Lac Cultivation as a Pathway to Prosperity: A Success Story from Ranchi, Jharkhand

Abstract

Lac is a commercially significant cash crop that serves as a vital source of income for millions of economically disadvantaged farmers residing in tribal-dominated forest and sub-forest regions of the country. Due to the worldwide trend towards the usage of natural products, there is a consistent demand for bio-degradable and non-toxic products made from lac in the market. However, production of this economically vital commodity is declining over the years because of alterations in precipitation patterns, recurrent droughts and floods, heightened intensity and frequency of cold waves, and surges in insect pests and diseases. Jharkhand, the largest lac producer state in the country has reflected a disappointing growth rate at -0.33% over the period of 2011-2022. A success story of Motilal Singh Binjhya who is a resident of Saraitoli village, Ranchi has been discussed in this regard. The benefit cost ratio of 2.43 by selling ~~stick~~ lac stickto middlemen, clearly reflects the high profitability nature of lac cultivation. Considering the economic benefits of the producers and the global demand for safe natural lac cultivation, enhancement in various aspect is required.

Keywords: Forest product, lac, livelihood, profitability, production trend

Introduction

The word ‘Lac’ has been originated from the Sanskrit word ‘laksha’ which means hundreds of thousands, referring to the huge groups of bug larvae that cover the branches of host trees during brood season (Sharma et al., 2020). Lac is a broad term utilised in commerce to denote all varieties of natural resin excreted by diminutive lac insects on certain host trees, predominantly located in India, Thailand, china and Indonesia. Indian lac insects, *Kerrialacca* (Kerr.), are the primary secretors of natural resin lac that thrive on the delicate twigs of particular host trees, such as Palash (*Buteamonosperma*), Ber (*Ziziphusmauritiana*), Kusum (*Schleicheraoleosa*), Flemingiasemialata. Ficus spp., etc. The life cycle of lac insect consists of three distinct stages, namely egg, nymph and adult. The eggs develop into adults in a span of six months. The two lac bug strains known as Rangeeni and Kusmi are most common in India which can be categorised based on insect’s predilection for particular host plants, length of life cycle, and quality of produced resin (Kapur, 1962; Shah et al., 2015). Kusmi lac is considered one of the highest quality commercial lacs as it commands superior

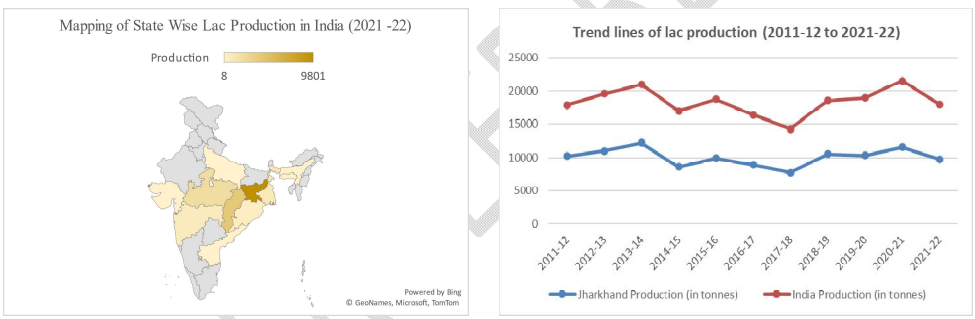
prices in both domestic and international markets (Lalita, 2020). Three valuable products that can be generated through the processing of raw lac is wax, dye, and resin. Lac resin is a multifaceted substance with usage across various industries including varnish, paints, inks, adhesives, food, cosmetics, leather, electrical applications, and the pharmaceutical industry. Wax derived from lac is employed in shoe polish, bottle sealing, tailor's chalk, crayons, lipsticks, and fruit coatings (Sharma and Ramani, 2014). These products have huge demand at global market for its eco-friendly and natural characteristics. Lac production in India was approximately 18,944 tonnes in the 2019-20 fiscal year and the country exported 7293.47 tonnes of lac in various forms and earned a foreign exchange income of Rs.405.51 crores (Yogi et al., 2021). Approximately, 3-4 million tribal people who represent the weaker section of the society, derive supplementary income from lac cultivation for sustaining their livelihood (Kumar and Reddy, 2024). Lac cultivation not only sustains the livelihoods of millions of lac producers but also aids in the conservation of extensive forest areas, lac insects, and their related biota.

Major lac producing region in India

India is the predominant producer of lac, contributing over 50% of global production (Kumari et al., 2024). All the primary lac host plants are found in natural woods, along roadsides, adjacent to agricultural land, and near to villages within the Chotanagpur plateau, that includes Jharkhand and its neighbouring states. The production primarily occurs in tribal, sub-forest, forest, and rainfed regions of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Orissa, Maharashtra, as well as parts of Uttar Pradesh, Andhra Pradesh, Gujarat, and the northeastern region (Singh et al., 2018). 54.60% of total production in the country comes from the state Jharkhand alone, which rightfully makes it the 'Lac state of India' (Government of Jharkhand, 2024; Kumar, 2018). This is followed by Chhattisgarh (17%), Madhya Pradesh (12%), Maharashtra (8%), and Odisha (3%), respectively. Ranchi, Palamau, Garhwa, Gumla, Simdega, Lohardaga, East and West Singhbhum are the main lac producing districts in Jharkhand. However, majority of these resources remain underutilised due to insufficient awareness, with just 5% of S. oleosa and Z. mauritiana and 1% of B. monosperma plants being employed for the production of lac (Das and Kumar, 2013).

Production scenario of Lac over the years in Jharkhand and India

Lac crop is highly susceptible to biotic (pathogens, weeds and insects) and abiotic (weather and climate related parameters) stressors, which can decline both quality and quantity of lac output (Shah et al., 2015). Annual precipitation of 1000 to 1500 mm, accompanied by an average temperature of 24 to 27°C, is deemed favourable for lac cultivation. Prolonged weeks with above 50 mm of rainfall during pivotal phases of lac growth impact lac yield (Yogi et al., 2016). Climate of India has experienced substantial alternations, exhibiting an upward trend in annual temperature with an average rise of 0.7°C during 1901-2018 (Krishnan et al., 2021). The highest temperature in August rose by 1.3°C and the lowest temperature dropped by 0.5°C over the previous 24 years. Further, lac insects are vulnerable to the pest attacks due to their limited hours of active mobility and significant hours of sedentary lifestyle, causing 35-45% crop losses each year (Shah et al., 2015). These weather variations cause some parasite population to spike with disastrous results. The annual national lac production has declined from 21,008 (2013-14) to 14,315 tonnes (2017-2018) and then again from 21,590 (2020-21) to 17978 tonnes (2021-22).



(a) (b)

Fig 1: a) Mapping of state-wise lac production; b) Trend lines of lac production (2011-12 to 2021-22) (Source: Ministry of Agriculture & Farmers Welfare, Govt. of India)

The growth trend and estimates of instability in lac production in Jharkhand and India from the period of 2011-12 to 2021-22 are presented in Table 1. The results clearly indicated that reduction is severe in case of Jharkhand as it experienced a negative growth over the years with a compound annual growth rate (CGAR) of -0.33% whereas the national growth rate is still positive with a value of 0.05%. This is in tune with another study that reported significant decline in summer crop of rangeeni is highly associated with both short-term and long-term changes in climatic parameter in Jharkhand (Monobrullah et al., 2016). However, the decline in lac production in both cases is statistically non-significant.

Table 1: Growth and instability analysis of Lac production (in tonnes)in Jharkhand and India (2011-12 to 2021-22)

Region	CAGR	Mean	SD	CV	Adj R^2	CDVI	Extent of Instability
Jharkhand	-0.33^{NS}	10092.00	1303.98	12.92	-0.10	13.57	Low
India	0.054^{NS}	18356.82	1956.54	10.66	-0.11	11.23	Low

Note: NS- Non-significant; CAGR- Compound annual growth rate; SD- Standard deviation, CV- Co-efficient of variation; CDVI- Cuddy-Della Valle Index

The mean production data revealed that Jharkhand state alone contributes 54.97% of total lac production in this country, highlighting its prime importance in national economy. From the values of CDVI instability index, it can be concluded that both Jharkhand state and the country is experiencing low level of instability as the values are less than 15.

A case study in Saraitoli Village, Ranchi District, Jharkhand, India

ICAR-National Institute of Secondary Agriculture, previously known as Indian Institute of Natural Resins and Gums, located in Namkum, Ranchi, is a unique institution dedicated solely to all facets of lac, including its production, processing, and product development. This institute has initiated efforts to enhance farmers' livelihoods through lac cultivation by providing training programmes on scientific methods. Motilal Singh Binjhya, a 57years old marginal farmer who resides with his wife (55years old) and two daughters (14 and 19 years old, respectively) in Saraitoli village of Ranchi district attended one of these training programmes back in 2012. He has completed graduation which made it easier for him to grasp the scientific methods of lac cultivation. His land holding size is 0.405 ha where he grows paddy and seasonal vegetables to primarily fulfil the requirement of family consumption and marketed the surplus amount. After completion of the training, he took up the venture of lac cultivation as a supplementary income source. He started cultivating kusmi strain of lac insect on 7 ber and 7 kusum host plants which were naturally available in his village (Table 2). Utilisation of palas host plant is minimal in this region due to persistent mortality of rangeen lac strain.

Table 2: Details of lac cultivation taken up by Motilal Singh Binjhya, Saraitoli village, Ranchi

Strain of Lac	Crop	Weather	Host plant	Seed inoculation	Crop harvesting	Time (in month)
Kusmi	Aghani	Winter	Ber (*Ziziphusmauritiana*)	June-July	January-February	Six
	Jethwi	Summer	Kusum	January-	June-July	Six

			(*Schleicheraoleosa*)	February		

The institute has provided him 6 Kg. of seed lac and required tools such as secateurs, dauli, tangi, pruning knife, axe and one sprayer to apply insecticides and fungicides. Implements like tree prunner, phunki hook and scraping machine were not provided. Various cost components and total return has been represented in table 3. Annually, he gets a yield of 4 to 5 quintal of stick lac from 14 plants and sale it to middlemen or some processing company at Rs.650 to 950/kg based on its demand at national and international market. The major item of cost has incurred on brood lac followed by human labour and medicines (insecticides and pesticides). It has generated 108 man-days of employment --- how ???it is not mentioned. It is included in the cost of production only. But the author can explain here about how lac cultivation is giving 108 man-days of labour in the area(indirect impact) and a gross return of Rs.315,000 from selling 450 kg at Rs.700/kg to middlemen in the year 2023.

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Table 3: Economics of cost and return in lac cultivation per14 host plants in 2023

Particular	**Unit**	**Quantity**	**Value (Rs.)**
Cost			
Labour	Man-days	108	37,800
Brood lac	Kg	140	84,000
Depreciation on fixed input (Spray machine and various implements)	Rs.	-	706
Insecticides and pesticides	Rs.	-	7000
Total Cost	Rs.		129,506
Return			
Stick lac	Kg	450	315,000
B:C Ratio			2.43

Source: Authors' own calculation

The benefit cost ratio was 2.43 which reflects its high profitability (Table 3- is it a reflection of 12 years effort because it is mentioned that he has adopted lac cultivation in 2012 afetr getting the training. ???). Please clear this point.Motilal Singh Binjhya's journey exemplifies the essence of tenacity and ingenuity in agriculture. His venture into lac cultivation transcended mere yields and signifies a paradigm shift towards sustainable techniques to enhance livelihoods while preserving the environment.

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Motilal Singh Binjhya	Lac insects on Ber hostplant	Stick lac ready to sale

Suggestions

- Adaptation of scientific methods of lac cultivation should be highly encouraged and promoted among the farming community. Pruning of lac host plants is crucial for optimal shoot development and ultimately lac production. Nevertheless, many farmers still believe that pruning will hinder the growth of the plants. Their failure to timely prun the host plant at correct manner, ultimately leads to a gradual decline in lac productivity.
- Production of value-added lac-based products such as seedlac, shellac, bleached lac, aleuritic acid, and lac dye should be promoted. It is only possible when equipments or machineries developed for manufacturing of value-added lac-based products are available to them. This initiative may foster employment generation through entrepreneurship development in the country and increase foreign earnings via export.
- Palas, Ber, and Kusum- these traditional plants act as a very good lac host but growth rate is too slow along with its risky and labour intensive nature. Thus, introduction of perennial host plant *Flemingiasemialata* should be advocated for cultivation of kusmi lac strain as these plants take only a year to grow. Additionally, height of these plants (3-4m) make it ideal for managing even for women and children of the households.
- Central and eastern states of India are naturally abundant in traditional lac host plants such as Palas, Ber and Kusum. These are found in forest, agricultural fields, and sometimes even along roadside areas. Majority of these plants are predominantly used as fuel woods. In such situation, host plants need to be conserved so that they can be used in future for lac cultivation.
- Various government and non-government agencies arrange training programs through structured classroom instruction which ultimately fail to fulfil the target. Hence,

training program should be structured to occur in each season and coincide with the ac tive periods. In this way, farmers can have the opportunity to receive live instruction and engage in hands-on learning, leading to superior yields.

- Training organisers must strategically prepare to educate the chosen farmers or social workers with the objective to get a master trainer at the local level. The aim is that these master trainers will effectively train and support the farmers in their respective villages. These training sessions could also facilitate coordination among producer farmers, researchers, processors, factory owners, and policymakers.
- State forest department and research institutes used to manage over 200 brood lac farms across various region. Currently, department lacks any genuinely active farms, primarily due to the influence of naxal activities in forest regions, irregular exchanges of brood lac, and the absence of a stable management fund. As a consequence, they are not receiving a timely supply of healthy brood lac. This shortage of good quality brood lac can be tackled by producing it at village level.
- It has been observed that majority of lac growers have no idea regarding its economic value at global level. They are oblivious to the fact that India is the preeminent producer of lac worldwide and it is in huge demand for being natural and eco-friendly.Therefore, action needs to be taken to inform them about the extensive application and market potential of lac.

Conclusion

In a developing nation like India where majority of the population resides in rural areas, forest resources offer a way of life by generating revenue flow from wood and non-wood forest products (NWFPs). In recent decades, NWFPs, including natural resins and gums (NRGs), tendu leaves, perfumery oils, and exudates from the roots, trunks, and fruits of a variety of tree species, have been gaining recognition at global level for being natural, biodegradable and non-toxic. Over 75% of economically challenged tribal farmers residing in forest or forest edge villages are engaged in lac cultivation for sustaining their livelihoods. However, farmers are unable to achieve optimal yield because of various biotic and abiotic factors, illiteracy, ignorance towards scientific methods, ineffective host plant management, shortage of healthy brood lac etc. There exists significant potential for enhancing lac yield through the utilisation of additional hosts like *Flemingiasemialata* for lac cultivation. Promotion of scientific methods of lac farming is essential in this regard. Further, production of brood lac at village level is

also recommended to tackle the problem regarding shortage of quality brood lac. The global market for lac-based products is growing, presenting huge opportunities for entrepreneurs to enhance value through processing, thereby creating significant employment prospects.

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