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# Maximization of Profitability through Lac Production on *Flemingia semialata*- A Bushy Lac host

A. K. Singh*, A. K. Jaiswal, A. Bhattacharya, R. K. Singh[1], A. K. Singh, Md. Monobrullah and S. Ghosal

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**Abstract**

Lac is bio-degradable in nature and is being cultivated in large amount. Total production and export of lac in 2012-13 was 19,577 and 4,361 tons respectively. Major lac production in India comes from conventional host trees viz., *palas* (*Butea monosperma*), *ber* (*Ziziphus mauritiana*) and *kusum* (*Schleichera oleosa*). *Flemingia semialata* has emerged as one of the most suitable lac host plant. To demonstrate the profitability of winter season lac production on *Flemingia semialata*, field demonstrations were conducted in Jharkhand, Chhattisgarh, Odisha, Bihar and U.P. Broodlac inoculation was done at the mean rate of 50 g/bush during July-August and harvested in January-February and was found quite remunerative. The broodlac yield ratio varied from 1:3.8 at Bokaro (Jharkhand) to 1:9 at Patna (Bihar) with mean broodlac yield ratio of 1:5.5. Lac cultivation resulted in higher net return of ▪ 323929 compared to ▪ 16980, ▪ 26910 and ▪ 43890 under rice, wheat and rice-wheat cropping system, respectively. The average B:C ratio of lac cultivation was 1.30 and that of rice, wheat and rice-wheat cropping system was 0.35, 0.81 and 0.54, respectively.

**Keywords:** Broodlac yield, *Flemingia semialata*, Inoculation, Lac production, Profitability.

## Introduction

Lac cultivation has gained momentum in the recent time, accounting for 50–60% of the total world lac production. Total production and export of lac in 2012-13 was 19,577 and 4,361 tons, respectively (Yogi *et al.* 2014). Lac is also a valuable source of income, particularly for tribals, who dwell in and around forest areas of India. Lac production in India is largely confined to forest and sub-forest areas due to availability of large number of conventional host trees viz., *palas* (*Butea monosperma*), *ber* (*Ziziphus mauritiana*) and *kusum* (*Schleichera oleosa*). Use of these hosts have limitations such as difficulty in crop operations on account of scattered nature and climbing on trees for lac cultivation operations, vulnerability to theft due to relatively higher market price, etc. Gestation period is also very long for these conventional lac hosts, a deterrent for new lac grower, venturing in lac cultivation. *F. semialata* has emerged recently as one of the most suitable lac host plant which is bushy in nature and quick growing, and more importantly lac cultivation can be started from second year on plantation basis. The practice of lac cultivation on *F. semialata* has been standardized (Jaiswal and Singh 2012) and it has shown potential for intensive lac cultivation in short time and provides very attractive returns. This plant can also be integrated in agriculture, horticulture and forest systems for enhanced income (Singhal *et al.* 2014). Due to good returns through lac as compared to the agricultural crops, introduction of bushy lac host *F. Semialata* in the farmers' field can improve overall returns. Thus the cultivation of winter season *kusmi* lac on *Flemingia semialata* with improved technologies will bring economic empowerment to farmers.

## Materials and Methods

Field demonstrations were conducted at 6 locations in Jharkhand, Chhattisgarh, Odisha, Bihar and U.P in the field through participation of the farmers, NGOs and Government organisations during July to February of 2011-12 to 2013-14 on sandy loam to heavy soils in irrigated conditions. During 2011-12, field demonstrations were conducted at Mayurbhanj (Odisha) and Raigarh (Chhattisgarh) on 300 and 400 *F. semialata* bushes in association with a progressive farmer and Janmitram, Chhattisgarh (NGO), respectively. Research farm of KVK, Bokaro (Peterwar), Jharkhand and farmer's field in association of BIOVED Research Institute of Agriculture and Technology, Allahabad (UP) were the site of field demonstration during 2012-13 where technology was demonstrated on 100 and 200 bushes, respectively. Technology was demonstrated at Patna and Buxur on 120 and 160 bushes, respective-

ICAR- Indian Institute of Natural Resins and Gums, Ranchi, Jharkhand- 834010
[1]Central Arid Zone Research Institute, Jodhpur (Raj.)
*Corresponding author E-mail: aksinghiinrg@gmail.com

Table 1. Production potential of lac cultivation at different locations

| Year | Location | No. of plants | Broodlac inoculated (kg) | *Phunki* scraped (kg) | Scarped lac (kg) | Broodlac Yield (kg) | Broodlac Yield ratio |
|---|---|---|---|---|---|---|---|
| 2011-12 | Mayurbhanj, Odisha | 300 | 15 | 7.3 | 13.4 | 76 | 1: 5.1 |
| | Raigarh, Chhattisgarh | 400 | 20 | 9.5 | 18.8 | 120 | 1:6 |
| 2012-13 | Bokaro, Jharkhand | 100 | 5 | 2.1 | 6.5 | 19 | 1:3.8 |
| | Allahabad, U.P. | 200 | 10 | 4.2 | 9.9 | 47 | 1:4.7 |
| 2013-14 | Patna, Bihar | 120 | 5 | 2.1 | 2.7 | 45 | 1:9 |
| | Buxar, Bihar | 60 | 2 | 0.8 | 3.2 | 8 | 1:4 |
| Total | | 1180 | 57 | 18.7 | 54.5 | 315 | 1: 5.5 (Mean) |
| Average over years and locations per ha (8000 bush) | | 8000 | 386.5 | 126.8 | 369.5 | 2135.7 | 1:5.5 |

ly, in association with ICAR- Research Centre for Eastern Region, Patna, Bihar during 2013-14. Demonstration was initiated on two year or more aged bushes of *F. semialata*. The improved technology of winter season *kusmi* lac cultivation on *F. semialata* included pruning of all shoots 5-6 cm above the ground level during February; broodlac inoculation with quality broodlac @ 50 g broodlac per bush during July-August; rotation of broodlac (after required settlement of lac insect, broodlac was removed and inoculated on other plant); *phunki* (used up broodlac) removal after emergence of lac insect crawlers in 12-15 days; removal of lower 5-6 leaves of the plant, around two feet from the ground after the settlement of lac insect for better aeration during rainy season; pest management with 2-3 sprayings of ethofenprox (10 EC) @ 2.0 ml/litre or indoxacarb (15.8 EC) @ 0.07ml/ litre along with carbendazim @1.0 g/litre of water at 27-30, 38-40 and 60-65 days after inoculation (lesser number of sprayings with different schedule at few locations). Fields were irrigated 2-4 times during November to January (when soil moisture became scanty) to avoid detachment of the encrustation from stick before crop maturity (except one location- Mayurbhanj, Odisha). The entire field was maintained weed free by weed removal and hoeing during the demonstration period.

The data on *phunki* scraped after its removal, yield of scraped and broodlac and monetary returns was collected from demonstration plots to work out the economic benefit of winter season lac cultivation on *Flemingia semialata*. Broodlac yield ratio was calculated by dividing the broodlac yield to broodlac inoculated. Besides, the data from rice and/or wheat crop of the respective regions were also collected where farmers were using their own practices for cultivation of these crops. Production data collected from *F. semialata*, rice and wheat were converted on hectare basis over the locations and years, and economics of lac, rice and wheat was calculated.

**Results and Discussion**

The data on production potential of winter season *kusmi* lac cultivation on *F. semialata* at different locations are presented in Table 1. The broodlac yield ratio varied from 1:3.8 at Bokaro (Jharkhand) to 1:9 at Patna (Bihar) with mean broodlac yield ratio of 1:5.5. Sustainable level of broodlac yield ratio was recorded at Mayurbhanj (Odisha) and Raigarh (Chhattisgarh) with values of 1:5.1 and 1:6. At Patna (Bihar), very good level of broodlac yield ratio (1:9) was recorded. Similar yield responses in different crops in front line demonstrations has amply been documented by Tiwari *et al.* (2003), Mishra *et al.* (2009), Kumar *et al.* (2010) and Balai *et al.* (2013). Lac productivity is highly influenced by biotic and abiotic factors (Bhagat and Mishra 2011, Sharma and Jaiswal 2011). Among biotic factors, lac crop is affected by occurrence of predation and parasitism by various harmful insects. The average losses due to pests in lac culture are known to be far greater than what is usually witnessed in other agricultural crops. The *kusmi* winter crop was subject to comparatively higher damage by *Chrysopa species* at Bokaro, Buxar and Allahabad and it appeared on lac crop between 25-30 days of inoculation in the forms of eggs and early stage larvae. Recommended spraying of pesticides could not be done on time at these locations, resulting in poor lac yield. Its control in early stage itself is necessary as it is capable of destroying whole crop within a short period of 7-10 days. At Mayurbhanj (Odisha), proper irrigation could not be given when soil moisture became scanty. Less soil moisture might be one of the reasons for relatively less crop yield at this location. At the advance stage of lac insect in the month of November to January, it needs sufficient plant sap. This is the time period, when the monsoon is

Table 2. Estimated economics of lac, rice, wheat and rice-wheat cropping system over years and locations

| Particulars | Average yield (q/ha) | Cost of Cultivation (▪ / ha) | Gross income (▪ / ha) | Net income (▪ /ha) | B:C Ratio |
|---|---|---|---|---|---|
| Lac | *Phunki* scraped – 1.268<br>Scarped lac- 3.695<br>Broodlac - 21.357 | 249700* | 573629 | 323929 | 1.30 |
| Rice | 50 | 48020 | 65000 | 16980 | 0.35 |
| Wheat | 40 | 33090 | 60000 | 26910 | 0.81 |
| Rice-wheat | 90 | 81110 | 125000 | 43890 | 0.54 |
| Average Rates: Scraped lac- ▪ 8000/q, Broodlac- ▪ 25000/q, Rice- ▪ 1300/q, Wheat- ▪ 1500/q<br>*Cost of lac cultivation include ▪ 47900 as 10% cost of plantation establishment and equipments | | | | | |

virtually over, and soil progressively looses the soil moisture. During this time, light irrigations are required by the lac inoculated plants to meet the sap requirement of growing lac insect. Failing which, encrustation detaches from the stick before crop maturity during January or February, evident from the higher yield of scraped lac per plant at this location.

The input and output prices of commodities prevailed during each year of demonstration and over the locations were averaged and taken for calculating cost of cultivation, gross return and benefit cost ratio. The mean estimated investment on production for lac, rice, wheat and rice-wheat cropping system was ▪ 2,49,700, 48,020, 33,090 and 81,110 per ha (Table 2). Cost of lac production is very high as compared to rice (5.2 times), wheat (7.5 times) and rice-wheat cropping system (3.1times). The major part of cost of lac cultivation is cost of plantation establishment and equipments, and for this reason, 10% was added in annual cost of lac cultivation. The major annual cost in lac cultivation is cost of broodlac (about 48%) followed by cost of labour (27%). Winter season *kusmi* lac cultivation on *F. semialata* gave higher net return of ▪ 323929 compared to ▪ 16980, ▪ 26910 and ▪ 43890 under rice, wheat and rice-wheat cropping system,respectively. The average B:C ratio of lac cultivation was 1.30 and that of rice, wheat and rice-wheat cropping system was 0.35, 0.81 and 0.54, respectively. Higher profitability of lac cultivation was due to its very high value which fetches very good price of the commodity. Pal *et al.* (2009) has also reported lac cultivation on *palas* (*Butea monosperma*), *ber* (*Ziziphus mauritiana*) and *kusum* (*Schleichera oleosa*) as a very remunerative crop, paying high economic returns and as an important source of income for livelihood for the tribal lac growers in Jharkhand. But, due to deforestation and indiscriminate cuttings of these tree-hosts for social, industrial and mining activities have caused gradual shrinking of tree-host population. Even among the available population of tree-hosts, a large proportion remain unutilized because of climbing nature of lac culture operations, theft of lac crop, problem in lac culture operation due to scattered tress etc. Moreover, gestation period of these tree-hosts is around 5-10 years to raise the plantation of these commercial hosts. Hence, lac cultivation on *F. semialata* offer opportunity to shift lac cultivation from tree based farming to quick growing shrub species so that it may spread in non-conventional regions and also to utilize fallow land with irrigation facility. It also offers more opportunity to women folk as all operations are carried out from ground only. Mukharjee (2003) has also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing system productivity.

Present investigation conclude that winter season *kusmi* lac cultivation on *F. semialata* with improved technologies is remunerative and its intervention may be popularized among the farmers. However, lac growers have to stick to the time schedule for crop management for reaping higher benefits.

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