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Lac-based indigenous technical knowledge of Assam

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The survey on lac-based Indigenous Technical Knowledge (ITK) amongst the farming communities of Assam revealed its prevalence mainly amongst the tribal people of West Karbi Anglong, East Karbi Anglong, Golaghat, Jorhat, Tinsukia, Goalpara, and Dhemaji districts of Assam. Altogether six numbers of lac-based ITKs were reported about lac culture, human medicine, dye making and post-harvest operations. Lac-based ITKs have not been documented scientifically so far. This paper describes some of the ITKs practiced by tribals/farmers of Assam for the first time, which might help other researchers/scientists in further studies for scientific validation of lac-based ITKs.

Keywords: Assam, Indigenous technical knowledge (ITK), Lac culture, Lac dye, Post-harvest operations

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Lac is an important bio-resource having wide economic, commercial, medical, and social significance. Lac is the only resin of animal origin, which is composed the of three most important products *viz.,* resin (65-70%), dye (1%), wax (4-6%)[1] and about 25% insect/wood debris. Cultivation of lac not only provides livelihood to millions of tribals[2] but also helps in the conservation of biodiversity associated with the lac insect complex. Although India is the largest producer of lac resin, contributing about 70% of the world's demand, still there is a huge scope for increasing its productivity to minimize the gap between current demand and supply.

In India, Jharkhand is the prime lac-producing state (50.83%) followed by Chhattisgarh (14.58%), Madhya Pradesh (14.41%), Maharashtra (8.98%), Odisha (4.21%) West Bengal (2.66%), and Assam (1.68%)[3]. Northeast India is known for the natural occurrence of *Kerria chinensis* (Mahdihassan, 1923) (Hemiptera: Kerriidae)[4], particularly in Assam, where it is naturally abundant, whereas *K. lacca* (Kerr, 1782) is commercially exploited in major lac growing states of the country. While cultivating, collecting, processing and usage of lac, farmers usually practice some indigenous know-hows, which are popularly known as Indigenous Technical Knowledge (ITK). ITKs are endemic to a state or region, which may also be shared by other regions of a country[5]. These are generally conserved by native tribes and farmers. In the last couple of years, a survey under the Network Project on "Conservation of Lac Insect Genetic Resources" has been carried out by Assam Agricultural University, Jorhat throughout Assam for gathering information about lac insects and their host plants, biodiversity associated with lac insect complex, climatic suitability, and the wider prospects in cultivation of lac insect. During the survey, a few lac-based ITKs were found prevailing amongst the farming communities of Assam. ITKs could serve as an input for valid scientific technology in terms of cultivation, product formation and value addition due to their eco-friendly and low-cost nature. However, due to mechanization and advancement of technologies, the farmers or local people are rapidly shifting to the modern methods of cultivation, which in turn causes the quick disappearance of the long earned ITKs carried from one generation to another. In order to conserve traditional practices in the cultivation and use of lac, the present investigation was carried out for the collection, compilation, documentation, and scientific evaluation of the ITKs associated with lac cultivation and their usage amongst the farming communities of Assam. The present paper catalogues all such ITKs practiced by the lac farmers of Assam.

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Methodology

A semi-structured interview schedule was prepared to obtain scientific rationality of the explored ITKs related to lac covering 990 individuals (30 each from 33 districts of Assam), some direct cultivators, some associated, and some acquaintances because of their proximity to lac garden, were interviewed during 2014-2019 by providing interview schedule[6]. Altogether 990 individuals of 33 districts of Assam were interviewed, out of which tribals and farmers of seven districts *viz,* West Karbi Anglong, East Karbi Anglong, Golaghat, Jorhat, Tinsukia, Goalpara and Dhemaji were aware about the Lac-based ITKs. Consent were obtained from respective farmers prior to conducting the survey.

After collection, ITKs were presented in terms of their percentage usage in all the districts as well as district-wise adoption in pictorial form. The data were also analyzed by taking each ITK as a treatment and districts as replications for analysis of variance (ANOVA) under completely randomized block design. Amongst the respondents of a district, the percentage of farmers following a particular ITK was calculated out and means were separated out by Turkey's Test (SPSS computer programme, Version 26.0)

Results and Discussion

Out of the 990 respondents, 504 responded in affirmative for all the queries (Table 1), remaining were unaware of lac/related information. One seventy-six respondents who answered in affirmation were from non-lac-growing districts showing that although they did not cultivate lac, they are aware of various uses of lac. Although lac is grown only in seven districts of Assam, 50.91% of total respondents had knowledge about one or other aspect of lac. Tribal farmers were found to disseminate and carry such information from one generation to another from elders to the younger generation.

During the course of investigation, it was found that the majority of the people in Assam are aware of lac, but they were unaware of its utility and their products. Moreover, the majority of tribal people of Assam cultivates lac and was dependent upon some ITKs due to their socio-economic conditions.

From the survey, we have identified six lac-based practices as ITKs (Table 2), amongst which, dyeing of clothes (Fig. 1a), preparation of lac solution for curing itching and other body pain (Fig. 1b), use of lac as adhesive of implements (Fig. 1c) and traditional bamboo cage for lac inoculation and brood lac storage (Fig. 1d) were the most commonly used ITKs in the surveyed districts.

Lac is the natural bio-resource of only animal origin. Farmers of West Karbi Anglong (36.66%), East Karbi Anglong (23.33%), Jorhat (3.33%) and Goalpara (16.66%) use lac for dyeing of clothes by boiling scrapped lac in water at desired concentration (Table 2 & 3, Fig. 2a). It has been observed that 56.66% of farmers from West Karbi Anglong use traditional bamboo cages for inoculation, carrying and storage of brood lac. This low-cost bamboo cage

Table 1 — Number of respondents who answered affirmatively

Sl. No.		Lac growing districts*	Non-Lac growing districts*	(n= 990) Tota#
1	Do you have knowledge about lac insect?	67 (42.95)	89 (57.05)	156 (15.76)
2	Have you seen lac cultivation?	56 (64.37)	31 (35.63)	87 (8.79)
3	Are you a lac cultivator?	54 (100.00)	0 (0.00)	54 (5.45)
4	Do you know about use of traditional knowledge in lac cultivation?	18 (100.00)	0 (0.00)	18 (1.82)
5	Do you believe in Ethno-medicine?	32 (54.24)	27 (45.76)	59 (5.96)
6	Do you use lac for prevention of any disease?	24 (80.00)	6 (20.00)	30 (3.03)
7	Is there any side effect like dizziness, vomiting and others?	0 (0.00)	0 (0.00)	0 (0.00)
8	Do you consume lac? If yes, how?	10 (100.00)	0 (0.00)	10 (1.01)
9	Do you make any product out of lac?	0 (0.00)	0(0.00)	0(0.00)
10	Do you use lac as dye?	18 (75.00)	6 (25.00)	24 (2.42)
11	Do you use lac for making or fixing tools or instruments?	35 (72.92)	13 (27.08)	48 (4.85)
12	Do you coat fruits and vegetables with lac formulations for preservation?	0 (0.00)	0 (0.00)	0 (0.00)
13	Do you know about any industrial use of lac in making utensils *etc*.?	14 (77.78)	4 (22.22)	18 (1.82)
Total		328 (65.08)	176 (34.92)	504(50.91)

*Figures in parentheses reflect percentage of affirmative responses

#Figures in parentheses are percentage of total respondent

known as *laha-atum* (in vernacular language) is of size 18.00- 20.5 cm x 5.00-7.8 cm, which protects the brood lac from heavy rain, sunlight and helps the crawlers in proper settlement on the host plants though nylon bags (60 mesh size) are recommended by ICAR-Indian Institute of Natural Resins and Gums, Ranchi for scientific inoculation of brood lac in field condition. In our present investigation, scraped

Fig. 1 — ITKs commonly followed in different districts of Assam; a. Traditional woollen cloth dyed with lac; b. Preparation of lac solution for curing itching by tribals of Karbi Anglong district; c. Lac as adhesive in implements; d. Traditional bamboo cage for lac inoculation and storage of brood lac

Table 2 — Lac based indigenous traditional knowledge of Assam

Sl. No.	Title of the ITK	Use of ITKs in seven districts of Assam (%)							(n=990) Mean ±SD
		West Karbi Anglong	East Karbi Anglong	Jorhat	Golaghat	Tinsukia	Goalpara	Dhemaji	
1.	Dying of clothes	36.66	23.33	3.33	-	-	16.66	-	11.43±14.51
2.	Inoculation and storage of brood lac	56.66	33.33	-	-	-	-	-	12.86±22.97
3.	Using lac as adhesive for fixing utensils / implements	46.66	33.33	26.66	20.00	10.00	13.33	10.00	22.85±13.66
4.	Application of lac to get rid of body pain	36.66	26.66	16.67	6.66	-	-	-	12.38±14.74
5.	Application of lac extract on body to remove itching on human skin	40.00	23.33	-	13.33	-	-	-	10.95±15.72
6.	Drinking of boiled scrapped lac for stomach-ache	16.66	10.00	-	-	-	6.66	-	4.76±6.62
Mean		38.88	24.97	7.78	6.67	1.67	6.11	1.67	-
S.Ed.									3.77
S.Em									2.67
C.D. (at 5%)									7.70*
C.V									8.04

Table 3 — Rationales behind use of lac based ITKs

Practice	Purpose	District	Inference
One gram of scraped lac is put in one litre of water. The mixture is boiled under high flame till lac completely melts in it and then allowed to cool in shade. Clothes are then dipped in the solution for a while and dried in shade	Dyeing of clothes	West Karbi Anglong, East Karbi Anglong, Jorhat and Goalpara	Natural source of colour extracted from lac
Lac encrustation is put in a bamboo cage of size (18.0- 20.5 x 5.0-7.8 cm) and the cage is then tied on to the host plants	Inoculation, carrying and storage of brood lac	West Karbi Anglong and East Karbi Anglong	Low-cost inoculation / storage for protection against heavy rainfall and sunlight to help in easy settlement of crawlers on host plants
Scraped lac is heated and melted lac is applied on the desired surface	Fixing metal parts of axes with its handle and fixing cracks or joining of bell metal plates or pots	West Karbi Anglong, East Karbi Anglong, Jorhat, Golaghat, Tinsukia, Goalpara and Dhemaji	Lac has adhesive/sealing property
Fully matured one gram lac cells are put in one litre of water in a bamboo pipe and that mixture is boiled under high flame till lac cells melt in water and volume is reduced by quarter of the initial volume. Mixture is then allowed to cool in shade and applied against rheumatic and other body pain	Relief from body pain	West Karbi Anglong, East Karbi Anglong, Jorhat and Golaghat	Lac has anti-arthritic medicinal properties[8]
Lac encrustation is boiled in water and allowed to cool for a while and the extract is applied on body to remove itching of skin	Relief from itching	West Karbi Anglong, East Karbi Anglong and Golaghat	Lac promotes strength, relieves burning sensation due to its astringent property[8]
One gram of scraped lac is put in one litre of water. The mixture is boiled and drunk against stomach-ache	Relief from stomach-ache	Goalpara, West Karbi Anglong and East Karbi Anglong	Lac has anti-dysenteric, stomachic medicinal property[8]

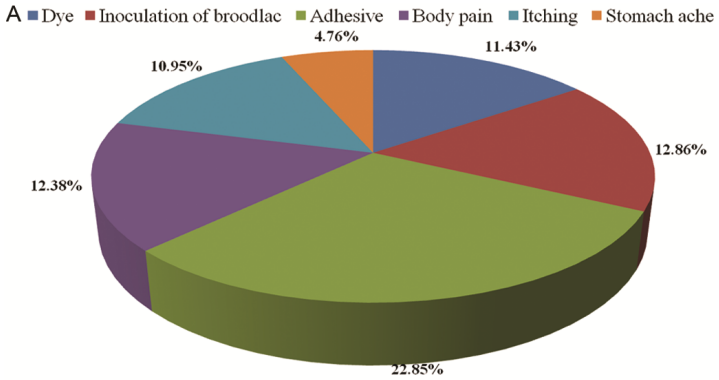

Fig. 2a — Per cent ITKs use in all the surveyed districts

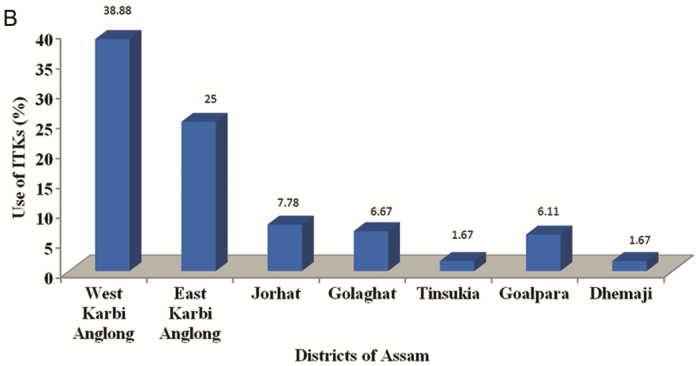

Fig. 2b — District wise uses of lac based ITKs

lac was used for fixing broken bell metal dish/plates and axe in various villages of the above mentioned six districts. It is also used for sealing official documents and polishing both the outer and inner sides of the new earthen pots (*Tibuk*) used for storing water. The highest adoption of this ITK (46.66% farmers) was seen in West Karbi Anglong district. Borah and Garkoti (2020) reported similar traditional practices of Karbi peoples of Assam in use of lac for dyeing of clothes, adhesive property, curative medicine against rheumatic, other body pain, and stomach-ache from Karbi Anglong district of Assam[7]. The tribal farmers were found to use lac as curative medicine against rheumatic, other body pain, stomach ache and for getting rid of itching. Traditional medicines are cost-effective alternative, which are popular among the members of a community due to their easy and widespread availability, low side effects, and little technological input requirement. In our present investigation, lac resin holds a special position among the Karbi communities as traditional medicine. Moreover, use of lac in *Unani* medicine has been reported for curing obesity, hyper-lipidemia, renal, jaundice, back ache, premature ejaculation, leprosy, cough, hemi-plegia, asthma, haemoptysis, epilepsy, chicken pox, ulcerations, worm infestation and palpitation[8]. Thombare *et al*.[9] also reported the medicinal properties of natural resins and gums in India, including the therapeutic use against intestinal parasites, dysentery, diarrhoea, internal bleeding disorders, cough, and skin diseases. They also reported use of lac against jaundice, leprosy, obesity, chicken pox, renal and spleen disorders, backache problems, ulceration, and epilepsy as well as for preparation of folk medicine *viz.,* hepatoprotective and anti-obesity drug. Lac also acts as an astringent, coagulation modifier, antiarthritic, anthelmintic, antipruritic, anti-hiccup, antiulcerogenic, and anti-inflammatory agent, which is in close conformity with our findings. Among all the ITKs, the highest adopted ITK by the farmers of Assam is for use as adhesive to fix the implements/utensils (22.85%) and the lowest adopted ITK is drinking of boil scraped lac for stomach-ache (4.76%). Tribal farmers of West Karbi Anglong district followed maximum ITKs (38.88%) as compared to other districts (Fig. 2b).

Conclusion

Since most of the ITK's are adopted from natural resources, the documented ITKs associated with lac culture could serve as a ready reference for both extension workers and agricultural scientists for future studies. However, the ITKs need to be validated scientifically for extensive use and promotion amongst the farming community.

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Conflict of Interest

The authors declare that they have no conflict of interest in financial interests or personal relationships that could have appeared to influence the work presented in this manuscript.

Author's Contributions

The idea was originally conceptualized & design by PD. The experiment was conducted by PD with support from LKH and SK in data collection. The manuscript was written and skillfully edited by PS. Throughout the process of writing the manuscript, PD, LKH, SK, AM and KKS review, supervised and took the lead, incorporating critical feedback.

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