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LAC CULTIVATION IN ASSAM WITH NOTES ON THE USE OF *ARHAR*
(*CAJANUS CAJAN*) AND OTHER SPECIES AS LAC HOSTS

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ABSTRACT

Assam which has been known as a centre of lac production since very early days, differs from the rest of the country in many respects in regard to lac cultivation. High precipitation received in the region, distributed over 8 to 9 months in the year has made it possible to exploit crop and shrub type host plants such as *arhar* (*Cajanus cajan*) and *Leea* species for successful lac cultivation. Published information on the state of lac cultivation in Assam, the use of *Arhar*, *Grewia*, *Leea* and other uncommon species of plants as lac hosts, and the various cultivation practices in vogue in the state is very meagre and in this article a detailed account on the above aspects has been given based on a recent study and enquiry made in the state.

Introduction—Although lac production in Assam has registered a sharp fall during the post-war years, the state still figures as one of the major lac growing states of the country with the average annual production (Average of 11 years from 1946—47 to 1956—57) at 1.43%. Lac cultivation in this State differs in many respects from that in the rest of country. The State enjoys a comparatively higher rainfall and receives on an average 50 to 100 inches of rain distributed over eight to nine months in the year, from March—April to November—December. Besides, cultivation is practically confined to the hilly tracts and higher elevations characterized by denser vegetation and lac is, thus, grown under more humid conditions in this State. Further, the floristic distribution in terms of the lac hosts is also peculiar to this State, and species uncommon as lac hosts in other parts of the country are employed for lac cultivation here. Lac production being concentrated almost entirely in the hands of tribal people who look to this commodity as one of their major cash crops to supplement their meagre income from the food crops, it is mostly raised in Jhum cultivation areas and consequently on host species that are not of such perennial nature as the tree type hosts, except for the few *Ficus* and other species. Also, the entire quantity of lac produced is of the Rangeeni strain and Kusmi strain is hardly known in the state.

Early history—The antiquity of lac and its utility for a variety of purposes are established from age-old indigenous crafts such as making ornaments, sealing handles of knives, etc. which employ lac and which have been handed down through generations practically unchanged even to this day from time immemorial. Systematic cultivation for the specific purpose of producing lac seems to have attracted attention in this state since very early days when lac used to be valued for its dye. Being grown under humid conditions, lac of Assam is rich in the dye-matter and was in great demand in the past. The lac-dye was being used locally also for "colouring cotton cloths and thread of every kind of material (cotton, silk, *muga* or *eri*) by the Kacharis, Mikirs and other *non-Hindu* tribes" (Watt 1901). When lac gained commercial importance as a resin, Assam continued to produce lac for its resin and the annual production towards the close of the nineteenth century ranged between 15,000 and 25,000 maunds (Watt 1901). Stebbing (1910) reports that lac was reared to a varying extent in almost all the districts of the state, Kamrup and Northern parts of the Khasi and the Garo

Hills bordering on the Brahmaputra valley, being the chief seats of the cultivation in the case of District lands. Among the forest areas, lac was obtained only from the unclassed state forests of Kamrup, Nowgong, Khasi and Jaintia Hills and Garo Hills Divisions. As much as 1,92,000 and 2,71,464 acres were under lac in the Garo Hills and Nowgong Forest Divisions respectively.

The production had received an impetus in the early two or three decades of the present century and it stood at 30,000 to 50,000 maunds per annum in the nineteen thirties. The World War II and the post-war period till 1954 witnessed some wide fluctuation and a gradual decline in the production, which has further deteriorated considerably since 1954. The present average annual production for the last 2 or 3 years is only 7,000 maunds.

The decline in the production of lac and the lack of interest in its cultivation appears to be chiefly attributable to the fall in the price of lac and the very wide market fluctuations. The hill tribes who are engaged in lac cultivation in their *jhum* lands prefer to grow more profitable crops like cotton. At one time, considerable amount of lac used to be produced in the plains of Assam particularly on *ber* trees, locally known as *bogori* (*Zizyphus jujuba*) and the *Ficus* species. But, today the cultivation in the plains districts of Assam has been almost completely abandoned and is practically unknown.

Present state of cultivation—At present lac cultivation in Assam is chiefly confined to only four hill districts and the cultivation is carried out almost exclusively by the tribal inhabitants of these hills. The districts in the order of importance and the tribes engaged in lac cultivation, along with the main centres of production and the important lac markets are given below.

| District | Tribes engaged in the cultivation | Centres of production | Lac markets |
|------------------------------------|-----------------------------------|---|---|
| (i) Mikir Hills | Mikirs and Lalungs | Duaramala Mauza Rong Khong Mauza Nagarengma Mauza and East Renga Mauza | Baithalongseo Amtreng Lengri Amshoi Nelli Borpathar Chaparmukh |
| (ii) Garo Hills | Garos | The area bounded by the District Goalpara in the north. Someswary river in the south and K. & J. Hills in the east and by the Jinari river to the west. | Rongjeng Damra Mendipathar Goalpara |
| (iii) Khasi and Jaintia Hills | Khasis and Garos | Khairem state Nogstin state | |
| (iv) Darrang | acharis | Very limited production, here and there. Practically no production during last two years. | |

On the basis of recent production figures, Mikir Hills produces about 60-70 per cent, and the Garo Hills, and the Khasi and Jaintia Hills about 15 to 20 per cent each, of the total production of the state. The production of Darrang District is practically negligible.

Stick lac assembled in the various markets find its way to any of the following three river ports namely Gauhati, Palasbari and Goalpara, from where it is sent to Calcutta through steamers for being processed. A certain quantity of lac also reaches parts of Bihar such as Muzaffarpur. Besides the movement through the Brahmaputra river, some quantity of lac is also sent through the rail from Chaparmukh to Calcutta. Only recently a Government Shellac Factory has been opened at Chaparmukh and this handles about a fourth of the total production of stick lac of the state and processes the stick lac into either seedlac or shellac, which is sent to Calcutta for export.

In addition to lac produced in the state some lac from the adjoining state of Bhutan is also received in the main markets of Assam for being sent to Calcutta.

Lac crops and the seasons—The Kusum strain of the lac insect is unknown in Assam and all the lac grown on a variety of lac hosts in this state is of the Rengeeni strain. There are two crops of this strain corresponding to the two generations in the year and are called the *Jethua* and *Katian* crops. These are comparable to the *Baisakhi* and the *Katki* crops respectively in the rest of the country. The crop seasons differ slightly due to the differing features of the climate and the host species. The *Jethua* crop is infected in the month of October-November and it matures in May-June, clearly one month ahead of the date of maturity of the *Baisakhi* crop in other lac growing regions of the country. The *Katian* crop is propagated in May-June and is ready for harvest in October-November. Unlike in other parts of the country, the *Jethua* crop is only a small crop and the main crop is the *Katian* crop. Hence the former has come to be looked upon as the brood crop and the latter as the commercial crop.

The larval emergence from the brood lac usually occurs in the second fortnight of May and October and the male emergence in the months of February and towards the end of July from the *Jethua* and *Katian* crops respectively.

Lac hosts of Assam—A variety of plant species are used as lac hosts in Assam and they number over a dozen. Most of them are unknown as lac hosts outside the state. One peculiarity is that crop and bush type hosts are exploited for lac cultivation in addition to certain tree species. This appears possible in view of the heavy precipitation received, distributed over many months in the year. *Palas*, *ber* and *kusum* which are the major hosts of the country are rarely utilized for lac cultivation in this state.

Among the host plants, four species namely *Cajanus cajan* (*arhar*), *Grewia* species, *Leea* species and *Ficus cunia* are the most commonly exploited ones, the others being cultivated more as minor lac hosts. Of the four major hosts *arhar* is a crop plant, *Leea* species is a bushy plant and *Grewia*, though a tree, is exploited invariably in the bush form. *Ficus cunia* is the only tree host. Among the minor hosts *Flemingia congesta* is a bush and the rest of them are all trees.

The important lac hosts of the state along with their local names are given below.

| Botanical name | Families | Local name |
|--|--------------------------|--|
| Major lac hosts | | |
| 1. <i>Cajanus cajan</i> (Linn.) Mill sp. Syn. <i>C. indicus</i> Spr. | Leguminosae | <i>Arhar-Hindi</i> <i>Rahar-Assamese</i> <i>Theckek-Mikir</i> <i>Nandu-Garo</i> <i>Kukursuta - Assamese</i> |
| 2. <i>Grewia glabra</i> Blume, Syn. <i>G. laevigata</i> . <i>Grewia serrulata</i> DC. Syn. <i>G. multiflora</i> . | Tillaceae ,, | <i>Senamlongdak - Mikir</i> <i>Bolmengo - Garo</i> <i>Dindohthli - Khasi</i> <i>Kaurithengia - Assamese</i> <i>Supplipi - Mikir</i> <i>Rahakani - Gangma - Garo</i> <i>Soh-phyrono - Khasi</i> <i>Sisidsu - Mikir</i> <i>Aminsap - Gaor</i> <i>Dingduit - lasas Khasi</i> |
| *3. <i>Leea aspera</i> Wall. <i>L. crispa</i> Linn. <i>L. robusta</i> Roxb. | Ampelidaceae ,, ,, | <i>Soh-phyrono - Khasi</i> <i>Sisidsu - Mikir</i> <i>Aminsap - Gaor</i> <i>Dingduit - lasas Khasi</i> |
| 4. <i>Ficus cunia</i> Ham. | Urticaceae | <i>Sisidsu - Mikir</i> <i>Aminsap - Gaor</i> <i>Dingduit - lasas Khasi</i> |
| Minor lac hosts | | |
| 5. <i>Flemingia congesta</i> Roxb. | Leguminosae | <i>Makhiati - Assamese</i> <i>Keepiatheckek - Mikir</i> <i>Samnaskhat - Garo</i> <i>Moj - Assamese</i> <i>Inhak - Mikir</i> <i>Machborga - Garo</i> <i>Pichala - Assamese</i> <i>Arlak - Mikir</i> <i>Boldabak - Garo</i> <i>Silapoma - Assamese</i> <i>Wokru - Garo</i> <i>Tengabor - Assamese</i> <i>Chiri-arong - Mikir</i> <i>Diengsop-pohlas - Khasi</i> <i>Ahat - Assamese</i> <i>Borgash - Assamese</i> <i>Gonok - Garo</i> <i>Pakaribor - Assamese</i> <i>Praprakseng - Garo</i> <i>Chiripili - Mikir</i> <i>Jari, Pakari - Assamese</i> |
| 6. <i>Albizia lucida</i> Benth. | ,, | |
| 7. <i>Kydia calycina</i> Roxb. | Malvaceae | |
| 8. <i>Engelhardtia spicata</i> Bl. | Juglandaceae | |
| 9. <i>Ficus infectoria</i> Roxb. | Urticaceae | |
| 10. <i>Ficus religiosa</i> Linn. | ,, | |
| 11. <i>Ficus bengalensis</i> Linn. | ,, | |
| 12. <i>Ficus rumphii</i> Blum. | ,, | |
| 13. <i>Ficus comosa</i> Roxb. Syn. <i>Ficus benjamina</i> Linn. | ,, | |

* Although Glover (1937) has reported *L. crispa* Linn and *L. robusta* Roxb. as the lac hosts of Assam, the common species on which lac is cultivated has been indentified as *L. aspera* Wall. by the systematic Botanist of the Botanical Survey of India, Eastern Zone, Shillong to whom our thanks are due.



Fig 1—Land being cleared for 'Jhum' cultivation.



Fig. 2—Lac on *Cajanus cajan*.



Fig. 3—Lac on *Grewia* species.

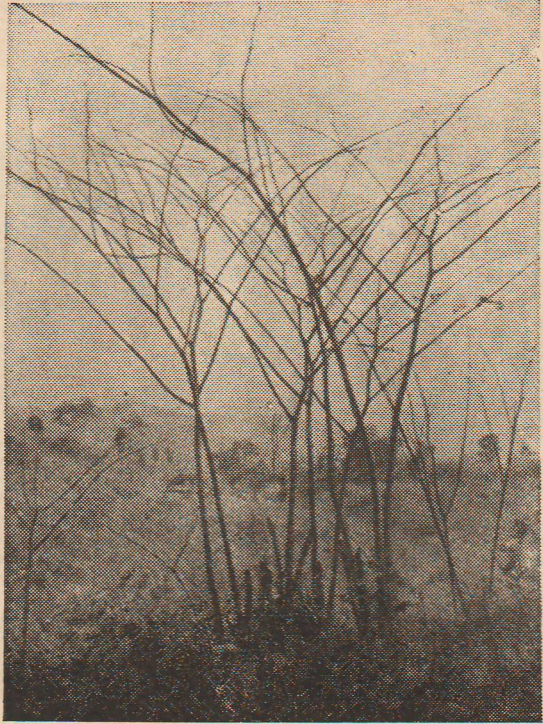


Fig. 4—*Leea aspera*.



Fig 5—*Ficus* species.

Local practice of lac cultivation on some important host species, arhar (*Cajanus cajan*)—
Arhar meant for growing lac on it is raised invariably as mixed crop along with other agricultural crops like paddy, cotton, 'til', maize, castor, chillies, etc. in the *jhum* areas by the tribal people of the hills of Assam. With the onset of the monsoon seeds are sown in May-June in lines with a spacing of about 6 to 8 feet between the rows and about 4 feet in the row. Sometimes the spacing may be even wider upto 12 feet. At times, single rows are sown along the boundary of the field or along the contours and so on. As the other crops in the mixture mature, they are harvested, leaving the *arhar* plants to grow. Any other lac host species such as *Grewia*, *Flemingia*, etc. that may be growing of their own accord are also allowed to grow so that they may be exploited for lac cultivation when they grow to suitable size.

The *arhar* plants are ready for lac infection in the following October season, when they are about 5 months old. By this time, they attain a height of about 9 to 10 feet with a stem girth of 4" to 5" at base. About $\frac{1}{2}$ to 1 chatak (1 to 2 oz.) of brood lac is used to infect a single plant depending upon its growth and size. For infecting the *Jethua* crop on *arhar* plants, usually *Katian* brood grown on *Grewia*, *Leea* or *arhar* is used, since brood from these sources are available in sufficient quantities. When the *Jethua* crop matures in May-June, a partial harvest is taken leaving sufficient brood on the plant itself to swarm *in situ* for self-infection of the *Katian* crop. The excess crop is removed by breaking off the lac encrustations from the twigs with a twist by the hand. This practice is resorted to with a view to maintain the full surface area of the plant available for infection of the succeeding *Katian* crop and also because of the fact that this species can not stand the lopping of branches. The excess brood that may be obtained from this partial cropping is generally used for infecting the *Leea* species to produce the *Katian* crop.

The lac crop on *arhar* suffers to some extent due to the summer heat and drought in April-May. The distribution and the amount of rain received in this period will determine the excess brood crop to be obtained on maturity. A good number of *arhar* plants also succumb to the summer heat and drought, and roughly about a fifth of the total number of plants may dry up leading to complete mortality of the lac insects. The plants produce a small crop of the 'dal' (*Cajanus* seed) as well, during February-March, which may be on an average anything from a fourth to half of the normal (seed) crop that may be expected had the plants not been infected. *Arhar* plants grown for the 'dal' crop ordinarily survive for two years and yield two crops in Assam. In the case of plants meant for lac cultivation, they do not survive long enough to give more than 2 lac crops, namely one partial *Jethua* crop and a full *Katian* crop. That is to say, the crop infected in October and allowed self-infection in the following May-June is harvested completely in the next October. Very rarely the *arhar* plants are healthy enough to take infection for the third crop.

A healthy plant of average growth may yield about 6-8 chataks of lac sticks or $1\frac{1}{2}$ to 2 chataks of scraped lac during partial cropping in May-June and about 12 chataks to 1 seer of lac sticks, mostly as broodlac at the time of complete harvest in October, which on scraping may yield about 3-4 chataks of stick lac on an average.

***Grewia* species**—These plants grow naturally in the *Jhum* land and other forest areas of Assam. They are observed to put forth vigorous growth after a clear burning of the forest in the hills. Ordinarily, nobody takes the trouble of growing these species from the seeds by sowing them. These, however, can be propagated by root and shoot cuttings. Under wild conditions, these grow into thin tall trees reaching a height of upto 30 feet. But being tender species and not hardy enough for human climbing, the grown-up trees are never used for lac cultivation. The tribal people keep the plants meant for lac cultivation under bushy or shrubby conditions and infect them when they grow to a height of about 10 to 12 feet. It takes about one and a half to two years for the plants to reach this height since the time the forest has been cleared for 'Jhum' cultivation.

Grewia species are the favoured hosts for growing the *Katian* (lac) crop, although at times they may be put to cultivation for the *Jethua* crop as well. Usually the surplus brood obtained from the Arhar plants is used to infect these species in May-June and the infection is carried out rather heavily. Upto 5-7 chataks (10 to 14 oz.) of broodlac may be put on a single plant, about 2 years old and 12-15 feet in height. The yield from such a plant on maturity may be about 3 to 4 seers of brood lac or 2 to 2½ seers of stick lac. Whenever they are infected for the *Jethua* season, the usual practice is to leave self-infection of the *Katian* crop in May-June. Rarely a partial crop is taken in May-June by breaking away some surplus broodlac by twisting with hand. The plant gives thick encrustations on their twigs and the colour of the lac is also lighter as compared to that from *arhar* plants.

Leea species:—These are high altitude species coming up above an elevation of 1,000 feet in the hilly districts of Assam and are commonly met with at altitudes ranging from 1,000 to 2,000 feet. They require moist and humid conditions for their growth and hence are generally found to occur along the streams and rivulets in the hills. The *Leea* species are among the most popular lac hosts of the state considered best for raising the *Katian* crop. *Jethua* crop is very rarely raised on these species as they remain leafless for long periods from winter till the monsoon rains.

Leea species are generally raised by root and shoot cuttings. During the months of April-May, when the monsoon breaks, cuttings of old stem are planted with a spacing of 10 to 12 ft. Sprouting starts within about a month or two and the plants put forth vigorous growth thereafter. The plants attain infectable heights after about 1½ to 2 years. Being natural bushes, they do not grow beyond a height of 12 feet. Plants once established can be exploited for lac cultivation every year repeatedly and the shoots continue to grow from stumps for years to come.

8 to 12 chataks (1 to 1½ lbs.) of broodlac may be required to infect a medium sized plant which may yield about 2 to 3 seers of broodlac or 1 to 1½ seers of scraped lac. The infection is carried out in the months of May-June with brood obtained from *arhar*, *Grewia* or *Ficus* species. When the crop matures on *Leea* species in October, the entire yield is obtained in the form of good broodlac and is used in turn to infect *arhar*, *Grewia* or *Ficus* species for growing the *Jethua* crop.

Ficus species:—The commonly cultivated species of this genus are the *F. cunia*, *F. infectoria* and *F. rumphii*. Of these the first is the most favourite host with the tribal cultivators. Other species such as *F. religiosa* and *F. bengalensis* are also occasionally exploited for lac cultivation. *F. comosa* (*pakari*) used to be good lac host of Darrang district till very recently. The plain people of Assam also mostly cultivated lac on this species till recently.

Ficus species serve as the main source of broodlac from the *Jethua* crop, since they carry heavy brood crops through the summer. The local cultivators practise repeated self-infection on these tree hosts and the trees may be kept under lac crops continuously for over 2 to 4 years. The crop cutting as practised by the tribal people is very heavy, which leads to completely spoiling the crown of the trees and often results in highly checked growth, forcing them to give up cultivation on such trees after a few years. *Ficus* species are also found in good numbers in the plains district as well, and they used to be cultivated for lac in past years. Even today the *Ficus* species are put under lac cultivation here and there. A medium sized *F. cunia* tree, once infected with about 2—3 seers of lac may continue to yield about 6—8 seers of surplus broodlac every year in the months of May—June for about 3 to 4 years. Other *Ficus* species which are bigger trees may need more broodlac for infection and may yield in turn bigger lac crops.

Other important species—Among other important minor lac hosts of the state mention may be made of *Albizzia lucida*, *Flemingia congesta* and *Kydia calycina*.

In the Mikir hills, *A. lucida* which is a tree is used as a minor lac host for infecting the *Katian* crop, although it may be found useful as a good host for producing broodlac in the *Jethua* season.

F. congesta is a natural shrub of Assam growing to a height of 8-10 feet and is occasionally used as a host for raising both *Jethua* and *Katian* crops, but the latter crop is better raised on this host. Lac cultivation on this species is mainly found in Mikir hills.

K. calycina occurs in nature in abundance in Mikir and Garo hills and is a small to moderate sized tree. It is put to lac cultivation to a very limited extent only in Garo hills for growing the *Katian* crop.

Local cultivation practices and their defects—At present the cultivation of lac is practically confined to the tribal inhabitants of the hills districts and they raise lac as one of the mixtures along with food crops in their *Jhum* lands. Lac is thus grown on a few plants per acre and does not receive much attention from the cultivator. Each cultivator produces only a few seers of lac and is satisfied with whatever he may get out of the few plants he infects. Hence the operations connected with lac cultivation are not carried out with due care needed for best results. Self-infection of the lac crops is practised repeatedly which, under the humid conditions prevailing in the state, encourages infestation by enemy insects and leads to heavy losses. Besides, the artificial method of infection as practised by the local cultivator is highly wasteful. High brood rate is used for infection and most of the larvae are wasted. Further instead of tying brood lac sticks to the stem or branches of host plants securely, they put bits of brood lac encrustations broken from the twigs and also bits of broodlac sticks in small bamboo containers or baskets called *khang* and tie them haphazardly to the plant. For such an infection, very heavy brood rate has to be used, and even then it may not give satisfactory and uniform larval settlement on all infectable shoots of the host plants.

Another peculiarity of the state is that the raw lac meant for disposal by cultivators is not in the pure scraped form but contains both bits of lac encrustations broken from twigs, and lac sticks with encrustations, cut into small bits 1 to 5 inches in length. Thus lac is never scraped from the sticks and most of the cells remain intact without being crushed, unlike sticklac scraped from lac sticks. This results in all the enemy insects thriving and passing unhindered from crop to crop.

Lac in Assam is marketed through middlemen who advance money to the poor tribal cultivators in times of need and takes away all the lac of the cultivator at the time of harvesting, paying only a poor price for the produce. Since lac is a monopoly produce in Assam, heavy royalty has to be paid, with the result that the cultivators' share in the price is comparatively small. This operates as a serious handicap to increased cultivation of lac in the state of Assam, and unless and until lac is made sufficiently attractive, it will be difficult even to stem the present trends of decline in lac production.

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