara, Varnya, Vishaprashamani, Vranaropana.

Rogaghnata[14]:-

Bhagna, Hikka, Jwara, Kasa, Krimiroga, Kushta, Urahkshata, Visarpa, Vishamajwara, Vyanga.

Prayojyanga[14] :- Resin – Niryasa.

Posology[14] :- Choorna:- 0.5 gm.-1.5 gm.

Therapeutic uses[14]:-

1. Laksha is powdered and mixed with honey along with milk given orally to patients of Urahkshata.
2. In case of fracture, the cow's milk cooked with sweet drugs and added with ghee and laksha is given in the morning.
3. Laksha and rasanjana are mixed and given along with goat's milk to woman suffering from pradara.
4. In balaroga management, Lakshadi tailam is used for external application as abhyanga, especially in specific disorder like Phakkaroga. In condition of dantasarkara (during Shastrachikitsa), the powder of laksha mixed with honey is suggested to be applied externally on tartar affected teeth parts.
5. Another prominent formulation, Laksha guggulu is prescribed in management of bhagna (fracture) internally.
6. The drug Laksha is an important complexion promoting (Varnya) drug and it is applied on skin (desired part of body). In suitable form,it is used in both healthy and diseased condition and hence it is of cosmetic use.

Cultivation Techniques[15]:

The main operations involved in the cultivation of lac are:

Pruning

-Inoculation

-Harvesting

1. Pruning:- It is done by removing undesirable shoots of host plant.

a) To ensure availability of good, healthy and large number of shoots.

b) To provide rest to host trees for maintaining its potential and to remove dead and diseased branches.

c) Pruning is carried out, such that one can get easy access of the lac encrusted shoot at the time of harvesting.

d) Branches diameter should be 2.5 cm. If they are having 1.25 – 2.5cm diameter, then it should be cut leaving 1- 1.5 ft length from the point of origin.

e) While pruning for the first time, thick branches also are required to be cut for better canopy management.

f)*Butea monosperma, Zizyphus mauritiana, Fleminigia semialata*– Pruning should be done 6 months before inoculation, for Kusmi and akashmani -18 months before inoculation.

2. Inoculation:-It refers to tying of broodlac bundles (lac stick with mature female insect) on host twigs for release of young lac larvae.

a) To raise new crop of lac.

b) Cut broodlac sticks preferably 15-20cm in length, weighing about 1 kg broodlac and divided into approximately 10 equal parts. Prepare the bundles of broodlac (about 100gm by weight) and tie with plastic string on both the ends by keeping a bit longer for tying on their shoots.

c) Tie the bundles of broodlac on the lower part of the pruning point parallel to shoots.

d) One metre long broodlac is sufficient for 10-15m long for inoculable shoots.

e) Normally in the month of January/February and June/July for jethwi and aghani crop of kusumi strain respectively.

f)In the month of October/November and June /July for baisakhi and katki crop of rangeeni strain.

3. Harvesting:-Cutting of mature or immature lac crop from host along with sticks. There are three types of harvesting

a) ARI harvesting:- In April from *Butea monosperma* and 3rd or 4th week of May from *Zizyphus mauritiana*.

b) Partial harvesting:-It is done in the month of January/February or june/july whenever larval emergence starts from kusumi tree. Perform partial harvesting only if there is surplus broodlac on host in the month of june/ july from *Butea monosperma* tree of broodlac coupe of trees. Use harvested broodlac either used for inoculation of other trees or to earn money by selling in the market.

c) Complete harvesting:-It is done in Butea monosperma in the month of October /November from broodlac set trees and in middle of April from baisakhi crop of ari set of trees. In summer, crop may be harvested 4-5days before larval emergence i.e when the yellow spot appears. Winter crop harvest only when a few crawlers seen over encrustation. Harvest broodlac from parent trees only when all preparation for inoculation of new tree is completed.

Collection and Method of Purification

-The encrusted twigs are taken from the tree, and they are dried in the sun which often leads to shrinkage of the twig which falls out, leaving a tubular mass of resin, this is called as **Stick lac.**

-These are broken off and the excretion is scraped from the twigs with the help of curved knives, these are called **scraped lac**.
-The resinous crust is broken and soaked in water for 24 hours and thoroughly extracted by treading under foot in the troughs containing the water. The coloured water is run off, evaporated down and the residue pressed into cakes, known as **lac dye**.
-The resin is further extracted with water or dilute the solution of sodium carbonate and finally spread out on floors to dry and bleach, thus forming the brownish product known as **seed lac**.
-The seed lac is melted in along sausage shaped bag suspended over a charcoal fire and the lac is squeezed out, it is broken up to give flake shellac of commerce, and these are moulds and on cooling stamped with the maker's name known as **button lac**.
-When the shellac is dissolved in hot alkaline solution bleached with chlorine or sulphurous acid, precipitated with acid and collected by filtration and pulled under water into sticks, it is known as **bleached shellac**.

Commercial Uses [16]:-

1. Electrical Industry - Due to its very high dielectric strength, anti-tracking property and adhesion to a variety of substances, shellac is extensively used in electric industry to act as air-drying and baking-type insulating varnish, cement for various electrical sockets, protective coating for PCBs, anti- tracking insulating varnish coating of spark plugs, various laminated sheets, tubes, etc.
2. Varnish and Printing Industries - The resistance to abrasion property of lac makes it useful as furniture polish (French polish), floor polish, heatproof and waterproof varnish, shellac red-oxide primer, sealers and in embossed printing.
3.Adhesive Industry - Its good binding and adhesive nature make shellac useful as gasket cement, optical cement, sealing wax, hot-melt adhesive, adhesive for Si-chips and solar cells, for making grinding wheel, polymer adhesive and coating of leather for adhering metal and plastic foils.
4. Food Industry - The non-toxic nature coupled with its adhesive character is suitable for its application in coating of fruits, chocolates, lozenges, coffee beans, etc. for increasing the shelf life, for internal can coating and for making non-toxic ink of marking food stuffs.
5. Pharmaceutical Industry: Lac has also been extensively used in pharmaceutical industry for coating of tablets, microencapsulation of vitamins and coating of medicines for slow release in the body. It is also used in the preparation of Unani formulations prescribed for diseases of bile, fevers, osteitis, osteomyelitis, dropsy, obesity, and as diuretic and anti-inflammatory agent. In these formulations lac is used as decoction or as refined resinous fraction.
6. Cosmetic Industry:-Because of its non-toxic nature and good binding property, lac is used in hair spray and lacquers, eye shadows, micro encapsulated perfumes, lipsticks, nail polishes, mascara, etc.
7. Other Uses - Lac is also used by the goldsmiths for filling the ornaments and for fixing gold sheet on a wooden log for embossing artistic designs. Lac bangles with jewels on the surface are extensively used. It is also used in polishing stones, sharpening

stones, encapsulation of fertilizers and pesticides for their slow release and in the synthesis of perfumes and bio-active compounds like insect sex pheromones and plant growth regulators.

Substitutes and Adulterants [17]:-

Colophony is sometimes added to shellac, chiefly with the object of lowering the melting point, the amount found in adulteration samples varies from 2 to 20%.

It is best detected by dissolving the sample in alcohol, pouring the solution into water and collecting the precipitate on the filter paper. The dried precipitate is rubbed down with light petroleum and filtrate is shaken with 0.1% solution of copper acetate and allowed to separate when the light petroleum shows a green colour if colophony is present.

DISCUSSION

Due to the high demand of medicinal plants, adulteration of raw drugs used in herbal formulations is increasing widely. This has resulted in manufacturing of formulations which are of inferior therapeutic efficacy. Hence it is important to know the quality of the drugs that are used in preparation of medicaments. Lac is one of the exudates which is commercially used. It is more useful than all the other natural or synthetic resins. Apart from being a great sthambaka, it is rich with other medicinal properties like Asthi sandhanakara, jwarahara, varnya etc, lac is widely used in many commercial industries. Internationally, there is a 40,000mt (metric tonnes) annual demand for shellac: the worldwide production of Lac is around 30,000mt. Since there is high demand for Laksha in both commercial as well as pharmaceutical industries, detailed description of its Cultivation, Collection and Method of purification has been mentioned. There are around 87 laccifer species available all over the world. Among them those species available in India have been mentioned. *Laccifer lacca* is the commonly used insect for lac production in India. Because Laksha is acellular and amorphous in structure, it is difficult for identification and due to its specific chemical composition, has scope for adulteration. Studies on Macroscopic features, Physico-chemical parameters and microscopic evaluation helps in identification of Laksha. The presence of tannins, oil globules, mucilage etc determined through powder microscopy helps in quality assessment of Laksha. Colophony is commonly used adulterant for Lac. Hence different parameters discussed above would be helpful in quality assessment of Laksha.

CONCLUSION

Lac is a unique resin of animal origin. Due to its potent therapeutic properties and multifaceted actions, lac is very much in demand in different industries for different purposes. Due to its acellular nature, lac could be easily adulterated. This review comprises detailed description of Laksha along with its therapeutic and commercial uses. It also reveals the scope of adulteration of Laksha due to its acellular and amorphous structure which makes it difficult for identification. The elaborate identification techniques discussed in this article proves to be very much useful in Standardization of Laksha.

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CORRESPONDING AUTHOR
Dr Alla Sujit Prakash Reddy,
PG Scholar, Department of Dravyaguna
GAMC, Bengaluru-Karnataka-India.
E-mail: sujithreddy007@gmail.com

Source of support: Nil,
Conflict of interest: None Declared

Cite this article as
Dr Alla Sujit Prakash Reddy.: Laksha: A Comprehensive Review
ayurpub; II (4):600-609